# Table of Contents

1  Introduction ........................................................................................................ 1-1

1.1 Authority .......................................................................................................... 1-1

1.2 Revisions ......................................................................................................... 1-1

1.3 Organization and Interpretation of Manual .................................................. 1-1

1.4 Definitions ....................................................................................................... 1-1

1.5 Abbreviations ................................................................................................. 1-4

1.6 Variance ........................................................................................................... 1-5

1.7 Specifications ................................................................................................. 1-5

1.7.1 Horizontal Construction Specifications (Division II - VII) ...................... 1-5

1.7.2 Regional Construction Specifications ....................................................... 1-6

1.8 Standard Details ............................................................................................ 1-6

1.9 Approved Products ......................................................................................... 1-6

1.10 References ..................................................................................................... 1-6

2  Development Coordination .............................................................................. 2-1

2.1 Regulatory Requirements ............................................................................... 2-1

2.2 Planning ........................................................................................................... 2-1

2.2.1 Comprehensive Plan ................................................................................ 2-1

2.2.2 Development Services Center ................................................................. 2-1

2.2.3 Permits and Inspections ....................................................................... 2-3

2.3 Public Utilities ............................................................................................... 2-7

2.3.1 Private Development Related Sureties ................................................... 2-7

2.3.2 Inspections and Testing ........................................................................ 2-7

2.3.3 Water and Sanitary Sewer Taps Program ............................................. 2-7

2.3.4 Flow Acceptance (Sanitary Sewer Capacity) ......................................... 2-8

2.3.5 Fats, Oils, and Grease Requirements ................................................... 2-9

2.3.6 Utility Easements ............................................................................... 2-9

2.3.7 HRSD Coordination .............................................................................. 2-9

2.3.8 City Procurement of Private Facilities ................................................ 2-10

2.3.9 Public Involvement ................................................................................ 2-10

2.3.10 Submittals ............................................................................................. 2-10

2.4 Public Works ................................................................................................... 2-14

2.4.1 Storm Water ............................................................................................ 2-14

2.4.2 Traffic ...................................................................................................... 2-14

2.4.3 Roadway .................................................................................................. 2-15

2.4.4 Real Estate .............................................................................................. 2-15
# Table of Contents

January 2012

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.4.5</td>
<td>Surveys</td>
<td>2-15</td>
</tr>
<tr>
<td>2.5</td>
<td>Fire</td>
<td>2-16</td>
</tr>
<tr>
<td>3</td>
<td>Wastewater Collection System</td>
<td>3-1</td>
</tr>
<tr>
<td>3.1</td>
<td>General</td>
<td>3-1</td>
</tr>
<tr>
<td>3.1.1</td>
<td>Consent Order Requirements</td>
<td>3-1</td>
</tr>
<tr>
<td>3.1.2</td>
<td>City Code Requirements</td>
<td>3-1</td>
</tr>
<tr>
<td>3.1.3</td>
<td>Construction Considerations</td>
<td>3-2</td>
</tr>
<tr>
<td>3.1.4</td>
<td>Subsurface Investigations</td>
<td>3-2</td>
</tr>
<tr>
<td>3.1.5</td>
<td>Inspections and Testing</td>
<td>3-2</td>
</tr>
<tr>
<td>3.2</td>
<td>Wastewater Design Flows</td>
<td>3-2</td>
</tr>
<tr>
<td>3.2.1</td>
<td>Average Daily Flows Based on Land Use</td>
<td>3-2</td>
</tr>
<tr>
<td>3.2.2</td>
<td>Peak Flow</td>
<td>3-6</td>
</tr>
<tr>
<td>3.3</td>
<td>Gravity Sanitary Sewer Lines</td>
<td>3-6</td>
</tr>
<tr>
<td>3.3.1</td>
<td>Depth</td>
<td>3-7</td>
</tr>
<tr>
<td>3.3.2</td>
<td>Location</td>
<td>3-7</td>
</tr>
<tr>
<td>3.3.3</td>
<td>Boring and Jacking</td>
<td>3-7</td>
</tr>
<tr>
<td>3.3.4</td>
<td>Acceptable Pipe Materials</td>
<td>3-7</td>
</tr>
<tr>
<td>3.3.5</td>
<td>Pipe Sizing</td>
<td>3-7</td>
</tr>
<tr>
<td>3.3.6</td>
<td>Slope and Velocity</td>
<td>3-8</td>
</tr>
<tr>
<td>3.3.7</td>
<td>Alignment</td>
<td>3-8</td>
</tr>
<tr>
<td>3.3.8</td>
<td>Corrosion Prevention</td>
<td>3-8</td>
</tr>
<tr>
<td>3.3.9</td>
<td>Sewer Main Connections at Manholes</td>
<td>3-8</td>
</tr>
<tr>
<td>3.3.10</td>
<td>Separation</td>
<td>3-8</td>
</tr>
<tr>
<td>3.3.11</td>
<td>Buoyancy</td>
<td>3-9</td>
</tr>
<tr>
<td>3.3.12</td>
<td>Trenching, Bedding, Backfill</td>
<td>3-9</td>
</tr>
<tr>
<td>3.3.13</td>
<td>Inspection and Testing</td>
<td>3-10</td>
</tr>
<tr>
<td>3.3.14</td>
<td>Aerial Crossings</td>
<td>3-10</td>
</tr>
<tr>
<td>3.3.15</td>
<td>Conflict Structures</td>
<td>3-10</td>
</tr>
<tr>
<td>3.3.16</td>
<td>HRSD Gravity Sewer Interceptor</td>
<td>3-10</td>
</tr>
<tr>
<td>3.4</td>
<td>Manholes</td>
<td>3-10</td>
</tr>
<tr>
<td>3.4.1</td>
<td>Manhole Depth</td>
<td>3-10</td>
</tr>
<tr>
<td>3.4.2</td>
<td>End of Line Requirement</td>
<td>3-11</td>
</tr>
<tr>
<td>3.4.3</td>
<td>Manhole Locations</td>
<td>3-11</td>
</tr>
<tr>
<td>3.4.4</td>
<td>Manhole Spacing</td>
<td>3-11</td>
</tr>
<tr>
<td>3.4.5</td>
<td>Manhole Diameter</td>
<td>3-11</td>
</tr>
<tr>
<td>3.4.6</td>
<td>Connection to Manhole</td>
<td>3-11</td>
</tr>
</tbody>
</table>
3.4.7 Manhole Separation from Water Mains .......................................................... 3-11
3.4.8 Drop Manholes ............................................................................................... 3-11
3.4.9 Bench and Flow Channel .................................................................................. 3-12
3.4.10 Water Tightness and Manhole Inserts ............................................................ 3-12
3.4.11 Corrosion Prevention ...................................................................................... 3-12
3.4.12 Inspections and Testing ................................................................................... 3-12

3.5 Service Connections ......................................................................................... 3-12
3.5.1 Service Connection Sizes ................................................................................ 3-13
3.5.2 Manhole Required at Right-of-Way ................................................................. 3-13
3.5.3 Service Connection Installation ....................................................................... 3-13
3.5.4 Inspection and Testing ...................................................................................... 3-13

3.6 Vacuum Sanitary Sewer Lines ........................................................................... 3-14
3.6.1 Materials .......................................................................................................... 3-14
3.6.2 Vacuum Pit and Valve ...................................................................................... 3-14
3.6.3 Buffer Tanks .................................................................................................... 3-15
3.6.4 Vacuum Main Design ....................................................................................... 3-15
3.6.5 Gauge Taps ....................................................................................................... 3-16
3.6.6 Isolation Valves ............................................................................................... 3-16
3.6.7 Inspections and Testing ................................................................................... 3-16
3.6.8 Vacuum Monitoring System Requirements ..................................................... 3-18
3.6.9 Odor Control .................................................................................................... 3-18

3.7 Wastewater Pump Stations .............................................................................. 3-18
3.7.1 Location ............................................................................................................ 3-19
3.7.2 Type of Stations ............................................................................................... 3-19
3.7.3 Mechanical Design .......................................................................................... 3-20
3.7.4 Structural Design ............................................................................................ 3-23
3.7.5 Electrical Design ............................................................................................... 3-24
3.7.6 Architectural Design and Aesthetics ................................................................. 3-26
3.7.7 Odor Control .................................................................................................... 3-27
3.7.8 SCADA and Telemetry Requirements .............................................................. 3-27
3.7.9 Inspections and Testing ................................................................................... 3-27
3.7.10 Operations and Maintenance Manual Requirements ..................................... 3-27
3.7.11 Instrumentation Requirements ....................................................................... 3-27
3.7.12 Emergency Pump Connection ...................................................................... 3-28
3.7.13 Private Pump Stations .................................................................................... 3-28
3.7.14 Miscellaneous ............................................................................................... 3-28
3.8 Force Mains ........................................................................................................... 3-28
  3.8.1 Location ........................................................................................................... 3-29
  3.8.2 Depth ............................................................................................................... 3-29
  3.8.3 System Capacity and Hydraulic Design ........................................................... 3-29
  3.8.4 Velocity ............................................................................................................ 3-29
  3.8.5 Material Requirements .................................................................................... 3-29
  3.8.6 Corrosion Prevention ...................................................................................... 3-30
  3.8.7 Thrust Protection Design ................................................................................ 3-30
  3.8.8 Air Relief and Vacuum Intake ......................................................................... 3-30
  3.8.9 Markers ........................................................................................................... 3-30
  3.8.10 Anchorage ..................................................................................................... 3-31
  3.8.11 Boring and Jacking ....................................................................................... 3-31
  3.8.12 Standard Connection Requirements ............................................................. 3-31
  3.8.13 Connection to Low Pressure Force Mains (LPFM) ........................................ 3-31
  3.8.14 Inspections and Testing ................................................................................ 3-32
  3.8.15 Connection to HRSD .................................................................................... 3-32
3.9 Wastewater Collection System Component Abandonment ................................... 3-32
  3.9.1 Gravity Sanitary Sewer Main .......................................................................... 3-32
  3.9.2 Manholes ....................................................................................................... 3-33
  3.9.3 Service Connections ....................................................................................... 3-33
  3.9.4 Vacuum Sanitary Sewer Main and Service Pits ............................................. 3-33
  3.9.5 Wastewater Pump Stations ............................................................................ 3-33
  3.9.6 Force Mains ................................................................................................... 3-34
4 Water Distribution and Transmission Systems ......................................................... 4-1
  4.1 General ............................................................................................................... 4-1
    4.1.1 Subdivision Ordinance ................................................................................. 4-1
    4.1.2 Master Plan Requirements .......................................................................... 4-1
    4.1.3 Pressure Zones ............................................................................................ 4-1
    4.1.4 Subsurface Investigations ........................................................................... 4-1
    4.1.5 Inspections and Testing ................................................................................ 4-1
    4.1.6 Construction Considerations ....................................................................... 4-2
  4.2 Water Demand .................................................................................................... 4-2
    4.2.1 Domestic Demand ....................................................................................... 4-2
    4.2.2 Fire Flow Demand ....................................................................................... 4-2
    4.2.3 Other ............................................................................................................ 4-2
  4.3 Water Main Criteria ............................................................................................ 4-2
<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.3.1</td>
<td>Jurisdictional Agency Approvals</td>
<td>4-3</td>
</tr>
<tr>
<td>4.3.2</td>
<td>Service Connections</td>
<td>4-3</td>
</tr>
<tr>
<td>4.3.3</td>
<td>Alignment and Easement Requirements</td>
<td>4-4</td>
</tr>
<tr>
<td>4.3.4</td>
<td>Water Main Extensions</td>
<td>4-4</td>
</tr>
<tr>
<td>4.3.5</td>
<td>Water Main Classifications</td>
<td>4-4</td>
</tr>
<tr>
<td>4.3.6</td>
<td>Hydraulic Requirements</td>
<td>4-4</td>
</tr>
<tr>
<td>4.3.7</td>
<td>Thrust Restraint</td>
<td>4-5</td>
</tr>
<tr>
<td>4.3.8</td>
<td>Corrosion Prevention</td>
<td>4-6</td>
</tr>
<tr>
<td>4.3.9</td>
<td>Separation</td>
<td>4-6</td>
</tr>
<tr>
<td>4.3.10</td>
<td>Start-Up and Commissioning Period</td>
<td>4-7</td>
</tr>
<tr>
<td>4.3.11</td>
<td>Inspections and Testing</td>
<td>4-7</td>
</tr>
<tr>
<td>4.3.12</td>
<td>Record Drawings</td>
<td>4-7</td>
</tr>
<tr>
<td>4.4</td>
<td>Distribution Design Criteria</td>
<td>4-7</td>
</tr>
<tr>
<td>4.4.1</td>
<td>Location/Alignment</td>
<td>4-8</td>
</tr>
<tr>
<td>4.4.2</td>
<td>Depth</td>
<td>4-8</td>
</tr>
<tr>
<td>4.4.3</td>
<td>Valve Spacing Requirement</td>
<td>4-8</td>
</tr>
<tr>
<td>4.4.4</td>
<td>Fire Hydrant Requirements</td>
<td>4-8</td>
</tr>
<tr>
<td>4.4.5</td>
<td>Line Valves</td>
<td>4-9</td>
</tr>
<tr>
<td>4.4.6</td>
<td>Restraint Systems</td>
<td>4-9</td>
</tr>
<tr>
<td>4.4.7</td>
<td>Air Release</td>
<td>4-9</td>
</tr>
<tr>
<td>4.4.8</td>
<td>Inspections and testing</td>
<td>4-9</td>
</tr>
<tr>
<td>4.4.9</td>
<td>Cross Connections and Backflow Prevention</td>
<td>4-9</td>
</tr>
<tr>
<td>4.4.10</td>
<td>Water Distribution System Plan Requirements – Checklist</td>
<td>4-10</td>
</tr>
<tr>
<td>4.5</td>
<td>Transmission Mains - Design Criteria</td>
<td>4-10</td>
</tr>
<tr>
<td>4.5.1</td>
<td>Location/Alignment</td>
<td>4-10</td>
</tr>
<tr>
<td>4.5.2</td>
<td>Depth</td>
<td>4-10</td>
</tr>
<tr>
<td>4.5.3</td>
<td>Line Valves and Spacing</td>
<td>4-10</td>
</tr>
<tr>
<td>4.5.4</td>
<td>Restraint Systems</td>
<td>4-10</td>
</tr>
<tr>
<td>4.5.5</td>
<td>Air/Vacuum Valve Assemblies</td>
<td>4-10</td>
</tr>
<tr>
<td>4.5.6</td>
<td>Appurtenant Facilities</td>
<td>4-11</td>
</tr>
<tr>
<td>4.5.7</td>
<td>Design Survey Requirements</td>
<td>4-11</td>
</tr>
<tr>
<td>4.5.8</td>
<td>Inspections and Testing</td>
<td>4-11</td>
</tr>
<tr>
<td>4.5.9</td>
<td>Transmission Main Plan Requirements – Checklist</td>
<td>4-11</td>
</tr>
<tr>
<td>4.6</td>
<td>Fire Line Systems</td>
<td>4-11</td>
</tr>
<tr>
<td>4.6.1</td>
<td>Acceptable Pipe Materials</td>
<td>4-11</td>
</tr>
<tr>
<td>4.6.2</td>
<td>Design Requirements</td>
<td>4-11</td>
</tr>
</tbody>
</table>
4.7 Irrigation Systems and Water Features ................................................................. 4-12
  4.7.1 Design Requirements .................................................................................. 4-12
  4.7.2 Landscape Water Permit ................................................................. 4-12
  4.7.3 Limitations on Water Use ................................................................. 4-12
4.8 Backflow Prevention .................................................................................. 4-12
  4.8.1 Reduced Pressure Zone Devices .................................................. 4-12
  4.8.2 Detector Checks .............................................................................. 4-12
4.9 Water System/Component Abandonment ............................................. 4-13
4.10 Construction Meters .............................................................................. 4-13
  4.10.1 Hydrant Meter Program ............................................................... 4-13
  4.10.2 Construction Meter (residential) ................................................ 4-13
5 Other Water Facilities ...................................................................................... 5-1
  5.1 General ........................................................................................................ 5-1
    5.1.1 Water Production Facilities Criteria ........................................ 5-1
    5.1.2 Jurisdictional Agency Approvals ............................................. 5-1
    5.1.3 Environmental, Biological and Cultural Assessment ............. 5-1
    5.1.4 Project Site Requirements ......................................................... 5-1
    5.1.5 Supervisory Control and Data Acquisition (SCADA) .............. 5-2
    5.1.6 Electrical Design ........................................................................ 5-2
    5.1.7 Piping Systems ........................................................................... 5-3
    5.1.8 Valves ............................................................................................ 5-3
    5.1.9 Flow Metering ............................................................................. 5-4
    5.1.10 Operations and Maintenance Manual Requirements .......... 5-4
    5.1.11 Inspections and Testing ............................................................. 5-4
    5.1.12 Record Drawings ...................................................................... 5-4
  5.2 Pumping Facilities ...................................................................................... 5-4
    5.2.1 Pumping Units and Size ............................................................... 5-4
    5.2.2 Design Criteria ........................................................................... 5-4
    5.2.3 Inspections and Testing ............................................................... 5-5
  5.3 Wells ............................................................................................................. 5-5
    5.3.1 Construction Materials ................................................................. 5-5
    5.3.2 Design Criteria ........................................................................... 5-5
    5.3.3 Additional Design Requirements ............................................. 5-6
    5.3.4 Abandoned Wells ........................................................................ 5-6
  5.4 Water Storage Facilities ............................................................................. 5-6
    5.4.1 Construction Materials ................................................................. 5-6
5.4.2 Storage Capacity ........................................................................................................ 5-6
5.4.3 Design Criteria ........................................................................................................ 5-6
5.4.4 Coatings .................................................................................................................. 5-7
5.4.5 Chlorination System Requirements ......................................................................... 5-7

Appendix A – DPU Administrative Directives, Policies & Codes ........................................ A
Appendix B – Standard Legend for Record Drawings .......................................................... B
1 Introduction

The purpose of the Design Standards Manual is to provide conformity to the design and review of public water and wastewater utility improvements that are to be owned and maintained by the City of Virginia Beach, Department of Public Utilities.

This manual replaces any earlier version of the Department’s Design Standards Manual or Design Guidelines Manual. It is intended to be used with the current edition of the City of Virginia Beach Department of Public Utilities Standard Details; the City of Virginia Beach Amendments to the Virginia Department of Transportation Road and Bridge Specifications, 2007; and the Department’s Approved Products List.

The sections of this manual identify routine or standard design assumptions and practices used and accepted by the Department. This document is a compilation of widely accepted design practices and standards presently in use throughout the professional engineering and water and wastewater communities. Special or unique design situations must be addressed on a case by case basis.

The Department strives for continuous improvement. Comments or suggestions for the improvement of this document are welcomed. Please send comments or suggestions to Mr. R.H. Nettleton, P.E., Design & Construction Manager, Department of Public Utilities (rnettlet@vbgo.gov.com).

1.1 Authority

1. The design standards set forth in this manual are adopted pursuant to the authority granted in the Virginia Beach City Code - Chapter 2 of the Charter.

1.2 Revisions

1. This manual may be modified and updated periodically. Proposed revisions will be available for review on the City of Virginia Beach Department of Public Utilities website for a period of 60 days unless the revision is required to be in compliance with pertinent laws, regulations, ordinances, or codes governed by the Federal, State or City government.

1.3 Organization and Interpretation of Manual

1. This manual provides written engineering standards, links and references to standards established by other organizations and agencies, and Standard Details of the City of Virginia Beach Department of Public Utilities. The Design and Construction Manager of the Virginia Beach Department of Public Utilities will have the authority to make binding and controlling interpretations of sections or differences between sections.

1.4 Definitions

Capital Improvement Program (CIP)
A project funded under the City of Virginia Beach Capital Improvement Program
**City**
The City of Virginia Beach

**Comprehensive Plan**
The Comprehensive Plan is a Department of Planning document consolidating the major elements of various planning reports and establishing an overall guide for the City of Virginia Beach's zoning and plan of growth

**Control Center**
The Department's central facility utilized in monitoring the public sanitary sewer pumping stations, the water pumping stations, storage facilities, and monitoring points

**Department of Planning**
The Department of Planning facilitates the land use planning and development process in the City of Virginia Beach.

**Department of Public Utilities (DPU)**
The Department of Public Utilities provides public water, including water for fire protection and public sanitary sewer services, to the urban areas of the City of Virginia Beach.

**Department of Public Works (DPW)**
The Department of Public Works provides total life cycle management of the public infrastructure and key essential services.

**Developer**
Any property owner, or any person or group with written authorization from the property owner, who intends to improve or to construct improvements upon a given property

**Development Services Center (DSC)**
The DSC is a division of the Planning Department responsible for the coordination of the review and approval of the following land development related items: commercial site plan, subdivision plats, redevelopment/infill residential site plans, residential and commercial site plans located within the Resource Protection Area (RPA) of the Chesapeake Bay Preservation Area (CBPA). In addition, the DSC issues Land Disturbing Activity/Storm water Management Permits, Right-of-Way Permits (associated with plans approved by the DSC), and manages private development related sureties (bonds, letters-of-credit, and cash).

**Distribution Main**
A water main less than 12" in diameter used for distributing water within a specific area or region of a water system

**Engineer**
The engineering consultant, tasked with the design of a project by the Department or Developer

**Interceptor Force Main**
A force main that receives flows from one or more sewage force mains and conveys such flows to a point for treatment or disposal
Lateral
The pipe or conduit conveying wastewater in a gravity sewer from a property to the public gravity sewer system and has no other common sewer tributary to it

Main
(i.e. water, gravity sanitary sewer, vacuum, force) means a gravity, vacuum, or pressure pipe that conveys water or wastewater from one point to another

Peer review
The review of construction plans by various agencies and divisions of the City of Virginia Beach as determined and coordinated by the Project Manager

Private Force Main
Refers to any force main that is privately owned and maintained

Private Utilities
Refers to any gravity sewer, force main, sewage treatment plant or water supply system that serves residential subdivisions or other groups of uses or structures and is not owned and maintained by the Department

Project Area
The area where work is to be performed either by the City of Virginia Beach or a developer

Project Cost
The total dollar amount required for funding a project including engineering study, design, right-of-way and/or easement acquisition, construction costs, and contingencies. Developer projects shall also include a cost for inspection and support.

Project Inspector
The Department construction inspector assigned to a project for constructing CIP or developer projects

Project Manager
The Department engineer assigned to a CIP project for planning, design or construction

Public Sanitary Sewer System
Any sanitary sewer facility or line owned and maintained by the Department

Public Water System
Any water facility or line owned and maintained by the Department

Service Line
A pipe or conduit conveying water from a water distribution main to the water meter of any individual property

Sewage Collection and Treatment Regulations (SCAT)
The Commonwealth of Virginia Sewage Collection and Treatment Regulations govern the design, construction and operation of sewerage systems and treatment works serving more than one residence or a non-residential sewage source.
**Shall**
Means a mandatory requirement

**Site Plan**
The detailed drawings indicating all building layout, land improvements including landscape treatments, drainage, grading, utilities, right-of-way improvements, erosion control and details which may be required by city ordinance

**Transmission Main**
A transmission main is a water or force main, used for conveyance from one area or region of the system to another. Water transmission mains are generally 12-inch diameter and larger. Many sewerage transmission mains in the City are owned and operated by HRSD.

**Virginia Department of Environmental Quality (VDEQ)**
The Department of Environmental Quality administers state and federal laws and regulations for air quality, water quality, water supply and waste management.

### 1.5 Abbreviations

**AWWA**
American Water Works Association

**CAD**
Computer Aided Design

**CIP**
Capital Improvement Program

**DPU**
Department of Public Utilities

**DPW**
Department of Public Works

**DSC**
Development Services Center

**HRPDC**
Hampton Roads Planning District Commission

**HRSD**
Hampton Roads Sanitation District

**RTS**
Regional Technical Standards
**SCAT**  
Sewage Collection and Treatment

**VDEQ**  
The Virginia Department of Environmental Quality

**VDOT**  
The Virginia Department of Transportation

**VDH**  
The Virginia Department of Health

### 1.6 Variance

1. All utility infrastructure (water, gravity sanitary sewer, vacuum sanitary sewer, force main, pump stations, various appurtenances) whether DPU or Developer built, shall adhere to these Design Standards, including any Special Provisions or Amendments.

2. The DPU provides an opportunity for the Developer and/or Engineer to request a variance from the Design Standards where appropriate and justifiable to the individual situation. For consideration, the design Engineer must submit the variance request with complete documentation and justifiable support (see Section 2.3.10.5 of this manual for details regarding the variance process).

3. The DPU will consider each request on an individual case-by-case basis. Thus, an approved variance of the Design Standards for one project may not be approved for another project. The DPU divisions of Engineering, Operations, and Business will, as appropriate, consider the variance request and the potential impacts before approval or denial by the DPU Director.

### 1.7 Specifications

1. This section describes the following specifications:
   a. Horizontal Construction Specifications
   b. Regional Construction Specifications

#### 1.7.1 Horizontal Construction Specifications (Division II - VII)

1. Horizontal construction specifications are located in a document titled, “City of Virginia Beach Amendments to the Virginia Department of Transportation Road and Bridge Specifications, 2007”, located on the City’s DPU website.
1.7.2 Regional Construction Specifications

1. Regional design specifications are located in the Hampton Roads Planning District Commission (HRPDC) Regional Construction Standards, located on the HRPDC website. The Regional Construction Standards are a reference document comprised of Regional Technical Specifications and Standard Details. If there are conflicts between the Regional Construction Standards and the City’s DPU Design Standards, the City’s DPU Design Standards shall supersede. Project specific details are to be coordinated with the City of Virginia Beach.

1.8 Standard Details


1.9 Approved Products

1. The products which have been approved by the Product Selection Committee are found on the Approved Products List on the City’s DPU website. The list provides approved products organized by type as well as by manufacturer.

1.10 References

1. The following documents shall serve as a suggested, though not exhaustive, list of references:

   a. ACI 211 – Guide for Submittal of Concrete Proportions
   b. ACI 212 – Chemical Admixtures for Concrete
   c. ACI 301 – Specifications for Structural Concrete
   d. ACI 318 – Building Code Requirements for Structural Concrete
   e. ACI 350 – Wastewater Facilities
   f. ACI 530-02 Building Code Requirements for Masonry Structures
   g. American National Standards Institute (ANSI)
   h. AWWA – Distribution System Requirements for Fire Protection (M31)/ISO
   i. AWWA – Distribution Valves: Selection, Installation, Field Testing, and Maintenance (M44)
   j. AWWA – Ductile-Iron Pipe and Fitting (M41)
   k. AWWA – Manual M11 Harness Restraint
   l. AWWA – Manual #32, "Distribution Network Analysis for Water Utilities"
   m. AWWA – Standard D-100, "Welded Steel Tanks for Water Storage"
   n. AWWA – Sizing Water Services Lines & Meters (M22)
   o. AWWA – Water Meters - Selection, Installation, Testing and Maintenance (M6)
   p. City of Virginia Beach Department of Public Utilities - Comprehensive Water Study (July 1991)
q. DIPRA – Thrust Restraint and Corrosion Protection
r. Fair, Geyer, & Okum – Water Supply & Wastewater Removal
s. Great Lakes – Upper Mississippi River Board of State Public Health & Environmental Managers - Recommended Standards for Wastewater Facilities
t. Hydraulic Institute – Engineering Data Book Standards
u. National Electric Code (NEC)
v. National Electrical Manufacturers Association (NEMA)
x. National Sanitation Foundation (NSF) International Standard
y. Sanks – Pumping Station Design, 2nd Edition
z. "Standards of Hydraulic Institute"
aa. Standard Rules of American Institute of Electrical Engineers (AIEE)
bb. The Commonwealth of Virginia Waterworks Regulations
c. The Commonwealth of Virginia Sewer Collection and Treatment Regulations
dd. The Society for Protective Coatings
e. Uni-Bell Plastic Pipe Association – Handbook of PVC Pipe
ff. Water Environment Federation (WEF) – Design of Wastewater and Stormwater Pumping Stations (MOP FD -4)
gg. WEF – Gravity Sanitary Sewer Design and Construction (MOP FD-5)
2 Development Coordination

2.1 Regulatory Requirements

1. The design of public utility water and sanitary sewer systems shall be prepared and certified in accordance with Title 54.1, Chapter 4 of the Code of Virginia, or as amended.

2. When the project design is under the jurisdiction of other State or Federal agencies and the design requirements are in conflict, the more restrictive requirements shall govern.

3. Sanitary sewer, sewage pump station, and sewer force main designs shall conform to the Commonwealth of Virginia "Sewage Collection and Treatment Regulations" (SCAT Regulations), and the requirements of the DPU, whichever is more restrictive.

4. Water distribution main, transmission main, water pumping station, and water storage facility designs shall conform to the Commonwealth of Virginia Waterworks Regulations and the requirements of the DPU, whichever is more restrictive.

2.2 Planning

1. This section provides information on the following aspects of the planning process:
   a. Comprehensive Plan
   b. Development Services Center
   c. Permits and Inspections

2.2.1 Comprehensive Plan

1. Refer to the City’s Comprehensive Plan on the City’s Department of Planning 2009 Comprehensive Plan – Process and Adoption webpage for information.

2.2.2 Development Services Center

1. Refer to the City’s Department of Planning webpage which provides information on the Development Services Center (DSC).

2.2.2.1 Review Processes, Forms, Fees and Documents

1. This section provides information on the following review processes, forms, fees and documents:
   a. Information Notices
   b. Legal Documents
   c. Processes
   d. Submittal Checklists
   e. Surety Documents
   f. Pump and Utility Connection Fees
   g. Review Fees
2.2.2.1.1 Information Notices

1. DSC Information Notices are provided to assist our customers by notifying them of changes to policies, standards, processes, procedures and general information related to the land development plan, plat and document review and approval processes. The information contained in these Notices, including staff members and contacts, is subject to change without notice. Refer to the DSC Information Notices webpage for a list of the current notices.

2.2.2.1.2 Legal Documents

1. The standard legal documents referenced are provided by the Development Services Center (DSC) to assist our customers in meeting the land development plan, plat or document approval requirements. The documents listed are subject to change without notice. Any changes to the wording or format of these documents will require additional legal review by the City Attorney’s staff. This additional review is likely to cause delays to the plan review process. Refer to the Fillable Forms – Applications, Checklists, Fees, Legal Documents, and Surety Documents webpage for a list of the current legal documents.

2.2.2.1.3 Processes

1. The documents listed are land development related processes used during the review and approval of plans and plats by the Development Services Center (DSC). These are subject to change without notice. Refer to the Development Plan/Plat Related Processes webpage for a list of the current land development related processes.

2.2.2.1.4 Submittal Checklists

1. The documents listed are standard Submittal Checklists required by the Development Services Center (DSC) for the review of most land development plans, plats and documents. The documents listed are subject to change without notice. Refer to the Fillable Forms – Applications, Checklists, Fees, Legal Documents, and Surety Documents webpage for a list of the current submittal checklists.

2.2.2.1.5 Surety Documents

1. The standard surety documents referenced are provided by the Development Services Center (DSC) to assist our customers in meeting the surety requirements associated with land development plan, plat and permit approval requirements. The documents listed are subject to change without notice. Any changes to the wording or format of these documents will require additional legal review by the City Attorney’s staff. This additional review is likely to cause delays. Refer to the Fillable Forms – Applications, Checklists, Fees, Legal Documents, and Surety Documents webpage for a list of the current surety documents.
2.2.2.1.6 Pump and Utility Connection Fees

1. The City’s DPU Rates, Fees & Charges webpage provides information regarding water and sewer rates and pump and utility connection fees. The rates, fees, and charges are levied in accordance with the Virginia Beach City Code.

2.2.2.1.7 Review Fees

1. The City’s Department of Planning, Fillable Forms – Applications, Checklists, Fees, Legal Documents, and Surety Documents webpage, provides information regarding applicable DSC Review Fees.

2.2.3 Permits and Inspections

1. This section provides information regarding permits and inspections as they pertain to:
   a. Right-of-Way Requirements
   b. Plumbing, Mechanical and Electrical Requirements

2.2.3.1 Right-of-Way Requirements

1. The sub-sections below describe the following aspects of Right-of-Way requirements:
   a. Permit Application Requirements
   b. Application Drawing
   c. Review
   d. Installation

2.2.3.1.1 Permit Application Requirements

1. City right-of-way permits are administered by the Department of Planning/Permits and Inspections and the DSC (Right-of-Way Permits associated with development plans approved by the DSC). A complete copy of the review sheet from Permits & Inspections is routed to the DPU for comments. Public Utilities will review each review sheet in relation to the City’s water and sanitary sewer infrastructure including Hampton Road Sanitation District (HRSD) infrastructure. Comments are returned to Permit & Inspections for consideration.

2. When emergency work is required, the permittee must contact Public Utilities/Engineering by telephone (757-385-4171) and provide the location of the emergency with the right-of-way permit number assigned by Permits & Inspections before work commences. A faxed notification sheet shall also be sent to Public Utilities/Engineering (757-385-5778) with the permit number and location noted. A permit application and drawing (see Section 2.2.3.1.2 of this manual) will be required within fourteen (14) days of emergency call in.

Applications routed to DPU for review must contain the following information:
   a. Company name
b. Company phone number
c. Company address
d. Contact person name and phone number
e. Contractor name and phone number
f. Type and description of work (including linear footage) to be performed (be specific)
g. Number of test holes and/or number and sizes of open cuts.
h. Street address / location of work and nearest cross street.
i. Indicate whether proposed utility work is within the limits of a CIP. If yes, provide CIP job number.

2.2.3.1.2 Application Drawing

1. Drawings submitted with a permit application (including emergency work permits) may be on existing site plans, record drawings, drawn by CAD, or manually drawn. All drawings shall be neat and legible.

   **Note:** The use of existing drawings will not eliminate any requirements listed in item 3 below.

2. Scaled drawings are not required but the drawing shall be adequately sized to show the degree of congestion within the limits of all proposed work and all existing utilities.

3. Drawings must show the following for Public Utilities review:

   a. All proposed private utilities (clearly labeled and highlighted)
   b. Property line or right-of-way line (labeled P/L or R/W)
   c. Horizontal distance between right-of-way line (R/W) or public easement line to the nearest existing public utility, horizontal distance between existing public utilities and all proposed utilities (must be referenced from edge of pavement)
   d. Edge of pavement and driveways (labeled EOP and DW)
   e. All water mains, detector checks, fire hydrants, water valves, water meter, gravity sanitary sewer mains, manholes, gravity sanitary sewer services with clean out (if available), sanitary sewer force mains (including HRSD force mains), force main valves, vacuum sanitary sewer mains, valve pits, and service lines
   f. Diameter of all existing water mains, sanitary sewer mains, force mains, sanitary sewer service laterals, and water services within the proposed work area
   g. The starting point and point of termination of the proposed private utility or the point where the utility crosses out of the city right-of-way or easement, i.e. from pedestal to pole or from pole to property line
   h. Linear footage of all private proposed utilities within the City’s right-of-way i.e. including, cable, conduit or piping
   i. North arrow
   j. Match line station or sheet number, if applicable
   k. Street name with addresses and nearest cross street name
   l. Show all public utility easements within proposed work area
2.2.3.1.3 Review

1. The DPU will make every effort to review and return comments to Permits & Inspections within five (5) business days. Additional review time may be necessary as a result of permit volume. DPU reviewers shall notify Permits & Inspections prior to, or on the fifth day, when more review time is required.

2.2.3.1.4 Installation

1. All work site locations shall be faxed (757-385-5778) to the Public Utilities’ Engineering Division no later than 9:00 a.m., daily.

2. Proposed utility depth requirements must adhere to the Code of Virginia Section § 56-265.26:1, found in the Virginia Professional Excavator’s Manual.

3. Private utility installations must maintain a minimum 24-inch (2 foot) vertical edge-to-edge separation and a minimum 36-inch (3 feet) edge-to-edge horizontal separation from all water and sanitary sewer utilities that are at a depth less than six (6) feet. The vertical separation of 2 feet is allowed only when all proposed utilities are installed utilizing non-mechanized equipment.

   There shall be a minimum of 18-inches edge-to-edge of vertical separation between water and sanitary sewer utilities with 10 feet of horizontal separation.

   When water and sanitary sewer utilities are at a depth greater than six (6) feet, the required horizontal and vertical separation distance will be increased. Additionally, the diameter of water and sanitary sewer utilities may increase horizontal and vertical separation distance.

4. When crossing over or under water and sanitary sewer utilities, the Contractor is required to comply with Section 20VAC5-309-150 titled "Requirements for Trenchless Excavation" found in the Virginia Professional Excavator’s Manual. These rules delineate procedures used by the State Corporation Commission to enforce the Underground Utility Damage Prevention Act. The requirement states, “The excavator shall visually check the drill head as it passes through pot holes, entrances, and exit pits; and if the depth indicated by the locating device is lower than the bottom of the pot hole or pit, the excavator shall cease boring until the hole/pit can be hand excavated further to maintain a visual inspection of the drill head.”

   Contractors installing private utilities must notify the DPU Engineering Division twenty-four (24) hours in advance to request an appointment for utility depth verification. A Public Utilities Engineering Technician must record the observed depth of all water and sanitary sewer utilities and approve the vertical separation between the DPU utility and the proposed utility. At no time shall the drill head be allowed to pass any utility owned by the DPU with less than 24-inches of separation.

   For utilities such as deep gravity sanitary sewer mains where performing depth verification by test hole method is not feasible, visually checking the drill head passing through the test hole may not be enforced. The contractor must obtain prior approval
and an approved depth (in writing) from the DPU before crossing water and sanitary sewer utilities if a test hole is not performed.

The Department of Public Utilities reserves the right to request additional utility depth verification (test holes) as needed. Permittee shall contact Permits & Inspections for field change authorization.

5. Private utilities shall not cross Public Utilities’ water and sanitary sewer facilities diagonally. All crossings must be perpendicular.

6. The HRSD Interceptor Engineer shall be notified (757-460-7015) forty-eight (48) hours prior to crossing HRSD force mains.

7. Contractor must have a complete copy of the approved right-of-way permit on site, including all attachments and addendums, and a cleared Miss Utility ticket for the permitted work.

8. Contractor must have a complete copy of the Virginia Professional Excavator’s Manual on site at all times and must be familiar with the Underground Utility Damage Prevention Act.

9. Notify Miss Utility (811) at least forty-eight (48) hours before beginning any installation / construction. The 48-hour period begins at 7:00 a.m. the next day after notifying Miss Utilities. Do not excavate if there is clear evidence of unmarked utilities.

10. If conflicts are discovered between proposed private utilities and existing water and sewer utilities, work shall not commence until all field changes are approved by the City. Please refer to the Department of Planning Permits & Inspections Division for Field Revision Guidelines.

Note:
The Department of Public Utilities reserves the right to stop work and require a revision if field conditions and / or field changes impact water and sanitary sewer utilities.

11. If damage to water or sanitary sewer infrastructure occurs, the Contractor or authorized representative shall notify Public Utilities Engineering Division (757-385-4171) and the Operations Division (757-385-1400). The private utility company acquiring the permit shall be held responsible for damages due to negligence and the cost associated with the repairs made by Public Utilities.

Note: Contractors shall exercise extreme caution when working around vacuum sanitary sewer systems. Damaging one related service can result in a major service outage. Tracer wire and marking tape are buried with all vacuum sanitary sewer piping. If tracer wire is damaged, notify the Operations Division at the number listed above. If marking tape is damaged, Contractor shall replace in kind. Do not attempt to repair any piping, wires, or related appurtenances and do not backfill until notified to do so by Public Utilities. Backfilling may be permitted only if unsafe conditions exist and damaged location is flagged or labeled.
2.2.3.2 Plumbing, Mechanical and Electrical Requirements

1. The City’s Department of Planning Permits & Inspections – Forms, Fees & Procedures webpage provides information regarding requirements for plumbing, mechanical and electrical permits and inspections.

2.3 Public Utilities

1. The City’s Department of Public Utilities (DPU) is primarily concerned with the provision of water and sanitary sewer services to residents. More information about the DPU can be found at the City’s DPU website.

2. The sub-sections listed below provide information pertaining to the following functions of the DPU:

   a. Private Development Related Sureties
   b. Inspections and Testing
   c. Water and Sanitary Sewer Taps Program
   d. Flow Acceptance (Sanitary Sewer Capacity)
   e. Fats, Oils, and Grease Requirements
   f. Utility Easements
   g. HRSD Coordination
   h. City Procurement of Private Facilities
   i. Public Involvement
   j. Submittals

2.3.1 Private Development Related Sureties

1. The Planning Department/DSC coordinates the review, acceptance, management, and release of land development sureties associated with development plans and plats approved by the DSC.

2.3.2 Inspections and Testing

1. Inspections and testing shall be governed by Section 520.04 of the City of Virginia Beach Amendments to the Virginia Department of Transportation Road and Bridge Specifications, 2007, Section 105 and Section 106 of the HRPDC Regional Construction Standards, Section 270 of the Commonwealth of Waterworks Regulations, and the Commonwealth of Virginia SCAT Regulations. The most applicable and most restrictive standard shall govern.

2.3.3 Water and Sanitary Sewer Taps Program

1. The DPU offers the installation of both water service and sanitary sewer service within the public right-of-way for single-family homes and duplexes. The homeowner/builder has the choice of selecting either DPU, which uses a competitive bid process for selecting their utility contractor, or their own private licensed utility contractor. In either case, the homeowner/builder bears the responsibility of the construction costs associated with the installation, relocation, removal, and abandonment of water and
sanitary sewer utility service(s) and the preparation and submittal of a site plan to the DSC for approval.

2. The homeowner/builder must choose either the DPU or a private licensed utility contractor for the installation and relocation of water services and sanitary sewer services. The DPU will no longer install one of the services while a private contractor installs and/or relocates the other service(s).

3. Should the owner/developer wish to have a private contractor install these taps, a right-of-way permit must be obtained through the DSC before any Public Utility fees may be paid in the Business Office.

### 2.3.4 Flow Acceptance (Sanitary Sewer Capacity)

1. The Sanitary Sewer Flow Acceptance Process is required when one of the following criteria for a Flow Acceptance Letter is met:

   a. Average flow is greater than 40,000 gallons per day (gpd)
   b. Pumped connection to gravity with average design flows of greater than 2,000 gallons per day (gpd)
   c. Pumped connections to pressurized system
   d. Vacuum systems

2. Recent concerns identified by the Regional Consent Order from the Virginia Department of Environmental Quality (VDEQ) and the United States Environmental Protection Agency (EPA), have prompted the localities within the Hampton Roads area to take a closer look at their Sanitary Sewer Flow Acceptance Process. The City of Virginia Beach Department of Public Utilities (DPU) and Development Services Center (DSC) partnered together to create a flowchart for projects that require a Request for Hampton Roads Sanitation District (HRSD) Certification, HRSD Flow Acceptance Letter, City Flow Acceptance Letter and a VDEQ Certificate to Construct (CTC). The flow chart detailing the flow acceptance process is provided in Appendix A.

3. Improvements to the public systems shall be sized such that the existing system capacity is not exceeded. Where appropriate, up-sizing for future system demand should be incorporated to provide for logical, cost effective and efficient system extensions.

4. The system demand computation and design shall be based on the City's Comprehensive Plan, existing use, or existing zoning, whichever is greater. An analysis shall be prepared tabulating numbers and types of structures served or proposed to be served. Service area boundaries must be identified.

5. Developers are required to provide facilities with capacity sufficient for the type of development proposed and so related to existing or potential surrounding development as to form a logical part of a coordinated system. The City may have the developer "up-size" or deepen facilities to accommodate future customers through a developer Cost Participation Agreement where the City pays for the additional costs of the accommodation for future needs or existing needs on or off-site.
6. Refer to City Administrative Policy No. PU AP/ENG 1114 in Appendix A for information regarding the DPU policy for conditional flow acceptance.

**2.3.5 Fats, Oils, and Grease Requirements**

1. Refer to the City’s DPU website for information pertaining to the Fats, Oils, and Grease (FOG) Program and associated requirements.

**2.3.6 Utility Easements**

1. All utilities and their appurtenances owned and maintained by the DPU shall be located in the public right-of-way, DPU owned property, or permanent public utility easements. Permanent public utility easements may be appropriate when there is no feasible right-of-way alternative available, but must be reviewed and approved by the DPU variance process.

2. A 5-foot Public Utility easement may be dedicated to the City of Virginia Beach to allow for the placement of sanitary sewer cleanouts and water meters behind the public right-of-way and on private property. This 5-foot easement must be directly behind and parallel to the public right-of-way.

3. Field conditions will sometimes require a variation from the design location of the cleanout and/or meter. Once this is discovered, an easement over the item must be dedicated immediately. The owner/contractor/developer of the parcel or lot is responsible for providing the easement prior to the completion of the project.

4. Public Utility mains may be permitted in easements only when no feasible alternative exists and the DPU approves such easement through its variance process. The minimum easement width for a shallow (less than six (6) foot depth) single public utility placed in a permanent public utility easement shall be twenty (20) feet, except when widening existing right-of-way or public utility easement. Thirty (30) feet is the required width when shallow water and shallow gravity sewer or a single deep (greater than six (6) foot depth) water or gravity sewer line is placed in a public utility easement. Note, buildable lot area currently excludes any easement over twenty (20) feet.

5. Ductile iron pipe is required for any Public Utility main placed within an easement.

6. Public Utility easements shall provide at least a 20-foot width for Public Utility mains with a depth of 6-feet or less and shall provide at least a width of 30-feet for depths greater than 6-feet.

7. Water mains 12-inches and larger shall be provided with a minimum width of 30-feet.

**2.3.7 HRSD Coordination**

1. Contact the HRSD Interceptor Engineer at P.O. Box 5911, Virginia Beach, VA, 23471-0911, (757) 460-7015. If the Interceptor Engineer cannot be reached, contact the HRSD Main Office at (757) 460-2261.
2.3.8 City Procurement of Private Facilities

1. Contact the DPU Engineering Division for information pertaining to City procurement of private sanitary sewer assets.

2. Refer to the DPU Standard Operating Policy No: PU AP/ENG 1104 located in Appendix A for information pertaining to the transfer of utility and power accounts for Developer-Constructed pump stations.

2.3.9 Public Involvement

1. The requirements for the solicitation of public involvement in the acceptance of public infrastructure projects and CIP projects are provided in City Administrative Directive 3.14 and DPU Administrative Directive Policy No. PU AP/DO 1000 located in Appendix A.

2.3.10 Submittals

1. The engineer’s stamp and seal shall be affixed to all drawings and construction documents submitted to the DPU.

2. Submittals for plans to the DPU shall conform to the standards and requirements of the following subject areas as necessary:

   a. Design Report (including demand and pipe sizing calculations)
   b. Construction Plans – CIP Projects and Projects with City Cost Participation
   c. Construction Plans – Private Development
   d. Utility Easement Plans
   e. Variance Process
   f. Record Drawing Requirements
   g. Technical Specifications – CIP Projects and Projects with City Cost Participation

2.3.10.1 Design Report

1. The purpose of the engineering report is to study the available options to determine the best means of integrating the proposed utility improvements into the existing system, while taking into account the potential for future system extensions. The report shall, at a minimum, address hydraulic conformity, an evaluation of alternatives, project cost, maintenance cost, easement and property acquisition, neighborhood and traffic impact, with a summary of conclusions and a recommendation for design/construction.

2. For developer projects, the proposed system layout shall be identified at the time of preliminary subdivision submittal. The layout shall include, at a minimum, main configuration and sizing, connections to existing systems, rim and invert elevations, pump station location, proposed finished floor elevations, and hydraulic calculations.

3. A comprehensive engineering report shall be submitted for CIP projects when required by the scope of services of the Engineering Service Contract.
4. The layout of the system shall be consistent with the recommendation of the approved Engineering Report as approved by the DPU, unless directed otherwise by the DPU.

5. The layout of utility system improvements shall be situated to provide logical system extensions to the existing system, and, where appropriate, shall be situated to accommodate future system extensions.

6. Provide adequate working space for construction, operation and maintenance of the system.

7. Existing underground utilities, private and public and structures shall be located and shown in the system layout.

8. Calculations submitted to the DPU for review/approval shall be typed and include an explanation of all assumptions.

2.3.10.1.1 Wastewater Collection System

1. The design of a wastewater collection system shall meet or exceed the Commonwealth of Virginia SCAT Regulations.

2. Site plan approval is required through the Development Services Center in accordance with the City's Zoning Ordinance.

3. Plans and specifications for Developer pump stations shall be approved by the DPU prior to submittal to VDH for approval.

4. Pump stations shall only be utilized where conveyance of wastewater by gravity sewer is not possible.

2.3.10.1.2 Water Distribution and Transmission Systems

1. The design of water distribution and transmission systems shall meet or exceed standards and requirements stipulated by the Commonwealth of Virginia Waterworks Regulations.

2.3.10.1.3 Other Water Facilities

1. The design of all other water facilities, including but not limited to: production and pumping facilities, wells, and water storage facilities; shall meet or exceed standards and requirements stipulated by the Commonwealth of Virginia Waterworks Regulations.

2. All water main systems shall be designed as looped systems to ensure the consistent flow of water.
2.3.10.2 Construction Plans - CIP Projects and Projects with City Cost Participation

1. Submittals of construction plans for CIP projects and projects with City cost participation shall adhere to DPU Administrative Directive Policy No. PU/ENG 1101 located in Appendix A.

2.3.10.3 Construction Plans - Private Development (see 2.2.2 Development Services Center)

1. Submittals of construction plans for private development shall adhere to DPU Administrative Directive Policy No. PU/ENG 1101 located in Appendix A.

2.3.10.4 Utility Easement Plans

1. The location of the cleanouts and meters must be shown on the site plan. If the cleanout and/or the meter are located outside of the public right-of-way, an easement must be dedicated before the site plan is released. This easement may be dedicated by deed with an exhibit plat.

2. Utility easement plans shall demonstrate compliance with the standards described in Section 2.3.6 of this manual.

3. Plans shall conform to the requirements described in Section 2.3.10.6 of this manual.

2.3.10.5 Variance Process

1. To request a variance for private development during the design process, the Developer or Engineer must submit a letter to the Development Services Center (DSC) Utility Engineer with the following:

   a. State and reference the section of the Design Standards for which the variance is requested
   b. State the change to the Design Standards being sought
   c. Discuss the reason the variance is being requested
   d. Indicate any examples where a similar variance has been granted
   e. Discuss the alternatives to denying the variance request
   f. Include any calculations, model analysis results, drawings, or site plans, supporting and explaining the request
   g. Discuss any cost considerations relating to the alternatives

2. The DSC Utility Engineer will forward the request to the DPU for consideration. The review process generally requires thirty (30) working days.

2.3.10.6 Record Drawing Requirements

1. Record drawings for DPU or Developer projects shall be prepared by the Engineer; based on marked up plans provided by the contractor and submitted to the DPU upon completion of the work. These drawings must show changes from the construction
plans, conditions found during the work, and conditions that changed during the work. Refer to DPU Standard Operating Policy No. PU SOP/ENG 1177 located in Appendix A for additional information. Contact the Development Services Center for additional information regarding record drawing requirements.

2. Design files shall be corrected and submitted in TIFF Digital Format and Mylar as record drawings.

3. Lateral inverts at property/right-of-way line shall be indicated.

4. Drafting Conventions
   a. Symbols and designations for existing facilities and proposed utilities systems should conform to the Standard Legend contained in Appendix B.
   b. Digital design and related files will be prepared in an accepted format. CAD should use Microstation version SE. Reports, calculations and tables, should use Microsoft Office 2000. Otherwise, all documents should be prepared in PDF format.
   c. The scale shall be selected based on the type of construction and the degree of congestion in the work area. Typically, horizontal scales of 1"= 40' or 1"= 25' and vertical scales of 1"= 4' or 1"= 2.5' are appropriate.
   d. Pump stations shall typically be drawn to 3/8" = 1' scale. Details shall be drawn to appropriate scale. Site Plans shall be at 1" = 20'.
   e. Stationing for pipeline construction projects shall be shown from left to right beginning at 0 + 100.00.
   f. All construction drawings shall be prepared on 24"x 36" sheets. Limit actual area used to 22"x 34" to allow for half-sheet printing.
   g. Sufficient coordinates, based upon the NAD 1983/1993 (HARN) datum, utilizing U.S. Survey Foot measurements, shall be shown on the construction plans to accurately locate the horizontal alignment of the project.
   h. Plans and maps should be oriented, whenever possible, so that the north arrow points to the top or right of the page or plan sheet.
   i. All proposed mains shall be shown in plan and profile. A profile is not required for water services or sewer laterals. However, the Engineer shall verify that no conflicts exist between sewer laterals and any crossed underground utilities, e.g., storm drains.

5. Drawing Organization
   a. Drawings for CIP and Developer subdivision projects shall generally consist of the following types of sheets arranged in the order listed below:
      i. Cover Sheet with date and legend (CIP Projects shall include location map)
      ii. Index Sheet and/or Index Map Sheet(s)
      iii. Plan and Profile Sheets
      iv. General Notes and Details
      v. Traffic Control Plans
      vi. Erosion and Sediment Control Plans
   b. An index map should be prepared for multi-sheet water or sewer main plans. The index map shall show a general schematic of proposed mains, valves, hydrants,
manholes, etc., with ties to existing utilities, including existing fire hydrants and shall provide a graphic plan sheet index.

c. Developer’s individual site development plans are not required to have a cover sheet, but shall contain sufficient plan and profile sheets to depict the utility layout, standard notes, special details, and other requirements of appropriate City of Virginia Beach ordinances and other agencies.

d. DPU Standard Details may be referenced by the plans and do not need to be provided on plans. However, details for special structures or unique situations shall be shown at a suitable scale on the plans.

e. Title Blocks shall be located at the bottom or vertical edge, right hand margin with the sheet number placed in the extreme lower right hand corner. Information shall include:

   i. Project Name (with CIP number for CIP projects)
   ii. Drawing Title
   iii. Engineer’s name and address with phone number (for developer project, also include developer’s name and phone number)
   iv. Scale and graphical scale reference for one (1) inch
   v. Revision block
   vi. Sheet Number

2.3.10.7 Technical Specifications - CIP Projects and Projects with City Cost Participation

1. Submittals of technical specifications for CIP projects and projects with City cost participation shall adhere to DPU Administrative Directive Policy No. PU/ENG 1101 located in Appendix A.

2.4 Public Works

1. Refer to the City’s Department of Public Works (DPW) website for information pertaining to the following Public Works related topics:

   a. Storm Water
   b. Traffic
   c. Roadway
   d. Real Estate

2.4.1 Storm Water

1. Refer to the City’s DPW main website for a link to the Storm Water webpage for storm water related documentation and contact information.

2.4.2 Traffic

1. Refer to the City’s DPW main website for a link to the Traffic Bureau webpage for traffic management related documentation and contact information.
2.4.3 Roadway

1. Refer to the City’s DPW main website for links to the Roadways webpage for roadway management related documentation and contact information.

2.4.4 Real Estate

1. Refer to the City’s DPW main website for links to the Real Estate webpage for information relating to real estate acquisitions and related documentation and information.

2.4.5 Surveys

1. Surveys shall be conducted in accordance with the following:
   a. Survey Standards
   b. Record Survey Requirements

2.4.5.1 Survey Standards

1. All surveys should be made in accordance with recommended standards of National Geodetic Survey (NGS) with accurate and legible survey notes kept in digital format, or hardback survey notebooks, properly numbered and indexed for identification.

2. All survey records used in the furtherance of the work under a CIP design contract (including all aerial negatives and exposed prints, manuscripts, field books, and tracings) shall become the property of the DPU.

2.4.5.1.1 Vertical Surveys

1. Vertical control shall be based on the North American Vertical Datum (NAVD) 1988 and shall be expressed in feet and decimals of a foot with a loop closure of not less than 0.03 feet times the square root of the distance in miles around the loop.

2. Vertical surveys shall consist of:
   a. Profiling the proposed construction centerline
   b. Setting bench marks along the line of proposed construction to the accuracy as set forth above
   c. Delineating the elevation of the topographic features, as set forth in Section 2.4.5.1.2 below.

2.4.5.1.2 Topographical Surveys

1. Horizontal control shall be based on the Virginia State Plane Coordinate System, South Zone (NAD 1983/1993 High Accuracy Reference Network (HARN), datum expressed in U.S. Survey feet values) with a traverse closure of not less than 1:20,000. The Engineer shall establish a survey baseline with sufficient coordinates and control points to
accurately locate the horizontal alignment of the project: The survey shall be suitable for construction layout and record drawing purposes.

2. Topographic surveys shall consist of obtaining and mapping horizontal and vertical data for all physical features which may influence utilities design.

3. Design data is generally limited to those physical features including utility castings, manhole inverts, building locations and type, ground elevations for contour determination, roadway data, bodies of water, landscaping features, fences, property lines, and rights-of-way. The lowest finished floor elevation shall be obtained to the nearest 0.1 foot for gravity sewer projects.

4. The design shall include underground utilities location by research of existing records and field verification.

5. Test pits shall be required to determine the exact location of underground utilities for critical conflict locations.

2.4.5.2 Record Survey Requirements

1. Record survey requirements at a minimum shall conform to the standards and procedures set forth in Section 18VAC 10-20-382 of the Board for Architects, Professional Engineers, Land Surveyors, Certified Interior Designers and Landscape Architects Regulations.

2.5 Fire

1. Contact the City's Fire Administration Office to initiate any necessary coordination efforts.

2. The City of Virginia Beach Fire Department will accept fire-flow calculations using either the IFC method, or the standard, previously accepted ISO method. The IFC method requires:

   a. Minimum fire-flow is 1500 gpm at 20 psi
   b. Total flow required is the addition of both the fire-flow plus the sprinkler flow
   c. A 50% reduction is allowed with the use of sprinklers, but the minimum fire-flow of 1500 gpm is still applicable

Contact the DPU for details pertaining to the IFC and the ISO calculation methods.
3 Wastewater Collection System

3.1 General

1. There shall be no physical connection between potable water pipelines, storm sewer pipelines and sanitary sewer pipelines.


3. All calculations and exhibits pertinent to the pump station design should be computer generated for review. All final design calculations should be supplied in digital format in addition to hard copy.

4. The smallest size station accepted by the DPU is 80 gpm (4-inch DIP discharge).

3.1.1 Consent Order Requirements

1. Refer to Appendix H of the Special Order by Consent signed by the City of Virginia Beach on September 27, 2007 for general requirements. Refer to the Regional Technical Standards (RTS) for more specific guidelines and requirements. Refer to the Virginia Beach City Code - Chapter 28 – Article IV – Division 1 – Sewer Use for additional information pertaining to the wastewater collection system and the Special Order by Consent.

3.1.2 City Code Requirements

1. This section will describe the following City Code requirements:
   a. Sewer Use Ordinance
   b. Subdivision Ordinance

3.1.2.1 Sewer Use Ordinance

1. Refer to the Virginia Beach City Code - Chapter 28 – Article IV – Use of the Public Sewer System for general information regarding the sewer use as it pertains to the wastewater collection system.

3.1.2.2 Subdivision Ordinance

1. Refer to the Virginia Beach City Code - Appendix B – Subdivision Regulations – Required Improvements – Section 5.9 – Sanitary sewerage for general information pertaining to subdivisions as part of the wastewater collection system.
3.1.3 Construction Considerations

1. Refer to Section 520.03 of the City of Virginia Beach Amendments to the Virginia Department of Transportation Road and Bridge Specifications, 2007 for construction methods and considerations.

3.1.4 Subsurface Investigations

1. When deemed necessary by the DPU, a geotechnical engineer will perform an investigation of the soil to determine the presence of groundwater or bedrock, soil bearing capacity, soil backfill suitability, corrosion potential, pH, resistivity, and any other conditions specified by the DPU that may impact the construction of any part of the wastewater collection system.

2. Dewatering activities shall adhere to the City’s Dewatering Standard as stated in the Groundwater Quality Assessment and Water Discharge Standard. Contact the DPU for a copy of this document.

3. Test holes for drilling shall be located no more than 1,000 feet apart.

4. Test holes for drilling shall be located at any highway, railroad and water body crossings.

3.1.5 Inspections and Testing

1. Refer to Section 520.04 of the City of Virginia Beach Amendments to the Virginia Department of Transportation Road and Bridge Specifications, 2007 for the system material, construction and testing requirements of wastewater collection systems.

3.2 Wastewater Design Flows

1. Wastewater Design Flows will be calculated according to the methodology used to calculate the following:

   a. Average Daily Flows Based on Land Use
   b. Peak Flows

3.2.1 Average Daily Flows Based on Land Use

1. Gravity sewer design and pump station wet well design shall be based on maximum dwelling/room/apartment unit densities as shown in Table 3-1:

<table>
<thead>
<tr>
<th>Zoning</th>
<th>CVB Zoning Classification</th>
<th>Maximum Density (Unit/acre)</th>
<th>Unit Flow (gpd)</th>
<th>Lot Coverage (acre)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A12</td>
<td>Apartments</td>
<td>12</td>
<td>400</td>
<td>1</td>
</tr>
<tr>
<td>A18</td>
<td>Apartments</td>
<td>18</td>
<td>400</td>
<td>1</td>
</tr>
<tr>
<td>A24</td>
<td>Apartments</td>
<td>24</td>
<td>400</td>
<td>1</td>
</tr>
</tbody>
</table>
### Table 3-1.

<table>
<thead>
<tr>
<th>Zoning</th>
<th>CVB Zoning Classification</th>
<th>Maximum Density (Unit/acre)</th>
<th>Unit Flow (gpd)</th>
<th>Lot Coverage (acre)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A36</td>
<td>Apartments</td>
<td>36</td>
<td>400</td>
<td>1</td>
</tr>
<tr>
<td>AG1</td>
<td>Agricultural</td>
<td>1</td>
<td>400</td>
<td>1</td>
</tr>
<tr>
<td>AG2</td>
<td>Agricultural</td>
<td>1</td>
<td>400</td>
<td>1</td>
</tr>
<tr>
<td>B1</td>
<td>Neighborhood Business District</td>
<td>43.56</td>
<td>250</td>
<td>0.33</td>
</tr>
<tr>
<td>B1A</td>
<td>Limited Community Business District</td>
<td>87.12</td>
<td>250</td>
<td>0.33</td>
</tr>
<tr>
<td>B2</td>
<td>Community Business District</td>
<td>87.12</td>
<td>250</td>
<td>0.33</td>
</tr>
<tr>
<td>B3</td>
<td>Central Business District</td>
<td>108.9</td>
<td>250</td>
<td>0.33</td>
</tr>
<tr>
<td>B3A</td>
<td>Pembroke Central Business Core District</td>
<td>108.9</td>
<td>250</td>
<td>0.33</td>
</tr>
<tr>
<td>B4</td>
<td>Mixed Use District</td>
<td>36</td>
<td>250</td>
<td>1</td>
</tr>
<tr>
<td>H1</td>
<td>Hotel District</td>
<td>80</td>
<td>130</td>
<td>1</td>
</tr>
<tr>
<td>I1</td>
<td>Light Industrial District</td>
<td>108.9</td>
<td>250</td>
<td>0.33</td>
</tr>
<tr>
<td>I2</td>
<td>Heavy Industrial District</td>
<td>108.9</td>
<td>250</td>
<td>0.33</td>
</tr>
<tr>
<td>O1</td>
<td>Office District</td>
<td>43.56</td>
<td>250</td>
<td>0.25</td>
</tr>
<tr>
<td>O2</td>
<td>Large Office District</td>
<td>87.12</td>
<td>250</td>
<td>0.25</td>
</tr>
<tr>
<td>PDH-1</td>
<td>Planned Development Districts</td>
<td>4.25</td>
<td>400</td>
<td>1</td>
</tr>
<tr>
<td>PDH-2/A36</td>
<td>Planned Development Districts</td>
<td>36</td>
<td>400</td>
<td>1</td>
</tr>
<tr>
<td>R2.5</td>
<td>Residential - Townhouse</td>
<td>9</td>
<td>400</td>
<td>1</td>
</tr>
<tr>
<td>R7.5</td>
<td>Residential – Medium Density, Single Family</td>
<td>3.5</td>
<td>400</td>
<td>1</td>
</tr>
<tr>
<td>R10</td>
<td>Residential – Medium Density, Single Family</td>
<td>3</td>
<td>400</td>
<td>1</td>
</tr>
<tr>
<td>R15</td>
<td>Residential – Medium Density, Single Family</td>
<td>2.25</td>
<td>400</td>
<td>1</td>
</tr>
<tr>
<td>R20</td>
<td>Residential – Low Density, Single Family</td>
<td>1.7</td>
<td>400</td>
<td>1</td>
</tr>
<tr>
<td>R30</td>
<td>Residential – Low Density, Single Family</td>
<td>1.1</td>
<td>400</td>
<td>1</td>
</tr>
<tr>
<td>R40</td>
<td>Residential – Low Density, Single Family</td>
<td>0.8</td>
<td>400</td>
<td>1</td>
</tr>
<tr>
<td>R5D</td>
<td>Residential Duplex District</td>
<td>6</td>
<td>400</td>
<td>1</td>
</tr>
<tr>
<td>R5R</td>
<td>Residential Resort District</td>
<td>6</td>
<td>400</td>
<td>1</td>
</tr>
<tr>
<td>R5S</td>
<td>Residential Single-Family District</td>
<td>6</td>
<td>400</td>
<td>1</td>
</tr>
<tr>
<td>RT1</td>
<td>Resort Tourist District Atlantic Ave</td>
<td>190</td>
<td>130</td>
<td>1</td>
</tr>
<tr>
<td>RT2</td>
<td>Resort Tourist District Resorts and Mixed Use</td>
<td>120</td>
<td>130</td>
<td>1</td>
</tr>
<tr>
<td>RT3</td>
<td>Resort Tourist District Mixed Use</td>
<td>160</td>
<td>130</td>
<td>1</td>
</tr>
<tr>
<td>RT4</td>
<td>Resort Tourist District</td>
<td>18</td>
<td>400</td>
<td>1</td>
</tr>
</tbody>
</table>

2. Average Flow. The below calculation shall be used for determining average flows for the above zoning(s):

\[ Q_{\text{avg}} = \text{Acreage} \times \text{Max. Density} \times \text{Unit Flow} \times \text{Lot Coverage} \]

3. Site development plans shall be based on the dwelling unit flow factors in Table 3-2:
### Table 3-2.

<table>
<thead>
<tr>
<th>Discharge Facility</th>
<th>Contributing Design Units</th>
<th>Flow (gpd/unit)</th>
<th>Flow Duration (hours)</th>
<th>Peak Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dwellings</td>
<td>Dwelling</td>
<td>310</td>
<td>24</td>
<td>2.5</td>
</tr>
<tr>
<td>Schools</td>
<td>Gross SF</td>
<td>0.21</td>
<td>8</td>
<td>3.0</td>
</tr>
<tr>
<td>Boarding Schools</td>
<td>Per Dorm Room</td>
<td>222</td>
<td>16</td>
<td>3.0</td>
</tr>
<tr>
<td>Motels &amp; Hotels</td>
<td>Per Room</td>
<td>151</td>
<td>24</td>
<td>3.0</td>
</tr>
<tr>
<td>Trailer courts, Apartments, Condos, Townhomes, and Time Shares</td>
<td>Unit</td>
<td>310</td>
<td>24</td>
<td>2.5</td>
</tr>
<tr>
<td>Restaurants (including fast food)</td>
<td>Gross SF</td>
<td>0.52</td>
<td>16</td>
<td>3.0</td>
</tr>
<tr>
<td>Service Stations</td>
<td>Gross SF</td>
<td>1.63</td>
<td>16</td>
<td>3.0</td>
</tr>
<tr>
<td>Shopping Centers</td>
<td>Gross SF</td>
<td>0.09</td>
<td>12</td>
<td>3.0</td>
</tr>
<tr>
<td>Hospitals</td>
<td>Gross SF</td>
<td>0.19</td>
<td>24</td>
<td>3.0</td>
</tr>
<tr>
<td>Nursing Homes/Assisted Living</td>
<td>Per Bed</td>
<td>125</td>
<td>24</td>
<td>3.0</td>
</tr>
<tr>
<td>Doctor's offices in medical centers</td>
<td>Gross SF</td>
<td>0.06</td>
<td>12</td>
<td>3.0</td>
</tr>
<tr>
<td>Laundromats</td>
<td>Gross SF</td>
<td>0.27</td>
<td>16</td>
<td>3.0</td>
</tr>
<tr>
<td>Community colleges</td>
<td>Per Student and Faculty</td>
<td>3.1</td>
<td>12</td>
<td>3.0</td>
</tr>
<tr>
<td>Theaters (auditorium type)</td>
<td>Gross SF</td>
<td>0.08</td>
<td>12</td>
<td>3.0</td>
</tr>
<tr>
<td>Picnic Areas</td>
<td>Gross SF</td>
<td>0.07</td>
<td>12</td>
<td>3.0</td>
</tr>
<tr>
<td>Camps, resort day and night w/limited plumbing</td>
<td>Gross SF</td>
<td>0.04</td>
<td>24</td>
<td>3.0</td>
</tr>
<tr>
<td>Luxury camps w/flush toilets</td>
<td>Gross SF</td>
<td>0.04</td>
<td>24</td>
<td>3.0</td>
</tr>
<tr>
<td>Warehouse</td>
<td>Gross SF</td>
<td>0.10</td>
<td>24</td>
<td>3.0</td>
</tr>
<tr>
<td>Convenient Store</td>
<td>Gross SF</td>
<td>0.27</td>
<td>24</td>
<td>3.0</td>
</tr>
<tr>
<td>Office Building</td>
<td>Gross SF</td>
<td>0.16</td>
<td>12</td>
<td>3.0</td>
</tr>
<tr>
<td>Fitness Center</td>
<td>Gross SF</td>
<td>0.11</td>
<td>16</td>
<td>3.0</td>
</tr>
<tr>
<td>Religious Assembly</td>
<td>Gross SF</td>
<td>0.03</td>
<td>6</td>
<td>3.0</td>
</tr>
<tr>
<td>Heavy Industrial</td>
<td>Gross SF</td>
<td>0.02</td>
<td>16</td>
<td>3.0</td>
</tr>
<tr>
<td>Light Industrial</td>
<td>Gross SF</td>
<td>0.02</td>
<td>16</td>
<td>3.0</td>
</tr>
<tr>
<td>Undeveloped Residential</td>
<td>Dwelling</td>
<td>0</td>
<td>24</td>
<td>3.0</td>
</tr>
<tr>
<td>Undeveloped other than Residential</td>
<td>Acre</td>
<td>0</td>
<td>24</td>
<td>3.0</td>
</tr>
</tbody>
</table>

4. When estimating pumping capacity for new pump stations, projected flows from undeveloped parcels in existing service areas shall be based on the dwelling unit flow factors in Table 3-3:
<table>
<thead>
<tr>
<th>Zoning</th>
<th>CVB Zoning Classification</th>
<th>Maximum Density (Unit/Acre)</th>
<th>Lot Coverage</th>
<th>Unit Flow (gpd)</th>
<th>Unit</th>
<th>Peaking Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>A12</td>
<td>Apartments</td>
<td>12</td>
<td>1</td>
<td>310</td>
<td>Unit</td>
<td>2.5</td>
</tr>
<tr>
<td>A18</td>
<td>Apartments</td>
<td>18</td>
<td>1</td>
<td>310</td>
<td>Unit</td>
<td>2.5</td>
</tr>
<tr>
<td>A24</td>
<td>Apartments</td>
<td>24</td>
<td>1</td>
<td>310</td>
<td>Unit</td>
<td>2.5</td>
</tr>
<tr>
<td>A36</td>
<td>Apartments</td>
<td>36</td>
<td>1</td>
<td>310</td>
<td>Unit</td>
<td>2.5</td>
</tr>
<tr>
<td>AG1</td>
<td>Agricultural</td>
<td>1</td>
<td>1</td>
<td>310</td>
<td>Unit</td>
<td>2.5</td>
</tr>
<tr>
<td>AG2</td>
<td>Agricultural</td>
<td>1</td>
<td>1</td>
<td>310</td>
<td>Unit</td>
<td>2.5</td>
</tr>
<tr>
<td>B1</td>
<td>Neighborhood Business District</td>
<td>43.56</td>
<td>0.33</td>
<td>160</td>
<td>1,000 Gross SF</td>
<td>3.0</td>
</tr>
<tr>
<td>B1A</td>
<td>Limited Community Business District</td>
<td>87.12</td>
<td>0.33</td>
<td>520</td>
<td>1,000 Gross SF</td>
<td>3.0</td>
</tr>
<tr>
<td>B2</td>
<td>Community Business District</td>
<td>87.12</td>
<td>0.33</td>
<td>160</td>
<td>1,000 Gross SF</td>
<td>3.0</td>
</tr>
<tr>
<td>B3</td>
<td>Central Business District</td>
<td>108.9</td>
<td>0.33</td>
<td>160</td>
<td>1,000 Gross SF</td>
<td>3.0</td>
</tr>
<tr>
<td>B3A</td>
<td>Pembroke Central Business Core District</td>
<td>108.9</td>
<td>0.33</td>
<td>160</td>
<td>1,000 Gross SF</td>
<td>3.0</td>
</tr>
<tr>
<td>B4</td>
<td>Mixed Use District</td>
<td>36</td>
<td>1</td>
<td>310</td>
<td>Unit</td>
<td>2.5</td>
</tr>
<tr>
<td>H1</td>
<td>Hotel District</td>
<td>80</td>
<td>1</td>
<td>151</td>
<td>Per Room</td>
<td>3.0</td>
</tr>
<tr>
<td>I1</td>
<td>Light Industrial District</td>
<td>108.9</td>
<td>0.33</td>
<td>160</td>
<td>1,000 Gross SF</td>
<td>3.0</td>
</tr>
<tr>
<td>I2</td>
<td>Heavy Industrial District</td>
<td>108.9</td>
<td>0.33</td>
<td>160</td>
<td>1,000 Gross SF</td>
<td>3.0</td>
</tr>
<tr>
<td>O1</td>
<td>Office District</td>
<td>43.56</td>
<td>0.25</td>
<td>160</td>
<td>1,000 Gross SF</td>
<td>3.0</td>
</tr>
<tr>
<td>O2</td>
<td>Large Office District</td>
<td>87.12</td>
<td>0.25</td>
<td>210</td>
<td>1,000 Gross SF</td>
<td>3.0</td>
</tr>
<tr>
<td>PDH1</td>
<td>Planned Development Districts</td>
<td>4.25</td>
<td>1</td>
<td>310</td>
<td>Unit</td>
<td>2.5</td>
</tr>
<tr>
<td>PDH2 / A36</td>
<td>Planned Development Districts</td>
<td>36</td>
<td>1</td>
<td>310</td>
<td>Unit</td>
<td>2.5</td>
</tr>
<tr>
<td>R2.5</td>
<td>Residential - Townhouse</td>
<td>9</td>
<td>1</td>
<td>310</td>
<td>Dwelling</td>
<td>2.5</td>
</tr>
<tr>
<td>R7.5</td>
<td>Residential – Medium Density, Single Family</td>
<td>3.5</td>
<td>1</td>
<td>310</td>
<td>Dwelling</td>
<td>2.5</td>
</tr>
<tr>
<td>R10</td>
<td>Residential – Medium Density, Single Family</td>
<td>3</td>
<td>1</td>
<td>310</td>
<td>Dwelling</td>
<td>2.5</td>
</tr>
<tr>
<td>R15</td>
<td>Residential – Medium Density, Single Family</td>
<td>2.25</td>
<td>1</td>
<td>310</td>
<td>Dwelling</td>
<td>2.5</td>
</tr>
<tr>
<td>R20</td>
<td>Residential – Low Density, Single Family</td>
<td>1.7</td>
<td>1</td>
<td>310</td>
<td>Dwelling</td>
<td>2.5</td>
</tr>
<tr>
<td>R30</td>
<td>Residential – Low Density, Single Family</td>
<td>1.1</td>
<td>1</td>
<td>310</td>
<td>Dwelling</td>
<td>2.5</td>
</tr>
<tr>
<td>R40</td>
<td>Residential – Low Density, Single Family</td>
<td>1</td>
<td>1</td>
<td>310</td>
<td>Dwelling</td>
<td>2.5</td>
</tr>
</tbody>
</table>
Table 3-3.

<table>
<thead>
<tr>
<th>Zoning</th>
<th>CVB Zoning Classification</th>
<th>Maximum Density (Unit/Acre)</th>
<th>Lot Coverage</th>
<th>Unit Flow (gpd)</th>
<th>Unit</th>
<th>Peaking Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>R5D</td>
<td>Residential Duplex District</td>
<td>6</td>
<td>1</td>
<td>310</td>
<td>Dwelling</td>
<td>2.5</td>
</tr>
<tr>
<td>R5R</td>
<td>Residential Resort District</td>
<td>6</td>
<td>1</td>
<td>310</td>
<td>Dwelling</td>
<td>2.5</td>
</tr>
<tr>
<td>R5S</td>
<td>Residential Single-Family District</td>
<td>6</td>
<td>1</td>
<td>310</td>
<td>Dwelling</td>
<td>2.5</td>
</tr>
<tr>
<td>RT1</td>
<td>Resort Tourist District Atlantic Ave</td>
<td>190</td>
<td>1</td>
<td>151</td>
<td>Per Room</td>
<td>3.0</td>
</tr>
<tr>
<td>RT2</td>
<td>Resort Tourist District / Resorts and Mixed Use</td>
<td>120</td>
<td>1</td>
<td>151</td>
<td>Per Room</td>
<td>3.0</td>
</tr>
<tr>
<td>RT3</td>
<td>Resort Tourist District Mixed Use</td>
<td>160</td>
<td>1</td>
<td>151</td>
<td>Per Room</td>
<td>3.0</td>
</tr>
<tr>
<td>RT4</td>
<td>Resort Tourist District</td>
<td>18</td>
<td>1</td>
<td>310</td>
<td>Dwelling</td>
<td>2.5</td>
</tr>
</tbody>
</table>

3.2.2 Peak Flow

1. Peak flow is calculated using a peak factor of 2.5 unless otherwise indicated in Tables 3-2 and 3-3 above; thus
   \[
   Q_{\text{peak}} = 2.5 \times Q_{\text{avg}}
   \]

2. Exceptions to the average flow and peak flow requirements will be considered only if impractical to provide required capacity and a variance is requested by the Engineer and approved by the DPU.

3.3 Gravity Sanitary Sewer Lines

1. This section provides information on the following subjects pertaining to gravity sanitary sewer lines:
   a. Depth
   b. Location
   c. Boring and Jacking
   d. Acceptable Pipe Materials
   e. Pipe Sizing
   f. Slope and Velocity
   g. Alignment
   h. Corrosion Prevention
   i. Sewer Main Connections at Manholes
   j. Separation
   k. Buoyancy
   l. Trenching, Bedding, Backfill
   m. Inspection and Testing
   n. Aerial Crossings
   o. Conflict Structures
   p. HRSD Gravity Sewer Interceptor
3.3.1 Depth

1. Minimum cover for gravity sewers shall be twenty-four (24) inches for ductile iron pipe and thirty-six (36) inches for other pipe.

3.3.2 Location

1. Gravity sanitary sewers shall be located in publicly owned rights-of-way in the center of streets avoiding the wheel path, if practical.

3.3.3 Boring and Jacking

1. A jack and bore installation is required where open cutting is not permitted, typically at railroad crossings or high volume roadways. Steel casings with leak detectors, are required for all jack and bore installations. Other methods such as micro tunneling, tunnel liner plate or directional drilling may also be considered. Refer to Sections 302.03 and 520.03 of the City of Virginia Beach Amendments to the Virginia Department of Transportation Road and Bridge Specifications, 2007 for details regarding boring and jacking procedures and construction methods.

3.3.4 Acceptable Pipe Materials

1. Polyvinyl Chloride (PVC) - shall meet requirements of ASTM D 3034-81 and shall have Integral Bell, Gasketed Joint Pipe with a minimum dimension ratio (dr) of 26 and a minimum stiffness (ps) of 46 psi at 5% deflection.

2. Fittings and gaskets for PVC and Ductile Iron Pipe shall meet criteria listed in Section 520.02 of the City of Virginia Beach Amendments to the Virginia Department of Transportation Road and Bridge Specifications, 2007.

3. For pipes with less than 3 feet of cover, collection systems entering a pump station, and pipes within public utility easements use Protecto 401 Ductile Iron pipe and fittings (minimum Class 52). PVC SDR 26 pipe and fittings are required when depths of cover are from 3 to 12 feet. PVC C900 or C905 pipe and fittings (DR18) are required for pipe with cover greater than 12 feet.

4. Pipe depth shall not exceed 16 feet unless approved by a variance.

3.3.5 Pipe Sizing

1. Pipe sizing shall be determined based on the minimum allowable grade as specified in the table below:

<table>
<thead>
<tr>
<th>Sanitary Sewer Size</th>
<th>Minimum Slope per 100 Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-inch (lateral only)</td>
<td>1.0</td>
</tr>
<tr>
<td>6-inch (lateral only)</td>
<td>0.63</td>
</tr>
<tr>
<td>8-inch</td>
<td>0.40</td>
</tr>
</tbody>
</table>
### 3.3.6 Slope and Velocity

1. Sanitary sewer lines shall be designed with uniform slope between manholes.

2. Sanitary sewers shall be designed for a minimum flow velocity of two feet per second for design flows. Manning’s formula for pipe roughness shall be based on the pipe material.

3. Sanitary sewer lines discharging to pump stations must be steeper than the minimum required slope.

### 3.3.7 Alignment

1. Radial pipe is not permitted.

### 3.3.8 Corrosion Prevention

1. Corrosion potential shall be analyzed by the Engineer and corrosion protection shall be provided as necessary. Stray voltage testing and geotechnical data must be evaluated to ensure adequate protection.

### 3.3.9 Sewer Main Connections at Manholes

1. Sanitary sewer tributary flow lines shall intersect in manholes at angles of 90 degrees or more with the outflow line and channel shaping is required. Refer to Detail 8 of the City’s DPU [Standard Details](#) for Invert Shaping.

### 3.3.10 Separation

1. This section discusses the separation of gravity sewer mains from the following types of structures:

   a. Water Mains
   b. Water Supply System Structures
   c. Storm Drains and Culverts
   d. Other Utilities
3.3.10.1 Water Mains

1. Gravity mains shall maintain a minimum of 18-inches of vertical separation and 10 feet of horizontal separation from water mains. Such distances shall measure from outer wall of pipe to outer wall of pipe.

3.3.10.2 Water Supply System Structures

1. Gravity mains shall maintain a minimum of 18-inches of vertical separation and 10 feet of horizontal separation from water supply system structures. Such distances shall measure from outer wall of pipe to outer wall of pipe.

3.3.10.3 Storm Drains and Culverts

1. Gravity mains shall maintain a minimum of 18-inches of vertical separation and 10 feet of horizontal separation from storm drains and culverts. Such distances shall measure from outer wall of pipe to outer wall of pipe.

2. A variance is required if the minimum vertical separation cannot be obtained.

3.3.10.4 Other Utilities

1. Gravity sewer mains shall maintain a minimum of 18-inches of vertical separation and 10 feet horizontal separation from any underground utility. Such distances shall measure from outer wall of pipe to outer wall of pipe.

2. Private Utility installations must maintain a minimum 24-inch (2 foot) vertical edge-to-edge separation and a minimum 36-inch (3 foot) edge-to-edge horizontal separation from all water and sanitary sewer utilities that are at a depth less than six (6) feet.

3. A variance is required if the minimum vertical separation cannot be obtained.

3.3.11 Buoyancy

1. Where high groundwater conditions are anticipated or known to exist, buoyancy of sewers shall be given due consideration, and appropriate construction shall be employed to prevent flotation of any gravity sewer lines. Buoyancy calculations shall be based on sewer pipes that are not conveying any flow.

3.3.12 Trenching, Bedding, Backfill

1. Trenching, bedding, and backfill considerations shall conform to the requirements of Section 302 of the City of Virginia Beach Amendments to the Virginia Department of Transportation Road and Bridge Specifications, 2007.
3.3.13 Inspection and Testing

1. Gravity sewer related inspections and testing activities shall adhere to Section 330 (which covers monitoring, records, and reporting), and Section 370 (which covers sampling frequency) of the Commonwealth of Virginia Waterworks Regulations. Refer also to Section 520.04 of the City of Virginia Beach Amendments to the Virginia Department of Transportation Road and Bridge Specifications, 2007 for additional information.

3.3.14 Aerial Crossings

1. Aerial crossings are prohibited under normal circumstances. A variance is required if an aerial crossing cannot be avoided.

2. The pipe material and supporting material will need to be specified during the variance process.

3. Refer to Section 360 of the Commonwealth of Virginia SCAT Regulations for acceptable pipe materials and additional information.

3.3.15 Conflict Structures

1. Conflict structures are prohibited under normal circumstances. A variance is required if a conflict structure cannot be avoided.

3.3.16 HRSD Gravity Sewer Interceptor

1. Any City owned gravity sewer line connected to an HRSD gravity sewer interceptor shall adhere to HRSD connection standards. Any such proposed connections shall receive prior approval by HRSD before the establishment of a connection.

3.4 Manholes

1. Metal riser rings are prohibited.

2. Stub-outs are prohibited.

3. Refer to Details 7-1 and 7-2 of the City’s DPU Standard Details for Frame and Cover requirements.

4. Refer to the Commonwealth of Virginia SCAT Regulations for additional manhole standards.

3.4.1 Manhole Depth

1. The maximum depth for collection manholes serving sewage pumping stations is 16 feet from manhole cover to pipe invert.
3.4.2 End of Line Requirement

1. Terminal or mainline cleanouts are not allowed.
2. End of line manholes shall have a maximum depth of 4.5 feet.

3.4.3 Manhole Locations

1. Avoid installing manholes in sidewalks.
2. Manholes rims shall not be buried.
3. An easement is required if a manhole cannot be placed in a right-of-way.
4. Witness posts for manholes are required within easements.
5. Manholes shall not be located in the wheel path of a vehicle.
6. Manholes shall not be located in a depressed area.
7. Refer to the Commonwealth of Virginia SCAT Regulations for additional information on manhole location requirements.

3.4.4 Manhole Spacing

1. The maximum distance between manholes is 400 feet.

3.4.5 Manhole Diameter

1. Manhole diameters shall be 4 feet except when deeper than 12 feet.
2. Manholes 12 feet in depth and deeper shall be a minimum of 5 feet in diameter for the entire depth below the cone.

3.4.6 Connection to Manhole

1. When connecting to an existing pre-cast concrete or brick manhole, core drill and install an approved flexible connector for the pipe.

3.4.7 Manhole Separation from Water Mains

1. Separation of water mains for sanitary sewer manholes shall adhere to the provisions outlined in Section 1150 of the Commonwealth of Virginia Waterworks Regulations.

3.4.8 Drop Manholes

1. Drop manholes shall use inside drop connections and must be a minimum of 5 feet in diameter. Drop manholes should be avoided when possible by adjusting the depth and slope of the main. When the invert of the connecting tributary sewer exceeds the invert
of the main by 2 feet or more, an inside drop shall be used. Drops shall not conflict with manhole steps.

### 3.4.9 Bench and Flow Channel

1. A 0.1 ft drop is required in sewer manholes from inlet to outlet invert.

### 3.4.10 Water Tightness and Manhole Inserts

1. The DPU requires the installation of manhole inserts with all new construction on public and private property in an effort to reduce stormwater inflows into the sanitary sewer system.

2. Refer to the “Mandatory Supplemental Specification for Manhole Inserts” document on the DPU Construction Specifications webpage for a comprehensive description of manhole insert requirements.

### 3.4.11 Corrosion Prevention

1. Sewer manholes receiving flows from a sanitary force main shall direct discharge to the downstream pipe and shall be adequately protected against hydrogen sulfide attack with a coating or lining system approved by the DPU. Refer to Detail SS_17 of the HRPDC Regional Construction Standards for information on force main saxophone connections.

### 3.4.12 Inspections and Testing

1. Refer to Section 520.04 of the City of Virginia Beach Amendments to the Virginia Department of Transportation Road and Bridge Specifications, 2007 for system material, construction and testing requirements.

### 3.5 Service Connections

1. Gravity sanitary sewer laterals shall normally be limited to one service per site (duplexes are allowed two) unless otherwise directed by the DPU.

2. Lateral cleanouts shall be placed at the right-of-way lines. If not feasible at the right-of-way, a variance for placing the cleanout in an appropriately sized easement may be considered by the DPU. Invert elevations need to be indicated at the right-of-way line.

3. Sewer laterals shall have a minimum of six (6) inch vertical clearance between curbs, gutters, sidewalks, driveways, and ramps. The minimum depth of cover at ditch crossings shall be eighteen (18) inches from the lowest likely ditch invert.

4. Laterals shall not exceed 75 ft in length from the main to the cleanout or from the manhole to the cleanout.

5. The maximum number of service laterals entering a manhole shall be four (4), except for inside drop connections, where the maximum shall be two (2). Laterals and drops shall not conflict with manhole steps.
6. Depth of service lateral shall be sufficient to provide adequate gravity service to the property. The Engineer shall indicate on the plan the lateral invert elevation at the right-of-way line.

7. Service laterals shall normally be the same material as the sewer main unless otherwise required.

8. Any discharge from a restaurant to the public system must have pre-treatment (i.e., pass through a grease trap prior to discharge into the public system). Refer to the City’s DPU website for information pertaining to the Fats, Oils, and Grease (FOG) Program and associated requirements.

3.5.1 Service Connection Sizes

1. Minimum size shall be 4 inches in diameter. An increase in size must be justified and approved by the DPU.

3.5.2 Manhole Required at Right-of-Way

1. For a private sanitary sewer system, manholes are required at the right-of-way. Manholes shall not be placed in drainage ditches or low areas.

3.5.3 Service Connection Installation

1. This section describes the following aspects of service connection installation:
   a. Clean Outs
   b. Right-of-Way Requirements

3.5.3.1 Clean Outs

1. Avoid installing cleanouts in existing or proposed sidewalks, driveways, paved areas, drainage ways or depressed areas.

3.5.3.2 Right-of-Way Requirements

1. Service laterals shall be placed in a right-of-way under normal conditions. A variance is required to locate a service connection in an easement.

3.5.4 Inspection and Testing

1. New or modified residential and commercial connections require a plumbing permit.

2. Refer to the City’s Plumbing Permits & Inspections webpage to determine if a plumbing permit is required and the applicable permit requirements.
3.6 Vacuum Sanitary Sewer Lines

1. The following documents are suggested references to aid in the design of vacuum sanitary sewer systems:
   b. AIRVAC Design Manual 2005

2. Single lots shall connect to an existing valve pit or a vacuum valve pit owned by the DPU. A maximum of four lots can be serviced by a single valve pit.

3. Location of the lines, valves, or valve pits shall follow the same considerations as that of gravity sanitary sewer lines, Section 3.3.2 of this manual, with regard to variance process approval for placement in easement.

4. Valve pits must be located to allow gravity flow from the intended point of service. Drawings shall note rim elevations and lateral elevations at each valve pit.

5. Record Drawings shall provide two swing-tie points, rim elevation and lateral length and invert at right-of-way and service address.

3.6.1 Materials

1. Pipe for mains and service lines shall be solvent weld PVC thermoplastic pipe, schedule 40, SDR 21 or class 200 in sizes 3-inch, 4-inch, 6-inch, 8-inch, or 10-inch. Fabricated PE fittings shall be made from identical pipe.

2. Fittings shall be Schedule 40 (pressure) type. Fittings include: wyes - for incoming branches or valve crossovers, 45 degree ells - for making changes in direction and fabricating profile changes, and concentric reducers - for making changes in main size. Fittings for pipe diameters 10-inches or greater shall be ductile iron.

3.6.2 Vacuum Pit and Valve

1. Collection Structures
   a. Fiberglass collection valve pits shall have a minimum wall thickness of 3/16-inch. Sumps shall be 55-gallon capacity and designed for H-20 truck loading at 2-foot depth of cover. Elastomer connections shall be provided for the gravity connections. See the DPU Standard Details.
   b. Elevation differences between structures may require separate valve pits for those structures.
   c. An anti-buoyancy collar shall be installed at the middle of all non-concrete valve pits at the completion of the backfilling operation, as manufactured by the vacuum system manufacturer.
   d. Design access to valve pits for easy installation/removal/ replacement.
   e. Valve pits will become property of the DPU, and be located within rights-of-way.
   f. When grinder pumps discharge into a valve pit, only one force main per pit is allowed.
2. Valves

   a. Resilient seated gate valves shall be used as division valves at branch/main connections, at both sides of a bridge crossing and unstable soil, and at periodic intervals along the route.

   b. Vacuum valves have a maximum capacity of 30 gpm flow, with one valve capable of handling the total sewage flow from four homes. Where flow exceeds 30 gpm, multiple valves must be used.

   c. High flows from schools, apartments, nursing homes, lift stations, or a number of grinder pumps may be received at buffer tanks. The maximum flow per valve should be reduced to 15 gpm for these continuous flows.

   d. The distance inside of the valve pit from the 90-degree suction bend to the 3-inch service pipe cannot be more than 14-3/8 inches.

   e. Valve boxes located in field (grass) areas shall use a 2’x2’x6” deep concrete collar.

   f. Knife valves shall be installed on the inside valve pit wall adjacent to the entrance of the vacuum line located not to impede operation of the valve pit’s components. The knife valve is used to aid in the installation or replacement of the interface valve. For extended period vacuum shut off a 3” plug attached with a Fernco shall be used.

3.6.3 Buffer Tanks

1. Concentrated flows over 15 gpm from schools, apartments, nursing homes, lift stations, or a number of grinder pumps shall be received at buffer tanks through a splitter box. A maximum of 25 percent of system flow can be controlled by buffer tanks. Buffer tanks should not be placed at project extremities.

2. High continuous flows must flow to a splitter manhole which will evenly split the flows to multiple valve buffer tank units. For systems requiring numerous buffer tanks, further restrictions may apply. Contact the DPU Engineering Division (757-385-4171) for assistance.

3. Buffer tanks with large concentrated flows in vacuum systems require careful design considerations. Refer to AIRVAC manual and discuss with DPU Engineering division to determine the appropriate standards.

3.6.4 Vacuum Main Design

1. Profile changes should be limited to 12 inches height for 3-inch and 4-inch vacuum lines and 18 inches for 6 inches and larger pipe.

2. Invert elevations shall be shown on profile for all lifts at the extreme end of a vacuum main, a maximum of 2,000 feet of 4-inch vacuum pipe can be used at the approval of the DPU. The maximum distance for 3-inch mains is 300 feet.

3. Slope requirements - Mains should be designed at a minimum slope of 0.2% slope with profile changes a minimum of every 500 ft. Where the natural ground falls in excess of 0.2% in the flow direction, the vacuum sewer profiles follow the ground slope with no profile changes.

4. When vacuum mains must ascend a grade, multiple lifts must be placed at a minimum of 20 feet apart.
5. Systems should be designed for a maximum of 13 feet of vacuum loss due to lifts and 5 feet of vacuum due to friction.

6. Where a lift is required in a branch sewer prior to entering the main, it should be made 20 or more feet from the main.

7. Connections from vacuum valve pits to the mains should be made over the top of the main but not less than 45 degrees. See the DPU Standard Details.

8. Profiles should be provided for all pipes running between the vacuum valve pit and the vacuum mains.

9. Provide four feet of cover for mains.

10. Alignment of the 3-inch service line to the 90-degree suction bend shall be 1/4-inch vertical and 1/8-inch horizontal.

11. Refer to AIRVAC manual and discuss with DPU Engineering division to determine the appropriate standards.

### 3.6.5 Gauge Taps

1. Gauge taps are placed on the station side of main line valves (except on dead-end lines where an extra gauge tap may be required on the upstream side of the main line valve for leak detection).

2. Line vacuum pressure gauges will be required in every vacuum station. There shall be 1 gauge per line with an electrically actuated valve and a switch located on the wall of the station.

### 3.6.6 Isolation Valves

1. Division valves shall be installed at branch connections with lines exceeding 300 feet and at intervals no greater than 2,000 feet on main vacuum lines.

### 3.6.7 Inspections and Testing

1. Daily Testing – perform daily testing of all vacuum sewer mains and lateral connections laid as follows:
   a. Plug all open connections with rubber stoppers or temporary caps, fitted to the pipe by No-Hub couplings.
   b. Apply a vacuum to 24-inches HG to the pipes and allow the pressure to stabilize for 15 minutes. There shall be no loss of vacuum in excess of 1 percent per hour for a two hour test period.
   c. As pipe is laid, the new section shall be tested in addition to the previously laid pipe on that main until a division valve is placed. Testing then shall be done with the valve either closed or open as directed by the DPU.
2. Additional pipe may not be installed until satisfactory test results are achieved for a given main.

3. Trenches must be backfilled at the conclusion of each workday.

4. Line flushing – prior to final acceptance testing, flush lines to remove debris and foreign materials that accumulated in the lines during construction.
   a. The Developer must flush the entire system at one time upon completion. At least 30 days prior to initiation of flushing operations, the Developer shall submit a proposed plan in writing for conducting line flushing to the DPU. The plan shall include the equipment to be used; the segments of the system to be flushed at a given time, the calculated volume of pipe (excluding 3-inch lines) to be flushed, by segment; the location if vacuum valves to be installed to facilitate the flushing operations, and the approximate volume of water to be introduced into the system at the end of each branch line, by segment.
   b. The Developer shall provide appropriate vacuum equipment and receiving tank to accomplish the work. The vacuum test rig may be temporarily connected to a collection tank to create a vacuum on the system of 20-inches of mercury. The tank must be sized to accommodate one seventh of the volume of the lines being flushed. The Developer shall take all necessary precautions to prevent the entrance of water into the vacuum pumps, if the test rig is used. The Developer shall supply the water for testing.
   c. The following describes the flushing procedure:
      i. Place system under vacuum at the downstream end of the vacuum main segment being flushed.
      ii. Add water to valve pits at extreme ends of system and cause vacuum valves to operate. (Developer to supply and install valves at the terminal end of each branch line to facilitate flushing.)
      iii. Utilize system vacuum to transport water and debris to collection point. Adjust valve timer to allow sufficient air into the system (Approximately 7:1 air to liquid ration).
      iv. Continue procedure until water entering at collection point is free of contamination or debris. Developer shall properly dispose of flushing water and debris.
      v. Developer shall remove vacuum interface valves and reinstall temporary caps using 3-inch Fernco couplings.
      vi. Close division valves to seal off flushed segment.

5. Final testing of vacuum sewer mains
   a. Final testing preparation:
      i. Prior to commencing final testing the Developer shall subject each main vacuum line and its associated sub-mains to a vacuum maintained between 16 and 20-inches of mercury. While under vacuum, the last vacuum pot on each sub-main and main shall be activated in a sequential manner such that air is admitted to the system for a period of 15 seconds. A minimum of four cycles of sequentially activating the pots is required.
ii. If after four cycles are completed and water is still being received at the vacuum pump, the main shall be considered as having failed and it should be the Developer’s sole responsibility to locate and repair the leaks.

b. Final testing:

i. Test the entire sewerage system to a vacuum of 24-inches Hg, allow to stabilize for 15 minutes. The test shall be initiated at 24-inch mercury. There shall be no loss greater than 1 percent per hour over a 4-hour test period.

ii. Developer to provide 48 hours notice to DPU prior to start of test.

iii. Developer shall verify all division valves are open prior to beginning of, and shall remain open during, final acceptance test.

iv. Final acceptance test shall be recorded on approved vacuum chart recorder. This chart will not be considered valid unless witnessed by the DPU on test equipment at beginning and the end of vacuum test period.

v. Seal system and make ready to place in operation.

3.6.8 Vacuum Monitoring System Requirements

1. At a minimum, a vacuum monitoring system shall satisfy the following requirements:

   a. Provide real-time monitoring of sewage flows in the vacuum system
   b. Be composed of hardware that is reasonably weatherproof
   c. IP sensing systems supplied by AIRVAC shall be used

3.6.9 Odor Control

1. The minimum requirement for odor control considerations is the inclusion of a biofilter appropriately sized for the flow volumes of the associated sewer.

3.7 Wastewater Pump Stations

1. This section describes the following aspects pertaining to wastewater pump stations:

   a. Location
   b. Types of Stations
   c. Mechanical Design
   d. Structural Design
   e. Electrical Design
   f. Architectural Design and Aesthetics
   g. Odor Control
   h. SCADA and Telemetry Requirements
   i. Inspections and Testing
   j. Operational and Maintenance Manual Requirements
   k. Instrumentation Requirements
   l. Emergency Generator Requirements
   m. Private Pump Stations
   n. Miscellaneous Considerations
2. Refer to the City’s Standard Pump Station Specifications and Construction Details for additional information. The latest Pump Station Specifications and Prototype Drawings can be found at the above link.

### 3.7.1 Location

1. The following subjects shall be given full consideration in making a determination of the location of a pump station:
   
   a. Service Area  
   b. Site Availability

#### 3.7.1.1 Service Area

1. Peak RTS build-out flow estimates shall be used for pump design and average VDEQ build-out flow estimates shall be used for wet well design.

2. Proper location of station is of prime importance within the proposed service area. The ultimate goal is to minimize the number of pumping stations for the area to be served while keeping the depth of the gravity sewer and pump station within a constructible and maintainable depth of sixteen (16) feet at the collection manhole. A comprehensive study and report shall be prepared addressing service area boundaries, hydraulic calculations, topography and 100 year flood elevations, as a minimum. Refer to Section 3.4.1 of this manual for maximum depth of gravity sanitary sewer.

#### 3.7.1.2 Site Availability

1. As part of the required Engineering report, the recommended site shall be reviewed for the following environmental concerns: (1) wetlands, (2) Environmental Protection Agency (EPA) Level 1 (Level 2 as needed) environmental assessment, (3) Chesapeake Bay Preservation Act, and (4) Hazardous materials.

2. Ensure all mechanical and electrical equipment is located above the 500-year flood plain. Design the finish floor elevation to be at least one foot above the 100-year flood elevation.

3. Stations shall be designed to remain fully operational during a 25-year flood.

4. Locate the pump station such that no other structure is within a 100-foot radius of the wet well.

### 3.7.2 Type of Stations

1. This section lists the types of pump stations which are permitted and corresponding design criteria.

#### 3.7.2.1 Wet Well / Dry Well

1. Pump stations with ultimate design flows over 1,000 gpm including phased development, shall be designed as wet well/dry well stations.
2. Refer to the Commonwealth of Virginia SCAT Regulations Part III – Article 2 for design criteria.

3.7.2.1.1 Dry Pit Submersible

1. Dry pit submersible pump stations shall not be designed for flows in excess of 1,000 gpm, including phased development.

2. In a dry pit submersible station, no single pump shall weigh more than 1,800 lbs.

3. Refer to the Commonwealth of Virginia SCAT Regulations Part III – Article 2 for additional design criteria.

3.7.2.2 Suction Lift

1. Single pit self-priming suction lift stations will be considered on a case-by-case variance basis and must be approved by the DPU.

2. Priming lift for suction lift pumping stations shall not exceed 18 feet.

3. Discharges from suction lift stations shall be made to a manhole in the gravity sanitary sewer system in accordance with Section 3.8.12 of this manual.

4. Refer to Part III – Article 2 of the Commonwealth of Virginia SCAT Regulations for additional design criteria.

3.7.2.3 Submersible

1. Submersible pump stations shall not be designed for flows in excess of 1,000 gpm, including phased development.

2. In a submersible station, no single pump shall weigh more than 1,800 lbs.

3. Refer to the Commonwealth of Virginia SCAT Regulations Part III – Article 2 for design criteria.

3.7.2.4 Vacuum

1. Vacuum pump station installations will be considered on a case-by-case basis and must be approved, by the DPU, prior to formal plan submittal.

2. Refer to the Commonwealth of Virginia SCAT Regulations Part III – Article 2 design criteria.

3.7.3 Mechanical Design

1. This section describes the design standards of the following components of pump stations:

   a. Pumps and Motors
b. Piping Systems

c. Valves

d. Ventilation

3.7.3.1 Pumps and Motors

1. This section describes the following pump and motor design criteria:

   a. Sizing Criteria
   b. Calculations and Schematics
   c. Packing

3.7.3.1.1 Sizing Criteria

1. Sewage pump selection should allow for up sizing or downsizing of impellers as dictated by sewage flows.

2. Pump motors shall be three phase.

3. Pump station storage volume shall be designed for 10 minute fill time (average theoretical flow) and 6.67 minute pump time for a total of 16.67 minute cycle time.

4. To accommodate the entire range of flow and head conditions derived from a system curve analysis or computer modeling techniques, constant speed pumps are preferred; however, two-speed or variable speed are acceptable if required. Motors shall be sized so that the motor can run out on the pump curve without overheating.

5. Pump stations shall have a minimum of two pumps and shall be designed such that peak flow can be handled with the largest pump out of commission. Pump stations shall operate by alternating between pumps for each required pump run.

6. Pumps in which solids pass through the impeller shall be at least capable of passing 3-inch diameter spheres.

7. Design 6-inch volute submergence for pumps.

3.7.3.1.2 Calculations and Schematics

1. Calculations and schematics shall be prepared showing static head, system friction head losses, minimum and maximum HRSD heads, Total Dynamic Head (TDH), and system head curve for both single and multiple pump operation. System head curve shall show high and low range of operating limits for C factors of both 100 and 120.

   a. The engineer shall submit Net Positive Suction Head (NPSH) and buoyancy calculations. The engineer shall ensure that the proposed pump is designed to handle the full possible range of NPSH.
   b. All calculations submitted for review by the DPU shall be typed.
   c. Contact the Hampton Roads Sanitation District Interceptor Engineer for static head conditions. Contact the DPU Planning & Analysis Bureau for static head conditions in city force main.
   d. Pump and motor shall be sized for maximum energy efficiency.
2. Calculations shall be prepared and submitted to the DPU, for the ventilation system.

### 3.7.3.1.3 Packing

1. Mechanical seals are not to be used for dry well pumps, packing glands are to be used instead.

### 3.7.3.2 Piping Systems

1. Internal suction and discharge piping and fittings within a sewage pumping station shall be flanged ductile iron, Class 52. Full-face fiber reinforced gaskets are required with 150 pound flanges.

2. The engineer shall provide a gate and check valve on the ¾-inch HDPE air relief recirculation line attached to the pump volute.

3. Wet well suction piping should be designed to minimize hydraulic interference and maximize solids movement, as recommended by the Hydraulic Institute.

4. Suction piping shall be sized for a velocity range from 2 feet per second (fps) to 5 fps over the range of pumping conditions.

5. Suction intakes shall be flared.

6. Horizontal spacing of down-turned suction intakes is generally three (3) times the diameter of the suction flare. Vertical spacing is to be not less than 1/3 and not more than ½ times the diameter of the suction flare off the finished floor.

7. The influent sewer shall have a gate valve inside the station (wet well) with a stainless steel riser stem and hardware to allow operation from the top slab of the wet well. A corrosion resistant coating shall be applied to the gate valve for protection against hydrogen sulfide gases.

8. The invert of the influent sewer shall be a minimum of one and one-half (1 1/2) feet above the wet well high water level.

9. Discharge piping shall be sized for a velocity range from 2 fps to 8 fps over the range of pumping conditions.

10. Air relief piping for a suction lift pump line shall be at least 1 ¼ inches in diameter.

### 3.7.3.3 Valves

1. A gate valve must be provided on each suction line for a suction lift or wet well/dry well pump station.

2. A check valve and gate valve must be provided on each pump discharge line. These must be located in a separate valve vault that drains back to the wet well. The drain line from the valve vault must be equipped with an anti-backflow device.
3.7.3.4 Ventilation

1. Wet well ventilation shall be mechanical and so arranged to ventilate the dry well independently.

2. Continuous ventilation shall provide at least 12 complete air changes per hour. Intermittent ventilation shall provide at least 30 complete air changes per hour.

3. Non-sparking fans shall be used for ventilation systems.

3.7.4 Structural Design

1. Sewage pumping station substructures shall be designed in accordance with ACI 318, “Building Code Requirements for Structural Concrete” and ACI 530-02, “Building Code Requirements for Masonry Structures.”


3.7.4.1 Soil Bearing Capacity

1. The soil bearing capacity and the potential for flotation shall be determined through an appropriate collection and analysis of soils information including groundwater determination.

3.7.4.2 Minimum Wet Well Dimensions

1. Minimum wet well area dimensions shall be 7' x 7'. The minimum wet well storage in gallons shall be calculated as: \( V_{\text{storage}} = 10 \text{ minutes} \times Q_{\text{avg}} \text{ (gpm)} \). This does not apply to submersible stations. Refer to Section 3.2.1 of this manual for the determination of \( Q_{\text{avg}} \).

3.7.4.3 Thrust Restraint

1. Piping shall be adequately secured (both to the structural walls and with restrained fittings to itself) to counter the effects of surge, water hammer and pump shut-off head. Submit calculations to the DPU.

3.7.4.4 Access

1. Separate access must be provided for wet wells. The minimum hatch size is 36-inches by 36-inches.

2. Ceiling lights in the dry well shall be accessible from the stairway.
3.7.4.5 Discharge Point

1. The sump pump and volute blow lines discharge point shall be one foot above the intermediate platform. The discharge pipe shall be PVC material and shall have crosses for fittings to allow cleaning.

3.7.4.6 Lifting Beam

1. A lifting beam shall be provided for stations with pumps or motors weighing less than 2000 pounds. Heavier equipment will be removed using a portable frame and hoist.

3.7.4.7 Hoist

1. Submersible stations will be provided with an A-frame with a hoist.

3.7.5 Electrical Design

1. This section describes the following aspects of electrical design within a wastewater pump station:
   a. Power Source
   b. Motor Control Center

3.7.5.1 Power Source

1. An emergency power connection with a three-position Transfer Switch shall be required for use with a portable generator (unless an emergency generator is a design requirement for the station).
   a. Unless otherwise directed by the DPU, pump stations with a peak capacity of 1,000 gpm or less shall have an emergency generator connection with an automatic transfer switch. Automatic transfer switches or Service Rated transfer switches will be used in all stations with breakers on the generator side of the switch. A breaker or fuse is needed at the point where the generator is connected to the station.
   b. Pump stations with peak capacity greater than 1,000 gpm (or those deemed critical by the DPU) shall have an on-site emergency generator with an automatic transfer switch.
   c. All stations with transfer switches shall have an access door built into the wall. Contact DPU for Standard Details.

2. The Engineer, in conjunction with the local electric utility, shall determine the availability of adequate electric service to the facility. New underground service shall be 480Y/227 volts, 60 Hz, 3 phase, 4 wire.

3. All electric service shall be underground and meters shall be located inside the building.
4. The Remote Telemetry Unit (RTU) and alarm system shall have battery back up rating of at least 24 hours.

5. The station shall have an electrical outlet near the front door inside the building.

3.7.5.1.1 Emergency Generator Requirements

1. All generators shall be mounted on a concrete slab and the concrete slab shall be independent from other concrete slabs or structures. The fencing material surrounding a generator shall be fixed to the concrete slab.

2. Generators shall have a minimum of a 3 ft clearance on all sides from walls, fences, buildings or other obstructions.

3. Refer to Section 400 of the Commonwealth of Virginia SCAT Regulations for emergency generator requirements.

4. Contact the DPU for all projects that require a new sanitary sewer pump station or an upgrade to an existing pump station to ensure that emergency power availability is satisfactory.

5. The finished surface of the concrete slab shall be 1 ft above the 100 yr flood plain elevation. The generator shall be mounted above the 500 yr flood plain elevation.

3.7.5.2 Motor Control Center

1. The Motor Control Center is comprised of the following components:

   a. Liquid Level Control
   b. Controls and Starters
   c. Wiring

3.7.5.2.1 Liquid Level Control Requirements

1. Liquid level sensors for wet wells shall be the air bubbler type with panel face mounted alternating switch.

2. Liquid level controls shall be equipped with dual compressors, air flow meters and sufficient tubing to reach the bottom of the wet well.

3.7.5.2.2 Controls and Starters

1. Controls and starters shall be assembled by the control panel manufacturer in a single panel and shall contain the following:

   a. One properly sized main circuit breaker.
   b. In 480 volt stations a step-down dry-type transformer shall be used to reduce voltage down for station’s controls and lights.
c. A circuit breaker and starter for the starting of each pump motor. The breaker shall be properly sized for motor running current and short circuit protection on all three phases of the motor.

d. Reduced voltage starters shall be provided for motors of 75 HP and larger when 230 volt 3 phase is used.

e. One control circuit to provide lead, lag, and alternate operation of pumps with provisions for Hand-Off-Auto operation (HOA). The switch for the pump lockout shall be located approximately 5 feet from the floor of the dry well at the base of the lighted stairway.

f. An HOA switch on the control panel which is to be lighted in automatic mode only.

g. An adjustable three phase voltage sensor to protect motors and motor starters from single phasing and under-voltage.

h. Individual circuit breakers shall be provided for lights, ventilation fans, convenience receptacles, heater, sump pump, and RTU receptacle, as required, with step-down transformer for 115 volts AC to control separate circuits and station auxiliaries.

i. The unit heater voltage shall be 230 volts, single phase.

j. The panel shall be UL standard, white on the inside and exterior painted with gray polyurethane paint.

k. The control panel shall have a National Electrical Manufacturers Association (NEMA) 12 rating. It shall be located in the motor room at least 12-inches above the floor.

l. Three-phase motors shall have overload protection.

3.7.5.2.3 Wiring

1. Panel and station wiring shall conform to all local building, electrical and fire codes; National Electric Code (NEC); Standard Rules of American Institute of Electrical Engineers (AIEE); NEMA; National Fire Protection Association (NFPA) 70E and State Fire Safety Regulations. Panels must have point to point wiring. All cabinets and boxes shall be drawn to scale (for placement) on the plan.

2. All electrical receptacles shall be located four-feet above the floor.

3. Each air compressor shall be located above the panel and shall be provided a separate receptacle with a selector switches for power and air flow.

4. The motor room shall be provided a separate exhaust fan with louver assembly.

5. Only standard receptacles and ground fault interrupted (GFI) breakers shall be used.

3.7.6 Architectural Design and Aesthetics

1. The above ground structure of sewage pumping stations as it pertains to roofs, roof shingles, brick, mortar, cornice trim, etc., will normally conform to the "Franco Georgian" architecture. However, the facility must blend harmoniously into its environment, especially in historically significant areas, and architecture appropriate for the environment shall be determined as listed below:

a. Site design shall best balance the existing natural features at the site with access and circulation needs. Landscaping shall be used to screen and buffer the facility as well as obscuring external features that do not blend well with the surrounding area.
b. Building design shall provide a structure that is compatible with its surroundings by incorporating design elements that provide visual interest consistent with the area. Design elements shall balance material texture, roof lines, wall plane projections or recesses with durability and maintainability.

c. The public involvement process of the DPU requires a public meeting before construction of any new structure. The meeting shall be held early enough in the design effort so that public input is fully incorporated into final design.

2. Pump station driveways shall be designed to a minimum width of 12 LF and a minimum length of 50 LF. The layout of the driveway must provide adequate space for onsite turnaround of standard sized maintenance vehicles.

3.7.7 Odor Control

1. Odor control shall be included in pump station design.

3.7.8 SCADA and Telemetry Requirements

1. The design for each sewage pumping station shall be provided with a remote telemetry unit, antenna and associated equipment of the same type and compatible with the DPU telemetry system and specifications. Alarm inputs shall be as specified by the DPU but, at a minimum, shall include:

   a. High water - wet well
   b. High water - dry well or vault
   c. Power failure from load side of main breaker
   d. Intrusion alarm
   e. Motor running indicators

3.7.9 Inspections and Testing

1. Sanitary sewer pump station related inspections and testing activities shall adhere to Section 520.04 of the City of Virginia Beach Amendments to the Virginia Department of Transportation Road and Bridge Specifications, 2007.

3.7.10 Operations and Maintenance Manual Requirements

1. Pump station operation and maintenance manuals shall include the contents stipulated by Section 140 and Section 950 of the Commonwealth of Virginia SCAT Regulations.

3.7.11 Instrumentation Requirements

1. Refer to Section 3.7.8 of this manual for basic design requirements.

2. Refer to the Approved Products List for a list of acceptable instrumentation products.
3.7.12 **Emergency Pump Connection**

1. A pump connection for an emergency bypass is required.

3.7.13 **Private Pump Stations**

1. The design of private pump stations must adhere to the Commonwealth of Virginia SCAT Regulations.

2. A Pump Station Plan Package is required in the submittal.

3. Refer to Section 3.8.12 of this manual for information pertaining to private sewer connections to the City sewer.

3.7.14 **Miscellaneous**

1. The Engineer shall determine the need for protection of the pumping station against hydrogen sulfide attack and shall provide the proper equipment if such protection is necessary. Prevention of hydrogen sulfide generation should be an important design consideration.

2. Cross connection control for sanitary sewer pump stations is required. Use a backflow preventer 909QT or approved equal.

3. Provision for continuous operation shall be included with the pump station.

4. Pump station site surveying shall contain appropriate state coordinate, GPIN, and address information.

5. Grading: site shall be graded to direct storm runoff away from pump station and wet well top slab.

3.8 **Force Mains**

1. This section describes the standards for the following aspects of force main design:

   a. Location
   b. Depth
   c. System Capacity and Hydraulic Design
   d. Velocity
   e. Material Requirements
   f. Corrosion Prevention
   g. Thrust Protection Design
   h. Air Relief and Vacuum Intake
   i. Markers
   j. Anchorage
   k. Anchorage
   l. Standard Connection Requirements
   m. Low Pressure Force Mains
   n. Emergency Pump Connection
Section 3 – Wastewater Collection System
January 2012

2. Refer to Section 440 of the Commonwealth of Virginia SCAT Regulations for additional design criteria not fully described below.

3.8.1 Location

1. Sewage force mains shall be located in publicly owned rights-of-way parallel to the center line, if practical, or in easements, in accordance with procedures established in Section 2.3.6 of this manual.

2. Sewage force mains shall be laid on a continuous grade, generally 0.10%.

3.8.2 Depth

1. The minimum depth of cover shall not be less than 36 inches. Future re-grading shall be taken into consideration.

3.8.3 System Capacity and Hydraulic Design

1. A Hazen-Williams coefficient of friction C equal to 100 shall be used for the purposes of design unless the DPU has data to justify a different coefficient.

2. The Engineer shall contact the DPU Planning and Analysis Bureau for head conditions in the DPU collection force main system.

3. The minimum diameter for a public force main is 4 inches.

4. Sewage force mains subjected to extreme variations in temperature (i.e., attached to bridges or box culverts) shall be designed to account for pipe expansion and contraction and to prevent the line contents from freezing.

3.8.4 Velocity

1. The minimum allowable velocity is 2 fps.

2. The maximum allowable velocity is 8 fps.

3.8.5 Material Requirements

1. Strength Design

   a. Protecto 401 Ductile Iron pipe and fittings (minimum Class 52) are required. Strength calculations shall be used to verify the adequacy of the pipe, based on operating pressures, depth of bury, trench width, foundation conditions, and test pressures of 150 PSI for at least two (2) hours.

2. Refer to the DPU list of Approved Products List for additional material requirements.
3.8.6 Corrosion Prevention

1. Refer to Section V of the HRSD Standards and Preferences for Engineered Construction Projects for information pertaining to corrosion prevention of force mains.

2. Refer to the H\textsubscript{2}S calculation form on the DPU Engineering & Construction - Forms webpage for a template using Pomeroy equations for force main to gravity connections.

3.8.7 Thrust Protection Design

1. Thrust protection shall be provided for all bends, tees, reducers, and plugs. Thrust restraint shall be determined by methodology presented in AWWA Manual M-11.

2. The retainer gland is the normally accepted method of joint restraint. See the DPU Approved Products List.

3. Design calculations and summary table shall be submitted for the restraint lengths.

4. Representative soils information shall be submitted along the pipe alignment.

5. Thrust protection of the existing system may be warranted at offsets, cut-ins, abandonments, etc.

6. Construction drawings shall reflect, in plan and profile, the location, type, and extent of required thrust protection and/or provide a restraint table.

3.8.8 Air Relief and Vacuum Intake

1. Manual air release valves shall be located at high points of a force main. Minimize or avoid vertical offsets.

2. Valves shall be located at approximate 1,000 foot intervals, at tees, at all changes in pipe diameter, at connections to HRSD force mains, and at City force mains when being manifolded. Valves shall be designed for installation at high points to control flow in the event of a break.

3. Additional valves may be required in environmentally sensitive areas. Valves will be required on both sides of water crossings or bridges.

3.8.9 Markers

1. Witness posts shall be provided at each valve location along the path of force mains installed in easements or right-of-ways in green belts, undeveloped areas, or when directed by the DPU. Concrete collars 2'x2'x6" deep are also required in undeveloped (i.e. grassy) areas.
3.8.10 **Anchorage**

1. A force main must be adequately anchored along the entire length of pipe as well as inside the pump station.

2. Any necessary bends in the force main should be kept to a minimum.

3.8.11 **Boring and Jacking**

1. Refer to Section 3.3.3 of this manual for boring and jacking requirements.

3.8.12 **Standard Connection Requirements**

1. Sewage force mains discharging into gravity sewer systems shall have a saxophone connection and shall discharge into a manhole. The manhole requires an approved H₂S coating. See the DPU Approved Products List and Standard Details.

2. Sewage force mains discharging into a gravity sewer system should enter the receiving manhole so that the force main invert is horizontal and level with the center line of the sewer main line in the manhole. A bench shall be constructed to transition the flow from the force main invert down to the main line invert.

3. Refer to DPU Standard Operating Policy No: PU SOP/ENG 1180 in Appendix A for additional information regarding force main connection to gravity sewer.

4. Private force mains:
   a. Whenever possible, connect to the public sewer system through a pressurized sanitary sewer force main.
   b. Require approval of an encroachment agreement for any private force main located in a public right-of-way or easement.
   c. Connection of a private force main to a public force main shall be performed by the Developer. Prior to making the connection, the Developer shall coordinate the "tie in" with the DPU Operations Division and/or HRSD as needed.
   d. Connection of a private force main to a public force main shall be by either 1) a tapping sleeve and valve or, 2) a tee with a 4-inch (minimum) gate valve. A tapping sleeve will not be permitted if the new force main is of the same diameter as the existing force main. See the Standard Details.

3.8.13 **Connection to Low Pressure Force Mains (LPFM)**

1. Lateral flushing chambers shall be placed at the right-of-way lines. If not feasible at the right-of-way, a variance for placing the flushing chamber in an appropriately sized easement may be considered by the DPU. See Standard Details.

2. LPFM shall have a minimum of six (6) inch vertical clearance between curbs, gutters, sidewalks, driveways, and ramps. The minimum depth of cover at ditch crossings shall be eighteen (18) inches from the lowest likely ditch invert. Avoid installing flushing chambers in existing or proposed sidewalk, driveways, paved areas, drainage ways or depressed areas.
3. Private LPFM owners shall install a backflow control device at the upstream end of the LPFM connection located on the private side.

4. Low pressure force mains shall have a minimum diameter of 4-inches. Any exceptions to this requirement shall require a variance approved by the DPU.

5. Low pressure force mains laterals (LPFML) shall be schedule (40) PVC pipe with brass fittings. LPFML shall not exceed 75-feet in length and have a pipe diameter of 2-inches. The valve vault and components as listed in the “Low Pressure Force Main Connection Detail” shall be provided by the City.

3.8.14 Inspections and Testing

1. Refer to Section 520.04 of the City of Virginia Beach Amendments to the Virginia Department of Transportation Road and Bridge Specifications, 2007 for force main inspections and testing requirements.

3.8.15 Connection to HRSD

1. Where force mains are to be connected to HRSD interceptors or manifolded to existing City force mains or discharged to a manhole, the design calculations shall include the ultimate hydraulic parameters of the receiving system.

2. The Engineer shall contact the HRSD Interceptor Engineer (757-460-7015) to determine the operating pressure range of the collection force main system.

3. Refer to the HRSD connection standards for additional information.

3.9 Wastewater Collection System Component Abandonment

1. This section describes guidelines for the abandonment of the following wastewater collection system components:
   a. Gravity Sanitary Sewer Main
   b. Manholes
   c. Service Connections
   d. Vacuum Sanitary Sewer Main and Service Pits
   e. Wastewater Pump Stations
   f. Force Mains

3.9.1 Gravity Sanitary Sewer Main

1. When a gravity sanitary sewer main is to be abandoned:
   a. Disconnect all lateral service connections at the main.
   b. Clean and purge the pipe.
   c. Fill gravity sewer main with flowable fill.
   d. Contact the DPU to ensure that GIS records are updated and the main is charted as abandoned.
3.9.2 Manholes

1. When a manhole is to be abandoned:
   a. Plug all connections to the manhole.
   b. Clean and purge the manhole.
   c. Remove manhole frame, grate and chimney to 2 feet below grade.
   d. Fill with flowable fill.
   e. Contact the DPU to ensure that GIS records are updated and the manhole is charted as abandoned.

3.9.3 Service Connections

1. When a service connection is to be abandoned:
   a. Sanitary sewer laterals shall be abandoned at the main line wye.
   b. Clean and purge the lateral.
   c. The sanitary sewer lateral shall be detached from the gravity main by removing a (3) ft. section of the lateral pipe at the main and the connection at the City main shall be capped or plugged based upon a method approved by PU Engineering.
   d. The sanitary sewer cleanout and lateral shall be removed from the right-of-way to the pavement/back of curb and then the remaining lateral shall be capped or plugged.
   e. Contact the DPU to ensure that GIS records are updated and the service connection is charted as abandoned.

3.9.4 Vacuum Sanitary Sewer Main and Service Pits

1. When a vacuum sanitary sewer main is to be abandoned:
   a. Remove the service pits.
   b. Clean and purge.
   c. Fill the main with flowable fill.
   d. Contact the DPU to ensure that GIS records are updated and the main is charted as abandoned.

3.9.5 Wastewater Pump Stations

1. When a pump station is to be abandoned:
   a. Remove all surface features from the building.
   b. Cut the wet well to 2 feet below grade and fill with flowable or select fill.
   c. Prepare abandonment drawings.
   d. Contact the DPU to ensure that GIS records are updated and the pump station is charted as abandoned.
3.9.6 Force Mains

1. When a force main is to be abandoned:

   a. Sanitary sewer force mains shall be abandoned at the City main. The valve shall be restrained as necessary.
   b. The sanitary sewer force main shall be detached from the valve by removing a (3) ft. section of pipe at the City main.
   c. Clean and purge the force main.
   d. The valve shall be closed and a plug/flange installed on the valve face, and the valve operating nut removed. The abandoned main shall be capped.
   e. Contact the DPU Operations Department to determine if the force main is re-usable. If it is not, fill with flowable fill.
   f. Contact the DPU to ensure that GIS records are updated and the force main is charted as abandoned.
4 Water Distribution and Transmission Systems

4.1 General

1. This section describes the following water distribution and transmission considerations:
   a. Subdivision Ordinance
   b. Master Plan Requirements
   c. Pressure Zones
   d. Subsurface Investigations
   e. Inspections and Testing
   f. Construction Considerations

4.1.1 Subdivision Ordinance

1. Refer to the Virginia Beach City Code - Appendix B – Subdivision Regulations – Required Improvements – Section 5.8 – Water Supply for information.

4.1.2 Master Plan Requirements

1. Refer to the Water Utility section of the CIP for information regarding planned water utility projects.

2. Contact the DPU for any relevant updates to the City of Virginia Beach Department of Public Utilities Water System Master Plan Update (July 2009).

3. Refer to Section 2.2.1 of this manual for general Comprehensive Plan related information and documentation.

4.1.3 Pressure Zones

1. Pressures in the City’s water distribution system typically remain between 40 and 70 psi. Developers are to contact the DPU to ensure that water main pressures are within the allowable range.

2. To obtain the appropriate design pressures, the engineer must request the System Capacity Curve from the Public Utilities Planning Department.

4.1.4 Subsurface Investigations

1. Refer to Section 3.1.4 of this manual for subsurface investigation requirements.

4.1.5 Inspections and Testing

1. Refer to Section 520.04 of the City of Virginia Beach Amendments to the Virginia Department of Transportation Road and Bridge Specifications, 2007 for applicable water distribution and transmission inspections and testing standards.
4.1.6 Construction Considerations

1. Refer to Section 520.04 of the City of Virginia Beach Amendments to the Virginia Department of Transportation Road and Bridge Specifications, 2007 for material, construction and testing requirements.

4.2 Water Demand

1. Domestic and fire flow demands shall be analyzed both separately and concurrently and pipes shall be sized in accordance with Section 4.2.1 and Section 4.2.2 of this manual.

4.2.1 Domestic Demand

1. Demand for single family residential units shall be sized at 225 gallons/unit/day.

4.2.2 Fire Flow Demand


2. The water distribution system shall not be required to accommodate fire flow greater than 1750 gpm at 20 psi residual pressure. Alternative fire protection (sprinkling, tanks, etc.) may be required where water quality may be jeopardized by mains sized for high fire flow.

3. Refer to Item #6 of Section 4.3.6 of this manual for the maximum allowable velocity requirement under fire flow conditions.

4.2.3 Other

1. Average daily water consumption rates shall be as indicated in the Virginia Waterworks Regulations. Refer to the International Plumbing Code for demands not contained in the Waterworks Regulations.

4.3 Water Main Criteria

1. This section provides information on the following subjects relating to water mains:

   a. Jurisdictional Agency Approvals
   b. Service Connections
   c. Alignment and Easement Requirements
   d. Water Main Extensions
   e. Water Main Classifications
   f. Hydraulic Requirements
   g. Thrust Restraint
   h. Corrosion Prevention
   i. Separation
   j. Start-Up and Commissioning Period
   k. Valve Spacing Requirement
4.3.1 Jurisdictional Agency Approvals

1. All affected jurisdictional agencies shall be consulted to determine their specific design requirements prior to obtaining a notice to proceed with the construction of any water main.

2. The most stringent design requirements of any affected agency shall take precedence.

4.3.2 Service Connections

1. Each service connection shall have an individual tap.

2. No service connections are to be tapped into a fire hydrant line.

3. Under normal circumstances one water service connection is allowed per lot. Lots with duplexes are permitted two service connections. A variance is required for multiple service connections.

4. Water meters shall be placed at the right-of-way line. Avoid placement of water meters in driveways, sidewalks, paved areas, ditches, drainage swales or BMP’s.

5. When necessary, a combination meter may be approved for use, via the variance process. Refer to the DPU Standard Details for combination vault requirements.

6. Service taps are not permitted on water transmission mains, unless approved by the DPU.

7. Refer to the City of Virginia Beach Amendments to the Virginia Department of Transportation Road and Bridge Specifications, 2007 for additional standards.

8. Contact the DSC for information pertaining to the payment of service connection related fees.

9. Refer to the Virginia Beach City Code - Chapter 37 – Article I for additional information relating to service connections and installation fees.

4.3.2.1 Water Meter Sizing

1. Standard meter sizes are: 5/8-inch, 1-inch, 1 1/2-inches, 2-inches, 3-inches, 4-inches, 6-inches, and 8-inches. Residential meters are generally 5/8-inch.

2. Calculations for water meters sizes shall be performed in accordance with AWWA Manual, M22, "Sizing Water Service Lines and Meters."

3. Refer to DPU Standard Operating Policy No. PU SOP/ENG 1182 for additional information regarding water meter sizing.
4.3.2.2 Service Line Sizing

1. Standard service line sizes are: 1-inch, 1.5-inches, 2-inches, 3-inches, 4-inches, 6-inches, and 8-inches. Residential service lines are generally 1-inch.

2. The smallest allowable line diameter is 1 inch.

3. Calculations for service line sizes shall be performed in accordance with AWWA Manual, M22, "Sizing Water Service Lines and Meters."

4.3.3 Alignment and Easement Requirements

1. The placement of public water lines in easements will require approval via the variance process. The minimum easement width for consideration is twenty (20) feet centered on the water line.

4.3.4 Water Main Extensions

1. The Planning and Analysis office within the Engineering Division of the DPU shall be consulted prior to the construction of any proposed water main extensions. Refer to the DPU Engineering and Construction webpage for additional information.

2. Water main extensions shall adhere to any relevant distribution and transmission main design standards. Refer to Section 4.4 and Section 4.5 of this manual for these standards.

3. Refer to the Virginia Beach City Code - Chapter 37 for additional information relating to water main extensions.

4.3.5 Water Main Classifications

1. Refer to Section 1.4 of this manual for definitions of “Distribution Main” and “Transmission Main”.

4.3.6 Hydraulic Requirements

1. Water distribution systems shall be designed to provide adequate flow and pressure for both domestic supply and fire flow, based on sound hydraulic system modeling and in accordance with AWWA Manual 31.

2. Design calculations shall be submitted to show adequate system capacity for the required domestic and fire flow demand based on the existing and proposed system configuration and sizing. The design calculations may be accomplished by the use of the Hardy-Cross network analysis method or hydraulic modeling software (i.e. Stoner, Cybernet, KY Pipe, etc.) acceptable to the DPU.

3. A Hazen-Williams coefficient of friction, C, equal to 120 shall be used for purposes of design for new pipes. Friction coefficient for existing pipes shall be determined based on the best available information.
4. Values of existing system pressures and flows shall be provided by the DPU for use in preparing hydraulic calculations.

5. The maximum allowable velocity is 5 fps for domestic design.

6. The maximum allowable velocity is 9 fps for fire flow.

### 4.3.6.1 Acceptable Pipe Materials

1. Ductile Iron Pipe - Shall meet requirements of ANSI/AWWA C151/A21.51-2002, thickness class 52 with a single thickness of cement/mortar lining with bituminous seal coat. Thickness design shall meet requirements of ANSI/AWWA C150/A21.50-2002. For burial depths exceeding those allowed by the class, pipe and fittings of sufficient wall thickness shall be provided. Cement-mortar linings shall meet requirements of ANSI/AWWA C104/A21.4. Structural requirements must be considered in the design of all water lines and the proper strengths determined for the pipe materials being specified.

2. Minimum of Class 52 ductile iron pipe. Test pressure of 150 psi for at least two hours.

3. Gaskets are to be fiber reinforced with current in accordance with AWWA requirement.

4. Refer to Article 6 of Section 1110 of the Commonwealth of Virginia Waterworks Regulations for additional information.

5. Refer to the DPU Approved Products List for additional information.

### 4.3.6.2 Pipe Sizing

1. Minimum pipe size shall be 6-inches on looped systems.

2. On the last 500 feet of pipe located beyond the last hydrant on cul-de-sacs or streets which cannot be extended, 4-inch pipe may be used if hydraulic demand is met.

### 4.3.7 Thrust Restraint

1. Thrust protection shall be provided, as required, for all bends, tees, valves, reducers, and plugs.

2. Retainer glands are used normally as the method of joint restraint. See the DPU Approved Products List for other restraint systems.

3. Design calculations and a summary table shall be submitted for proposed restraint lengths.

4. Representative soils information shall be submitted along the pipe alignment.

5. Hydrants normally shall be restrained by means of retainer glands and/or, swivel adapters. The variance process will be followed for any other method of restraint.
6. Valves and kicker joints used for future extension of the main shall be restrained.

7. Thrust blocks will not be permitted on new or proposed pipe.

8. Thrust protection of the existing system may be warranted at offsets, cut-ins, abandonments, etc.

9. Construction drawings shall reflect, in plan and profile, the location, type, and extent of required thrust protection and/or provide restraint table.

### 4.3.8 Corrosion Prevention

1. Corrosion potential shall be analyzed through appropriate soils information, stray current, and dissimilar metal analysis. Proper corrosion protection shall be provided.

2. Refer to the City of Virginia Beach Amendments to the Virginia Department of Transportation Road and Bridge Specifications, 2007 for additional guidelines pertaining to corrosion prevention.

### 4.3.9 Separation

1. This section discusses the required amount of separation of water mains from the following types of structures:
   a. Sanitary Sewer Mains
   b. Wastewater System Structures
   c. Storm Drains and Culverts
   d. Other Utilities

#### 4.3.9.1 Sanitary Sewer Mains

1. A minimum of 18” of vertical separation is required between water mains and sanitary sewer mains.

2. A minimum of 10’ of horizontal separation is required between water mains and sanitary sewer mains.

3. If the horizontal and vertical separation requirements cannot be obtained, a variance must be requested from the DPU.

#### 4.3.9.2 Wastewater System Structures

1. A minimum of 18” of vertical separation is required between water mains and wastewater system structures.

2. A minimum of 10’ of horizontal separation is required between water mains and wastewater system structures.
3. If the horizontal and vertical separation requirements cannot be obtained, a variance must be requested from the DPU.

4.3.9.3 Storm Drains and Culverts

1. Refer to Section 3.3.10.3 of this manual for guidelines for the separation of water mains from storm drains and culverts.

4.3.9.4 Other Utilities

1. Refer to Section 3.3.10.4 of this manual for guidelines for the separation of water mains and any underground utility.

4.3.10 Start-Up and Commissioning Period

1. A water main construction project will be considered functional upon completion of the required inspections and testing activities. See Section 4.1.5 of this manual for details.

2. Water mains shall be appropriately disinfected prior to activation and operation. Refer to Section 1210 of the Waterworks Regulations for information pertaining to required and acceptable disinfection practices.

3. The start-up and commissioning period may begin upon the completion of any required inspections and testing and disinfection activities. Details of the start-up and commissioning period shall be included in the scope of the project by the design engineer.

4.3.11 Inspections and Testing

1. Refer to Section 520.04 of the City of Virginia Beach Amendments to the Virginia Department of Transportation Road and Bridge Specifications, 2007 for applicable water main inspections and testing standards.

4.3.12 Record Drawings

1. Refer to Section 2.3.10.6 of this manual for record drawing requirements.

4.4 Distribution Design Criteria

1. This section describes the standards for the following aspects of water distribution main design criteria:

   a. Location/Alignment
   b. Depth
   c. Fire Hydrant Requirements
   d. Line Valves
   e. Restraint Systems
f. Air Release

g. Inspections and Testing

h. Cross Connections and Backflow Prevention

i. Water Distribution System Plan Requirements

4.4.1 Location/Alignment

1. Water mains on bridge crossings should be suspended from the side of the bridge.

2. Water mains shall be located in publicly owned right-of-ways or public utility easement no closer than 5 feet from the right-of-way or easement lines. Greater horizontal distances shall be considered based upon pipe size and depth.

3. Water mains exposed to extreme variations in temperature (e.g. attached to bridges or box culverts) shall be designed to allow for expansion and contraction and to prevent freezing of the line contents.

4.4.2 Depth

1. The minimum depth of cover is 36-inches.

4.4.3 Valve Spacing Requirement

1. Valves shall be located at intervals of not more than 1,000 feet and shall be included at connection points to other mains.

4.4.4 Fire Hydrant Requirements

1. Fire hydrants not located at intersections shall be located at the side lot lines. Poles and other above-ground structures shall be a minimum of 3 feet from hydrants (to allow hose connections).

2. At major intersections, hydrants shall be located on opposite diagonal corners.

3. Hydrants shall be located in such a way as to minimize damage by errant vehicles.

4. Limit placement of hydrants in the median to those situations where placement behind the curb and gutter is impractical.

5. A fire hydrant shall be located within 50 feet of any Fire Department Siamese connection.

4.4.4.1 Fire Hydrant Spacing

1. Fire hydrant spacing shall be measured along lines of vehicular access and shall conform to the following:

   a. The maximum distance between hydrants shall be 1,000 feet. No residential structure shall be farther than 500 feet from a public fire hydrant.
   
   b. Within 500 feet of the end of a cul-de-sac.
c. For properties zoned multi-family residential, commercial, or industrial, fire hydrant spacing shall not exceed 800 feet nor require a hose lay of over 400 feet along lines of vehicular access to the structure to be protected.

2. Spacing criteria for fire hydrants may be modified by the DPU to improve fire hydrant accessibility or to satisfy fire flow demand requirements.

3. For road sections of four lanes or more, the hydrant spacing for each side of the street shall be independent of the other.

4.4.4.2 Minimum Hydrant Line Size

1. The minimum size water line used for fire protection shall be 6-inch diameter for looped systems, and 8-inch diameter for unlooped systems.

4.4.5 Line Valves

1. Valves are required at all pipe line intersections. Generally, two (2) valves shall be provided at tees and three (3) valves shall be provided at crosses.

2. Valves shall be placed at departure and return points for aerial crossings.

3. A 2-inch blow-off shall be provided at the end of all dead-end lines.

4. Valves shall be located at intervals of not more than 1,000 feet.

4.4.6 Restraint Systems

1. Refer to Section 4.3.7 of this manual for additional information pertaining to thrust restraint standards and requirements.

4.4.7 Air Release

1. Manual air release valves shall be provided at high points as necessary.

4.4.8 Inspections and testing

1. Refer to Section 520.04 of the City of Virginia Beach Amendments to the Virginia Department of Transportation Road and Bridge Specifications, 2007 for applicable water distribution main inspections and testing standards.

4.4.9 Cross Connections and Backflow Prevention

1. No flushing device, blow off, or hydrant drain shall be directly connected to any sewer.

2. Refer to the Virginia Beach City Code - Chapter 37 – Article III for cross connection and backflow prevention related policies and standards.
4.4.10 Water Distribution System Plan Requirements – Checklist

1. If the distribution main is for regular development, refer to the DSC Submittal Subdivision Construction Plan Package checklist. If the distribution main is part of a CIP, contact the Department of Public Works to determine if any checklists are required.

4.5 Transmission Mains - Design Criteria

1. This section describes the standards for the following aspects of water distribution main design criteria:
   a. Location/Alignment
   b. Depth
   c. Line Valves and Spacing
   d. Restraint Systems
   e. Air/Vacuum Valve Assemblies
   f. Appurtenant Facilities
   g. Design Survey Requirements
   h. Inspections and Testing
   i. Transmission Main Plan Requirements – Checklist

4.5.1 Location/Alignment

1. The standards for the location and alignment of distribution and transmission mains are identical. Refer to Section 4.4.1 of this manual for details.

4.5.2 Depth

1. The minimum depth of cover is 36-inches.

4.5.3 Line Valves and Spacing

1. Butterfly valves shall be specified for use in mains sixteen (16) inches and larger in diameter.

2. Refer to Section 4.4.5 of this manual for line valve standards and requirements.

3. Refer to Section 4.4.3 of this manual for valve spacing requirements.

4.5.4 Restraint Systems

1. Refer to Section 4.3.7 of this manual for additional information pertaining to thrust restraint standards and requirements.

4.5.5 Air/Vacuum Valve Assemblies

1. Manual air release valves shall be provided at high points as necessary.
2. Vacuum valves are not permitted.

3. Air release valve assemblies for transmission mains must be approved by the DPU.

4. Air release valve assemblies will be used only when it is deemed inappropriate to use a fire hydrant instead.

### 4.5.6 Appurtenant Facilities

1. The location of outlets and tie-ins to any proposed or existing facility must be approved by the DPU.

2. An access vault may be necessary in some instances. The DPU shall be consulted in these cases.

### 4.5.7 Design Survey Requirements

1. Design survey requirements for water transmission systems shall adhere to the standards described in Section 2.4.5 of this manual.

### 4.5.8 Inspections and Testing

1. Refer to Section 520.04 of the City of Virginia Beach Amendments to the Virginia Department of Transportation Road and Bridge Specifications, 2007 for applicable water transmission main inspections and testing standards.

### 4.5.9 Transmission Main Plan Requirements – Checklist

1. If the transmission main is for regular development, refer to the DSC Submittal Subdivision Construction Plan Package checklist. If the transmission main is part of a CIP, contact the Department of Public Works to determine if any checklists are required.

### 4.6 Fire Line Systems

1. This section describes the following aspects of fire line systems:
   a. Acceptable Pipe Materials
   b. Design Requirements

#### 4.6.1 Acceptable Pipe Materials

1. Refer to Section 4.3.6.1 of this manual for acceptable pipe materials.

2. The Fire Marshal’s Office shall be consulted for additional information regarding acceptable pipe materials for fire line systems.

#### 4.6.2 Design Requirements
1. Fire line system design will meet the minimum criteria established in Section 4.2.2 and Section 4.3.6 of this manual.

4.7 Irrigation Systems and Water Features

1. This section describes the following aspects of irrigation systems and water features:
   a. Design Requirements
   b. Landscape Water Permit
   c. Limitations on Water Use

4.7.1 Design Requirements

1. Provisions shall be made to prevent cross-connections. Approved backflow prevention devices shall be used. Refer to Section 4.8 of this manual for details on backflow prevention.

2. In compliance with state regulations, irrigation systems are typically designed not to discharge to surface waters.

4.7.2 Landscape Water Permit

1. A landscape water permit shall be required for irrigation of large turf related facilities including cemeteries, golf courses, and parks. Contact the City's Department of Planning Permits and Inspections Division for the necessary requirements.

4.7.3 Limitations on Water Use

1. Refer to DPU Standard Operating Procedure Policy No. PU SOP/BD 5080 located in Appendix A of this manual for information related to limitations on water use.

4.8 Backflow Prevention

1. Refer to the DPU Cross-Connection Control and Backflow Prevention Policy (awaiting approval by the City Council).

2. Refer to the City's Backflow Prevention and Cross Connection Program webpage for additional information.

4.8.1 Reduced Pressure Zone Devices

1. All backflow prevention devices shall be installed according to the Uniform Statewide Building Code and the DPU Cross-Connection Control and Backflow Prevention Policy.

4.8.2 Detector Checks

1. Where existing fire protection systems have detector checks installed at the connection to the public water supply system for fire mains and these mains are equipped with
private fire hydrants and located in the consumer’s yard, no backflow prevention or cross connection control will be required.

4.9 Water System/Component Abandonment

1. Water service lines shall be abandoned at the City main. The water service line shall be detached from the corporation stop by removing a (3) ft. section of pipe at the main. The corporation stop is to be turned off and capped. The existing water meter and box shall be removed and delivered to Public Utilities/Operations (3500 Dam Neck Road, Virginia Beach, VA 23456).

2. Water service mains shall be abandoned at the City main. The valve shall be restrained as necessary. The water main to be abandoned shall be detached from the valve by removing a (3) ft. section of pipe at the City main. The valve shall be closed and a plug/flange installed on the valve face, and the valve operating nut removed. The abandoned main shall be capped.

3. When water system components are abandoned, ensure that updated drawings are produced and submitted to the City.

4. Contact the DPU to ensure that GIS records are updated and the asset is charted as abandoned.

4.10 Construction Meters

1. This section describes the following subjects:
   a. Hydrant Meter Program
   b. Residential Construction Meters

4.10.1 Hydrant Meter Program

1. Refer to the DPU Policy No. PU SOP/BD 5079 in Appendix A for information regarding fire hydrant meter rentals.

4.10.2 Construction Meter (residential)

1. Refer to Chapter 37 – Section 50 of the City’s Code of Ordinances for information pertaining to the usage rates applied during construction.
5 Other Water Facilities

5.1 General

1. This section describes the following water distribution and transmission considerations:
   a. Water Production Facilities Criteria
   b. Jurisdictional Agency Approvals
   c. Environmental, Biological and Cultural Assessment

5.1.1 Water Production Facilities Criteria

1. The City of Virginia Beach does not operate any water production facilities. Potable water is purchased from the City of Norfolk and distributed by water mains owned by the City of Virginia Beach.

5.1.2 Jurisdictional Agency Approvals

1. All affected jurisdictional agencies shall be consulted to determine their specific design requirements prior to obtaining a notice to proceed with the construction of any water production or other water facility.
2. The most stringent design requirements of any affected agency shall take precedence.

5.1.3 Environmental, Biological and Cultural Assessment

1. During the design of any water facility, the following considerations shall be taken into account:
   a. As part of the required Engineering report, the recommended site shall be reviewed for the following environmental concerns: (1) wetlands, (2) Environmental Protection Agency (EPA) Level 1 (Level 2 as needed) environmental assessment, (3) Chesapeake Bay Preservation Act, and (4) Hazardous materials.
   b. A thorough consideration of the environmental, biological and cultural impact shall be made to identify any mitigating requirements.
   c. When waters of the United States are impacted, care shall be taken to ensure that plans are in accordance with the Clean Water Act.

5.1.4 Project Site Requirements

1. Water pumping facilities and storage facilities shall be enclosed within a security fence, with double gates, and ample lighting to deter vandalism.
2. Site plan approval is required through the Development Services Center in accordance with the City's Site Plan Ordinance.
3. Landscaping shall be provided in compliance with City standards.
4. A weather and vandal proof above ground structure shall house the station's electrical, mechanical, and control equipment.
5. Access openings and walkways shall be situated to accommodate maintenance and the removal of equipment.

6. Treads for ladders and stairs shall be of nonslip materials.

7. The need for potable water, closets, sink, and lavatories shall be determined by the DPU.

8. Sump pumps shall be provided in water pumping stations and storage facilities in piping and/or equipment vaults where an accessible storm drainage system is not available.

9. Use mechanical seals with pumps.

### 5.1.5 Supervisory Control and Data Acquisition (SCADA)

1. All water pumping facilities and associated water storage facilities shall have a computer based SCADA system to provide the capability to remotely monitor and control the facility.

2. The SCADA system must be compatible with the DPU Control Center system.

3. The SCADA system must contain sufficient inputs and outputs for the safe and efficient monitoring and control of the pump station operating parameters, pump station components and pump station safety alarms.

4. Un-interrupted Power Supply (UPS) and battery back-up shall be provided, sufficient to run the SCADA and radio system for four hours.

### 5.1.6 Electrical Design

1. Panel and station wiring shall conform to all local building, electrical and fire codes; NEC; Standard Rules of American Institute of Electrical Engineers; NEMA; NFPA 70E and State Fire Safety Regulations. Panels must have point to point wiring. All cabinets and boxes shall be drawn to scale (for placement) on the plan.

2. Control panels shall be equipped with capacity to allow for 25 percent expansion of inputs and outputs.

### 5.1.6.1 Power Source

1. The Engineer, in conjunction with the local power company, shall determine the availability of adequate service to the facility.

2. The Engineer will also determine the need for primary service extension.

3. Minimum voltage requirements for a water pumping station shall be 480Y/277 volts, 60 Hz, 3 phase. Power shall be stepped-down with a transformer on the DPU side of the meter, as necessary.

4. All electric service to water pumping facilities shall be underground and meters shall be located inside the building and configured for remote reading.
5. Auxiliary power shall be provided by a generator capable of meeting design flow conditions. Fuel supply capacity shall be five days at full load.

6. Motors shall be equipped with soft start solid state motors.

**5.1.6.2 Controls**

1. Controls and starters shall be assembled in panels and shall contain the necessary components to efficiently operate the facility, including accessories. Additional requirements may be directed by the DPU.

2. Altitude valves will be required for all water storage tanks.

3. Surge suppression shall be provided to all incoming and outgoing conductors (power, signal, telephone, antenna cables, etc.).

**5.1.6.3 Internal Wiring**

1. Panel and station wiring shall conform to all local building, electrical and fire codes; NEC; Standard Rules of American Institute of Electrical Engineers (AIEE); NEMA; and State Fire Safety Regulations. Panels must have point to point wiring. All cabinets and boxes shall be drawn to scale (for placement) on the plan.

2. Control panels shall be equipped with capacity to allow for 25 percent expansion of inputs and outputs.

**5.1.7 Piping Systems**

1. Internal suction and discharge piping and fittings within a water pumping facility shall be flanged ductile iron, or welded steel. Gaskets shall be fiber reinforced.

2. Each pump shall be valved on both suction and discharge piping.

3. Tanks shall be capable of being placed on either the suction or discharge side of the pump station via use of remotely operated valves (known as phase transfer).

4. Tanks shall be equipped with an isolation valve at the tank discharge and shall be capable of remote operation via the Supervisory Control and Data Acquisition (SCADA) system.

5. Piping shall be adequately restrained to counter the effects of surge and water hammer.

**5.1.8 Valves**

1. A valve and piping schedule shall include information regarding size, class, type, flow range, actuator type and other details as necessary. Refer to the City’s Approved Products List for further information.
2. Under normal circumstances valves shall be installed so they can be operated without requiring vault entry. A variance is required if a vault entry cannot be avoided.

5.1.9 Flow Metering

1. An on-site flow metering system is required. Isolation valves are required for maintenance and repair. The meter shall be installed above ground and shall include an enclosure, with a rate of flow and totalizer read head.

5.1.10 Operations and Maintenance Manual Requirements

1. At a minimum, the Operation and Maintenance manual shall include guidelines for routine preventative maintenance and record keeping.

5.1.11 Inspections and Testing

1. Refer to Section 520.04 of the City of Virginia Beach Amendments to the Virginia Department of Transportation Road and Bridge Specifications, 2007 for system material, construction and testing requirements.

5.1.12 Record Drawings

1. Refer to Section 2.3.10.6 of this manual for record drawings requirements.

5.2 Pumping Facilities

1. This section describes the following aspects of the design of water pumping facilities:
   a. Pumping Units and Size
   b. Design Criteria
   c. Inspections and Testing

5.2.1 Pumping Units and Size

1. Calculations and schematics shall be prepared showing static head, system friction head losses, Total Dynamic Head (TDH), and system head curve for both single and multiple pump operation. System head curve shall show high and low range of operating limits.

2. Constant speed pumps are preferred. A two speed or a variable speed pump may be accepted if the design warrants.

5.2.2 Design Criteria

1. Proper location of the pumping station is of prime importance within the proposed service area. The ultimate goal is to minimize the number of pumping stations for the area to be served while maintaining the hydraulics of the system, water quality and protection from hazards. The maximum allowable velocity is 5 fps for domestic design and 9 fps for fire flow.
2. The soil bearing capacity and potential for flotation of pump stations and storage facility sites shall be determined through an appropriate collection and analysis of soils information.

3. Water pumping station and storage facility substructures shall be in accordance with ACI 318, "Building Code Requirements for Reinforced Concrete" standards.

4. The Seismic Zone Map contained in Appendix A of AWWA D100 shall be reviewed prior to design.

5. Set all motors, pumps, electrical panels, transformers, batteries, etc above the 500-year flood elevation.


7. All materials used shall be adequately protected against corrosion.

8. Refer to Section 1010 of the Commonwealth of Virginia Waterworks Regulations for additional design criteria guidelines.

5.2.3 Inspections and Testing

1. Refer to Section 520.04 of the City of Virginia Beach Amendments to the Virginia Department of Transportation Road and Bridge Specifications, 2007 for system material, construction and testing requirements.

5.3 Wells

1. This section describes the following aspects of the design of wells:
   a. Construction Materials
   b. Design Criteria
   c. Additional Design Criteria
   d. Abandoned Wells

5.3.1 Construction Materials

1. Refer to sub-sections A and B of Section 840 of the Commonwealth of Virginia Waterworks Regulations for information relating to construction materials and requirements for public wells.

2. Refer to Section 400 of the Commonwealth of Virginia Private Well Regulations for information relating to construction materials and requirements for private wells.

5.3.2 Design Criteria

1. Refer to Section 840 of the Commonwealth of Virginia Waterworks Regulations for information relating to public well design requirements.
2. Refer to Section 410 of the Commonwealth of Virginia Private Well Regulations for information relating to private well design requirements.

5.3.3 Additional Design Requirements

1. Refer to any pertinent sub-sections of Chapter 630 Private Well Regulations of the Virginia Administrative Code for additional private well design requirements if necessary.

5.3.4 Abandoned Wells

1. Refer to sub-section B of Section 840 of the Commonwealth of Virginia Waterworks Regulations for information relating to the abandonment of public wells.

2. Refer to Section 450 of the Commonwealth of Virginia Private Well Regulations for information relating to the abandonment of private wells.

5.4 Water Storage Facilities

1. This section describes the following aspects of the design of water storage facilities:
   a. Construction Materials
   b. Storage Capacity
   c. Design Standards
   d. Coatings

5.4.1 Construction Materials

1. Water storage tanks shall be of welded steel construction. The materials and designs used for finished water storage structures shall provide stability and durability as well as protect the quality of the stored water.

5.4.2 Storage Capacity

1. The type and size of a distribution storage facility shall be as determined by the required hydraulic system modeling.

2. Types of storage facilities shall conform to the latest Standards of the AWWA and approved by the DPU.

5.4.3 Design Criteria

1. The design of water storage facilities shall conform to the ANSI/AWWA D 100-11 (revision of ANSI/AWWA D 100-05), AWWA Standard for Welded Carbon Steel Tanks for Water Storage.

5.4.4 Coatings

1. Refer to Section 810 of the Commonwealth of Virginia Waterworks Regulations for restrictions regarding coatings.

2. Refer to the City’s Approved Products List for additional information.

5.4.5 Chlorination System Requirements

1. Refer to Section 1000 of the Commonwealth of Virginia Waterworks Regulations for general disinfection and chlorination requirements.
Appendix A – DPU Administrative Directives, Policies & Codes

Public Input for Public Utilities Projects – PU AP/DO 1000
Developer Credit Review Board – PU/ENG 1101
Public Input for Public Infrastructure Projects Undertaken in the City – AD 3.14
Wind Speed Criteria for New City Buildings and Public School Projects – AD 3.17
Capacity Assurance Program Conditional Flow Acceptance Policy – PU AP/ENG 1114
Transfer of City Utility & Power Accounts for Developer Constructed Pump Stations – PU AP/ENG 1104
Force Main Connection to Gravity Sanitary Sewer PU SOP/ENG 1180
Sizing Water Meters and Service Lines – PU SOP/ENG 1182
Irrigation Meters – PU SOP/BD 5080
Record Drawing Process – PU SOP/ENG 1177
Procedures for Authorization of Fire Hydrant Rentals – PU SOP/BD 5079
City of Virginia Beach Flow Acceptance Process
I. Purpose and Need for Policy

The City Administrative Directive 3.14 requires notification of the public for those Capital Improvement Program (CIP) projects that have the potential to impact nearby properties and requires public input before construction of those CIP projects.

II. Policy

Conduct at least one public hearing, public meeting or other public forum, open to all interested citizens, prior to beginning construction of any Public Utilities CIP project. The Director may make an exception for:

a. Emergency projects.

b. Maintenance, renovations of, or repairs to existing infrastructure not involving expansion of facilities.

c. Minor projects not substantially affecting nearby properties or access to those properties.

d. Projects in which potentially affected members of the public have been notified of the department's willingness to hold a public meeting, but no member of the public has expressed a desire to participate.

III. Procedure to Accomplish Policy

A. Notification During CIP Project Design Phase

1. A public meeting will be held at the completion of the study phase to show concepts, potential impacts to property, and to solicit citizen input regarding major design concepts. Another meeting will be offered during the final design phase to show specific property impacts and to solicit citizen input regarding final design features.

2. Public Utilities will contact civic leagues to arrange project presentations at regularly scheduled meetings. If no civic league exists for an area, an advertisement noting our "willingness to hold a public meeting" will be placed
Public Input for Public Utilities Projects

in the newspaper or other written notice will be given to affected property owners (i.e., door hangers or letters) advising them of the project.

3. If a "willingness to hold a public meeting" results in the need, a public meeting will be announced in the news media (with print media such as the Beacon or the Pilot) or with a project brochure that is distributed directly to affected property owners and the civic league/association for the area.

4. Notice of public meetings must be forwarded to the City Council, City Manager, Chief Operations Officer, Public Information Office and the Director. A notice for the upcoming public meeting will also be placed on the Public Utilities Internet (vbgov.com) home page.

5. The Project Manager (PM) will ensure the appropriate Council Members (those representing the area of the project and/or those with an expressed project interest) are contacted and extended an invitation (if necessary, adjust the public meeting date). Also, ensure a copy of the project brochure and invitation are provided to the Council Member prior to the public meeting.

6. The PM will conduct the public meeting, and afterwards, the PM will prepare a memorandum for record (MFR) documenting attendance and major aspects of the meeting. The MFR will be distributed to the Engineering Manager through the supervisory chain.

B. CIP Construction Plan Routing for Bid Advertisement

Prior to the Director’s signature on the CIP project plan cover sheet, the public meeting or meetings MFR(s) will be submitted as attachment(s) to the construction plans and will include a summary memorandum regarding public involvement and completion of the acquisition process. This summary memorandum is to be transmitted with the cover sheet to the Design and Construction Manager for subsequent approval by the Engineering Manager and Director.

C. Notification During CIP Project Construction

The PM will contact the civic league "volunteer" advising them of the project and arrange for distribution of project flyers (door hangers) within the entirety of the project area.

D. Routine Maintenance or Rehabilitation Projects (Find and Fix)

For CIP projects like the "find and fix" that do not increase system capacity, the distribution of a project flyer to those properties adjacent the project area and pre-construction contact with the civic league (if one exists) will suffice. Otherwise, the PM shall follow the steps highlighted in paragraph III.A.
IV. Responsibility and Authority

The interpretation of this policy shall be the responsibility of the Engineering Manager or an assigned designee.

Reviewed:  
Robert S. Montague, Jr.  
Business Manager  
5/11/07

Reviewed:  
James W. Sarvis, P.E.  
Utility Operations Manager  
5/11/07

Recommended:  
Gary L. Jones, P.E.  
Engineering Manager  
5/10/07

Approved:  
Thomas M. Leahy, III  
Director, Public Utilities  
5/11/07

This policy shall become effective immediately upon the approval of the Director of Public Utilities.
I. **Purpose and Need for Policy**

This policy establishes the Development Credit Review Board (DCRB), identifies its responsibilities, and outlines procedures for execution of Cost Participation Agreements.

This policy is needed to meet the requirements of the Subdivision Ordinance (Sec. 5.6 & 5.9) and the Site Plan Ordinance (Sec. 5.4 & 5.15). The Policy provides a method of payment to developers for utility system improvements that are beyond the needs or responsibility of the developer, but which are needed to provide logical system extensions. The goal is to reduce the City's capital infrastructure costs and long-term operation and maintenance costs. This policy helps avoid redundant water and sanitary sewer mains, reduces the required number of sanitary sewer pump stations and reduces disruption to the public.

II. **Policy**

The DCRB shall consist of the Public Utilities Business Division Manager, Utility Engineering Manager or a Designee (usually the Department's Development Services Center Coordinator known hereafter as DPU-DSC Coordinator), who will serve as chairperson, and the City Purchasing Agent.

When the DCRB determines that adding capacity to a developer project is in the best interest of the City, the City will pay developers to enhance their utility infrastructure to include infrastructure capacity beyond their project requirements in order to accommodate the desired City need.

The DCRB is responsible for the review and approval of Cost Participation Agreements (CPA). The CPA is the instrument that will memorialize the responsibilities of involved parties, using a standard form template, to affect the needed infrastructure improvements and the fiscal obligations of the parties.

Appeals to the DCRB's decisions must be submitted in writing to the Director of Public Utilities.
### III. Procedure to Accomplish Policy

The following table outlines the procedure by linking the responsible person with each activity. Attachment A is the flow chart of the process and attachments B through D detail the contents of the CPA package.

<table>
<thead>
<tr>
<th>POSITION</th>
<th>ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>DPU-DSC Coordinator, DSC Review Engineer, Developer, Developer's Engineer and other PUEN staff as needed</td>
<td>1. Meet to review potential Cost Participation Agreement opportunities based on a pre-submittal inquiry or submittal of a site plan or preliminary subdivision. Must review DPU Master Plan guidance.</td>
</tr>
<tr>
<td>DSC Review Engineer</td>
<td>2. Notify the Developer of the City's interest to cost participate and provide a copy of the Woman and Minority Participation Form to the Developer.</td>
</tr>
<tr>
<td>Developer's Engineer</td>
<td>3. Perform an Engineering Study, as needed, including preliminary cost estimates for the additional City capacity.</td>
</tr>
<tr>
<td>DSC Review Engineer</td>
<td>4. Notify the DPU-DSC Coordinator of the need and amount of funding.</td>
</tr>
<tr>
<td>DPU-DSC Coordinator</td>
<td>5. Determine whether funding is available. If not available, coordinate funding needs with the DPU-Design and Construction (D&amp;C) Engineer IV and Planning and Analysis CIP Coordinator.</td>
</tr>
<tr>
<td>Developer's Engineer</td>
<td>6. Confirm, in writing to the DSC Review Engineer, the specific items proposed to be upgraded, prior to submittal of preliminary design.</td>
</tr>
<tr>
<td>DSC Review Engineer</td>
<td>7. Prepare the Cost Estimate (Estimate) showing the costs based on developer and City needs.</td>
</tr>
<tr>
<td>DSC Review Engineer</td>
<td>8. Submit the Estimate to DSC Review Engineer prior to final design submittal.</td>
</tr>
<tr>
<td>DSC Review Engineer</td>
<td>9. Evaluate the Estimate and prepare a cost savings analysis to determine if a public benefit exists.</td>
</tr>
</tbody>
</table>

II-ENG 2
| DSC Review Engineer and Developer's Engineer | 10. Resolve any discrepancies in the estimate. |
| Developer's Engineer | 11. Submit the revised estimate to DSC Review Engineer, if needed, prior to final design approval. |
| DSC Review Engineer | 12. If necessary, revise funding required and confirm funding availability with DPU-DSC Coordinator. Prepare the Cost Participation Agreement (CPA) package (See Attachment B for the Cost Participation Package Components). |
|  | 13. Submit the CPA package electronically to the DPU Contracts Coordinator for incorporation on letterhead. The electronic package will not include the map of the project. Generate an e-mail to the DPU-DSC Coordinator to track status with copies to the DPU-D&C Manager, DPU-D&C Engineer IV, the Engineering Manager's Administrative Specialist, and the DPU Contracts Coordinator. |
| DPU Contracts Coordinator | 14. Forward formatted package to DSC Review Engineer. "Reply to all" on e-mail to continue tracking process. |
| DSC Review Engineer | 15. Print and compile completed package including the Cost Participation Agreement Map. Initial and forward completed package to the DPU-DSC Coordinator. "Reply to all" on e-mail to continue tracking process. |
| DPU-DSC Coordinator | 16. Review the CPA package. If okay, sign the cover memo indicating approval and present the CPA packet to the DPU-D&C Engineer IV for approval. "Reply to all" on e-mail to continue tracking process. |
| DPU-D&C Engineer IV | 17. Review the CPA package. If okay, initial the cover memo and present the package to the DPU-D&C Manager for his initials. Return the CPA package to the DPU-DSC Coordinator and "reply to all" on e-mail to continue tracking process. |

PU AP/ENG-11C1
Page 8 of 13
| **DPU-DSC Coordinator** | **18.** Present the CPA package to the DPU Business Division Manager. DSC Review Engineer shall be available as needed for questions. "Reply to all" on e-mail to continue tracking process. |
| **Business Division Manager** | **19.** Review the CPA packet. If okay, sign the cover memo indicating approval and return to the DPU-DSC Coordinator. (Note: the final signature to the cover memo is the Purchasing Agent. This signature will be received concurrently with the contract routing.) |
| **DPU-DSC Coordinator** | **20.** Notify the DSC Review Engineer of DCRB status. |
|  | a. If approved, continue. |
|  | b. If not approved, go to Step 8 or discontinue. |
| **DPU Contracts Coordinator** | **21.** Return the CPA package to the DPU Contracts Coordinator for preparation of the Contract and Contract Approval Form. |
| **DPU-DSC Coordinator** | **22.** Prepare Contract Approval Form and three original Cost Participation Agreements. Include with the DCRB package and route to the DPU-DSC Coordinator for signature approval. "Reply to all" on e-mail to continue tracking process. |
| **DPU-DSC Coordinator** | **23.** Sign the Contract Approval Form. Forward through DPU-D&C Engineer IV for presentation to the DPU-D&C Manager. "Reply to all" on e-mail to continue tracking process. |
| **DPU-D&C Manager** | **24.** Review the CPA package and contract. If okay, sign Contract Approval Form and get signatures from the Engineering Manager and Director. The CPA package and contracts will be returned to the DPU Contracts Coordinator by the Engineering Manager’s Administrative Specialist. |
| **DPU Contracts Coordinator** | **25.** Send the three original Cost Participation Agreements to Developer for signature. |
Appendix A – DPU Administrative Directives, Policies & Codes
January 2012

TITLE: DEVELOPER CREDIT REVIEW BOARD (Continued)

approval. If the Developer is not entered in the City’s InSite system, a W-9 should also be sent with the Agreements for the Developer to fill out and return.

26. Encumber funds:

- If developer is primary contractor, need to encumber funds now.
- If City is primary contractor, funds will be encumbered as part of CIP construction project contracts.

Developer

27. Return the three signed CPAs and the Woman and Minority Participation Form to the DPU Contracts Coordinator.

DPU Contracts Coordinator

28. Route two copies of the CPA for signature approval to the City Attorney’s Office and Risk Management simultaneously along with cover memo. After these signatures are obtained, route the three copies of the CPA to the City Purchasing Agent who then executes the Agreement and signs the CPA packet concurrently.

29. Forward one original CPA to the DPU-DSC Coordinator for filing in the Public Utilities DSC Project File. Send one original CPA to the Developer and file one original CPA in the Cost Participation Agreement File. Place a copy of the signed Contract Approval Form in the DPU Contracts Coordinator Notebook.

30. Notify the DPU-DSC Coordinator of Agreement/Project status for database updating.

DPU-DSC Coordinator

31. File one original CPA in Public Utilities DSC Project File. Maintain Cost Participation database and “reply to all” as final e-mail to close out tracking process.

II-ENG 5
IV. Responsibility and Authority

The interpretation of this policy shall be the responsibility of the Utility Engineering Manager or his designee.

Reviewed:

Robert Montague
Business Manager

James W. Sarver, P.E.
Operations Manager

Date: 4/2/10

Date: 4/2/10

Recommended:

Gary Jones, P.E.
Utility Engineering Manager

Date: 3/29/10

Approved:

Thomas M. Leahy, III
Director, Public Utilities

Date: 4/2/10

This policy shall become effective immediately upon the approval by the Director of Public Utilities.

Attachments:
A – Flow Chart for Cost Participation Process
B – Cost Participation Package Components
C – Woman and Minority Participation Form
D – Cost Analysis
E – Cost Analysis for Agreement #14-503 (Example)
Flow Chart for Cost Participation Process

Attachment A

1. CPA Potential
2. Study Needed
3. Notify and Check Pocket Availability
4. Review Costs (As Needed)
5. Notify Design Construction Manager
6. Submit Package to DPU DSC Coordinator
7. CPA Package OK?
8. CPA Approved?
9. Route for Final Approval
10. CPA Disposition
11. Update CPA Status
12. Submit CPA Package
13. Enumerate Funds
14. Receive Signed CPAs
15. Approve Content
16. Prepare CPAs for Signature

END
Attachment B

Cost Participation Package Components

I. Cover Memo to DCRB
   Cover memo shall provide a brief summary of the agreement, recommended action, and space for signature approval.

II. Abstract
   The Abstract provides a summary of the Cost Participation Proposal and shall include:
   A. Purpose
   B. Benefit
   C. Recommendation

III. Cost Estimate
   The Cost Estimate shall identify the specific utility upgrades and provide a detailed cost breakdown. The City's CIP Unit Cost Sheet shall be used when possible. The Cost Estimate shall include the following:
   A. Maps
      1. Proposed development project boundary, area to be served by upgrade, remaining areas to be served
      2. Infrastructure required by development
      3. Infrastructure required for expanded service capability
   B. Calculations
      1. Cost of infrastructure required by development
      2. Cost of infrastructure required for City capacity need
      3. Cost differential, i.e. cost to be paid to the developer
   C. Engineering Study, as appropriate

IV. Cost Analysis
   Cost analysis shall identify the savings produced by the CPA. It shall include:
   A. Avoided future construction costs.
   B. Acreage of increased service area.
   C. Anticipated pump station fees
   D. Utility system enhancements.

V. Cost Participation Agreement
   The standard Cost Participation Agreement form shall be used. The City Attorney's Office, Engineering Manager, Purchasing Agent, and Risk Management must approve any changes to the standard form agreement.
Failure to submit a complete Woman and Minority Participation Plan, answering all questions set forth below, may void the Cost Participation Agreement.

(1) Subcontractor Utilization:
   
a) Will you be using any subcontractors? Yes ___ No ___ If no, skip to item (2).

   b) What steps have you taken to solicit subcontracting bids from woman and minority-owned subcontractors? If none, please so indicate.

   
   
   

   c) Please list the name, address, contact person and phone number of any woman or minority-owned businesses solicited.

<table>
<thead>
<tr>
<th>Business Name</th>
<th>Primary Contact</th>
<th>Address</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Business Classification Legend:
  - Minority Man (M)
  - Non-Minority Woman (W)
  - Minority Woman (MW)
  - All Other (AO)

II-ENG 9
**TITLE: DEVELOPER CREDIT REVIEW BOARD** (Continued)

<table>
<thead>
<tr>
<th>Business Name</th>
<th>Contact Information (Primary Contact, Address, Phone)</th>
<th>Work to be Performed</th>
<th>Estimated Amount of Subcontract Work</th>
<th>% of Total Contract</th>
<th>*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Business Classification Legend:
  - Minority Man (M)
  - Non-Minority Woman (W)
  - Minority Woman (MW)
  - All Other (AO)

e) If you have elected not to utilize any woman or minority owned businesses, please provide explanation of the decision.

__________________________________________________________

__________________________________________________________

__________________________________________________________

II-ENG 10
(2) Good-Faith Efforts:

a) Are there any additional good-faith minority-owned or woman-owned business participation efforts that you intend to make in connection with this contract? If none, please so indicate.


b) Not including this Cost Participation Agreement, have you undertaken any other good-faith minority-owned or woman-owned business participation efforts in the past two years? If none have been undertaken, so indicate and include a statement explaining why you have made no good-faith minority-owned and woman-owned business participation efforts in the past two years.


(3) Workforce Composition:

Total # of Employees ______

Please describe the Workforce Composition of your company:

<table>
<thead>
<tr>
<th>Type of Employee</th>
<th># Employees</th>
<th>% of Employees</th>
<th>% Managers</th>
<th>% Supervisors</th>
<th>% Professional</th>
<th>% Non - Professional</th>
</tr>
</thead>
<tbody>
<tr>
<td>Woman</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minority</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All Others</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Manager: is responsible for directing and controlling the work and staff of a business, or of a department within it.

Supervisor: oversees and guides the work or activities of a group of other employees.

Professional: requires extensive education in their field (undergraduate degree or higher) or a specialized certification from an accredited agency.

Non-Professional: not in one of the above categories.
Attachment D

Cost Analysis

Description of Benefit:

Cost to Public Utilities (per Agreement):

Facts Bearing on the Agreement:

Capital Cost Avoided by Public Utilities:

Assumptions:

Cost Savings:
Cost savings (CS) is equal to total costs (TC) to perform the construction as desired by Public Utilities minus the initial costs (IC) to be paid by the City.

\[ CS = TC - IC \]

Or

If there are costs avoided by cost participating with the project, then cost savings (CS) is equal to cost avoided (CA) minus the City’s cost (CC). The City’s cost is determined by estimating the total cost of the project and subtracting the Developer’s cost.

\[ CS = CA - CC \]

An example is attached on the next page.
Title: Developer Credit Review Board (Continued)

Attachment F

Cost Analysis for Agreement K13-634 (Example)

Benefit: Upgrade size of sanitary sewer force main to ensure adequate capacity for future development along Princess Anne Road south of Sandbridge Road.

Cost: $281,199.00

Facts: Through participation, Public Utilities can avoid the total cost of constructing the sanitary sewer force main.

Assumption: Undeveloped land just south and east of the subject property will bring development to the Princess Anne Road Corridor in the future. An adequate sanitary sewer discharge source is required to ensure that future development is accommodated.

Cost Savings: The cost savings arise from not having to maintain two additional force mains for the next 50 years ($646,450) and avoiding the cost to the motoring public by reducing two additional future work zone traffic control delays associated with the developer installation of the two force mains ($35,358). Thus, the total cost avoided is $881,808. With the city's cost of $281,199, the total estimated cost savings is $400,609.

Estimated Total Costs = $702,405.00
Less Developer Cost = ($421,206.00)
City Cost = $281,199.00

O&M Cost 2 Additional F.M. (Avoided)
(2.08 mile x $3.108/mile x 2 F.M. x 50 years) = $646,450.00

Traffic Delay Costs (Avoided)
$17,878.00 x 2 = $35,358.00 = $35,358.00

Total Cost Avoided = $881,808.00

Total Estimated Cost Savings = $400,609.00
(Total Cost Avoided - City Cost)
Administrative Directive

Title: Public Input for Public Infrastructure Projects Undertaken in the City

Index Number: AD 3.14

Date of Adoption: 01/07/99
Date of Revision: Page 1 of 2

1.0 Purpose and Need

Since public infrastructure projects undertaken in the City have the potential to impact nearby properties, it is important to notify the public and seek public input prior to the construction of these projects.

2.0 Definitions

Public Infrastructure Project - Any project listed in the City of Virginia Beach Capital Improvement Program or other construction project undertaken by a city agency. It also includes any infrastructure project undertaken in the City by another governmental entity in which City funds are used or which require the agreement or approval of the City.

3.0 Directive

There shall be at least one public hearing, public meeting, or similar public forum open to all interested members of the public prior to the beginning of construction of any public infrastructure project as defined above. Exceptions to this may be made by the responsible department director for the following:

a. Emergency projects.

b. Projects consisting of maintenance of, renovations of, or repairs to, existing infrastructure not involving the substantial expansion of facilities.

c. Minor projects not substantially affecting nearby properties or access to such properties.

d. Projects in which potentially affected members of the public have been notified of the City's or other governmental entity's willingness to hold a public hearing, meeting, or similar forum, but no member of the public has expressed a desire to participate therein.

4.0 Procedure to Accomplish Directive

a. Public input must be sought in time to allow appropriate suggestions to be incorporated into a public infrastructure project prior to construction.

b. If there is a civic league or recognized community group in the area of the public infrastructure project they shall be offered an opportunity to provide input to the project.

c. All property owners immediately adjacent to a public infrastructure project must be contacted and advised of the project prior to construction.

d. At a minimum the following must be notified of plans to hold a public hearing or public meeting: City Council, City Manager, Public Information Office.

e. Any public hearing, public meeting, or similar public forum may involve several City departments or other governmental entities and more than one public infrastructure project if the projects are related.
4.0 Procedure to Accomplish Directive (continued)

f. If a public hearing is held it must be advertised in the newspaper at least one week prior to the hearing.

g. If a public meeting is held it must be advertised in the newspaper or other written notice given to affected property owners at least one week prior to the meeting.

5.0 Responsibility and Authority

Department directors shall be responsible for seeing that this directive is carried out and for assisting each other to obtain public input on public infrastructure projects.

The following department directors are also responsible for carrying out this directive for public infrastructure projects undertaken by the following governmental agencies:

a. US Army Corps of Engineers - Director of Public Works
b. Virginia Department of Transportation - Director of Public Works
c. Southeastern Public Services Authority - Director of Public Works
d. Hampton Roads Sanitation District - Director of Public Utilities
e. City of Norfolk/Public Utilities - Director of Public Utilities
f. Tidewater Regional Transit - Director of Planning
g. Virginia Beach Development Authority - Director of Economic Development

Approved as to Content: David M. Grochmal
On behalf of the Facilities and Commons Policy Team
01/08/99

Approved as to Legal Sufficiency: William M. Macali
City Attorney’s Office
01/12/99

Approved: James K. Spore
City Manager
01/12/99
Appendix A – DPU Administrative Directives, Policies & Codes
January 2012

Administrative Directive

Title: Wind Speed Design Criteria for New City Buildings and Public School Projects
Index Number: AD 3.17
Date of Adoption: 04/27/00
Date of Revision: Page 1 of 1

1.0 Purpose and Need

To enhance the performance of essential City and School structures during significant weather events by establishing a consistent policy for wind speed load design criteria beyond the minimum building code requirements. These criteria are established primarily for the design and construction of new buildings, but can also be applied, as appropriate, to retrofitting existing buildings that have been designated as essential facilities.

2.0 Administrative Directive

This administrative directive is based on criteria from the current Uniform Statewide Building Code, i.e., the code applicable to the City of Virginia Beach. Existing City or School Structures were typically designed to meet or in some cases slightly exceed the minimum requirements of the code applicable at the time of design. The current building code requires buildings to be designed for fastest-mile wind speeds between 90 and 100 mph in Virginia Beach which equates to 65 to 84 mph sustained winds, respectively. As a part of the City's disaster preparedness and mitigation planning, the City has recognized the need to increase the wind speed load design criteria beyond the minimum established by building codes. It has now been concluded that the upper limit of a Category II hurricane (110 mph sustained winds) presents a realistic threat for the City of Virginia Beach and should be the basis for design of new essential City buildings and public shelters. It is worth noting that no existing buildings have been designed for Category II hurricane force winds, constructed to meet hurricane shelter criteria, nor built with storm hardened features.

3.0 Definitions

Three design criteria to be considered are: wind speed, importance factor, and exposure category. Additionally, selected buildings may be further enhanced by other hurricane hardening features and some buildings may be designated as shelters which brings Red Cross criteria into consideration.

A. Wind Speed

Fastest-Mile Speed - The wind speed criteria used for design per requirements of the Uniform Statewide Building Code. The wind speed is defined as a given geographical area with an annual probability of 2 percent (once every 50 years). Fastest-Mile Speed is measured as a fixed distance (1 mile) with a variable time period. The City of Virginia Beach is located in the 90 to 100 mph area for Fastest-Mile Speed per the current code.

Sustained Speed - The wind speed used by the National Hurricane Center when classifying hurricanes into Categories One through Five. Sustained Speed is measured as a variable distance over a fixed time period (1 minute).

B. Importance Factor - A design factor used to adjust the level of structural reliability of a building or other structure to be consistent with the building use or classification.

C. Exposure Category - A design factor in determining wind load pressures that reflect the surrounding terrain of a building and the effect of that terrain on wind velocities. The exposure category directly influences the wind loads used to design the main windforce - resisting structural components. The wind exposure categories, and the related wind loads, are less in urban and suburban areas than in flat, unobstructed areas.

City of Virginia Beach – DESIGN STANDARDS MANUAL
A-20
3.0 **Definitions** (continued)

D. Hurricane Hardening - Enhanced design and construction features to harden the vulnerable components of a building. These components would include windows, doors, louvers, etc. The enhanced features could include installation of shutters; elimination of potential falling objects and removal of potential “missiles” from laydown storage areas. Other features would include provisions for emergency electrical power.

E. Shelter Designation - The selection criteria for public shelters is established by the American Red Cross as provided by their publication: ARC.4496 - "Guidelines for Hurricane Evacuation Shelter Selection". When a building, or a portion of a building, is designated as a shelter, the facility must be rated for an appropriate occupancy load. Additionally, the facility must have the other amenities necessary for shelter designation such as an adequate number of toilets, provisions for food storage, preparation, and serving; and emergency electrical power.

F. Essential Facilities - Those buildings and structures, or portions thereof, that must be occupied and/or operated during an emergency situation, or are otherwise critical to the survivability and continuity of government in a post event situation, will be designated “essential”. Such municipal facilities include: fire, rescue, and police stations; emergency operation/repositioning centers; designated shelters for hurricanes; and primary communication and utility facilities. All “essential” facilities that are to be occupied during a storm event will take into consideration the applicable public shelter selection criteria from the above ARC publication. Those facilities designated to be “essential” will be defined as such in the Capital Improvement Program.

4.0 **Design Criteria**

To implement this policy for an enhanced wind speed building design, the following criteria will apply:

A. Wind Speed: All buildings and structures considered to be essential facilities will be designed for a Fastest-Mile Wind Speed of 118 mph (which equates to a Sustained Speed of 110 mph). A Sustained Speed of 110 mph is the upper limit for a Category II hurricane. In keeping with our strategy to provide safe communities, the minimum Fastest-Mile Speed for all other city buildings will be 100 mph (which equates to a Sustained Speed of 94 mph).

B. Importance Factor: The design for all City buildings and structures in Virginia Beach will use the various Importance Factors for hurricane oceelines as provided by the table in the Uniform Statewide Building Code. Within this table the City design criteria will use the highest importance factor for all essential facilities.

C. Exposure Category: The wind exposure category will be determined based on the location and surroundings of each building as described in the Uniform Statewide Building Code.

D. Hurricane Hardening: Hurricane hardening features will be added to all essential facilities including those designated as public shelters.

E. Shelter and Essential Facility Designation: Those schools and other City buildings, or portions of those buildings, that are designated as public shelters or other essential facilities will be designed to the current and applicable American Red Cross criteria and include the necessary amenities.

5.0 **Responsibility and Authority**

A. Department of General Services - The Director of General Services will be the City’s overall coordinator of the implementation of this directive. Additionally, the Director will ensure that project descriptions and cost estimates to implement this policy are included in the Capital Improvement Program.
5.0 **Responsibility and Authority** (continued)

B. Planning Department - The Building Code Official will advise the appropriate City staff on changes to the building codes as they occur and the revisions necessary to this directive to reflect the impact of those codes.

C. Public Works Department - The Director of Public Works will ensure City buildings are designed and constructed to the criteria established by this directive and that detailed implementing guidance is provided to all consulting architects and engineers. Coordination with other City agencies will be provided as required by Administrative Directive AD3.13, Project Management of City Buildings.

D. Virginia Beach City Public Schools - The Director of Facilities Planning and Construction will ensure School buildings are designed and constructed to the criteria established by this directive and that detailed implementing guidance is provided to all consulting architects and engineers.

E. Facilities and Land Commons Policy Team (FLCPT) - The FLCPT, with advice from the Fire/Office of Emergency Management, the Sheltering Committee and the Red Cross, will provide interpretation of this directive for each facility, as required, and will designate which facilities are to be public shelters and essential facilities.

Approved as to Content:  
**David M. Grochmal**  
Director, Department of General Services  
05/03/00  
Date

Approved as to Content:  
**E. Dean Block**  
Director, Department of Public Works  
05/04/00  
Date

Approved as to Content:  
**Robert Scott**  
Director, Department of Planning  
05/05/00  
Date

Approved as to Content:  
**Anthony L. Arnold, P.E.**  
Director of Facilities Planning & Construction, Virginia Beach City Public Schools  
05/11/00  
Date

Approved as to Legal Sufficiency:  
**Randall M. Blow**  
City Attorney's Office  
05/29/00  
Date

Approved:  
**James K. Spore**  
City Manager  
05/29/00  
Date
I. Purpose and Need for Policy

The purpose of this policy is to establish how the Department of Public Utilities (Department) will handle connection requests where the sanitary sewer system is determined to have capacity limitations between the proposed connection and the system discharge point to the Hampton Roads Sanitation District (HRSD) system.

II. Definitions

1. Firm pumping capacity - maximum flow rate produced by a pump or lift station with the largest pump out of service under maximum design pressure conditions as defined by the most current HRSD pressure policy.

2. Excessive pump run time – phenomenon identified by evaluating the total run time of all pumps within a pump station under wet weather/peak flow conditions. Excessive Pump Run Time exists when the total run time for all pumps exceeds a rolling average of 24 hours per pump with one pump out of service. This threshold can be calculated using the following equation,

   \[ \text{Excessive Pump Run Time} = \left[ \text{(Number of Pumps)} - 1 \right] \times 24 \text{ hours} \]

Excessive pump run time is a threshold that must be compared to actual pump run time under specific flow conditions to identify indications of potential capacity limitations. Excessive pump run time and actual pump runtime should be directly compared for pump stations that are comprised of constant speed pumps of equal size, or multi-speed pumps that are running at full speed.

III. Policy

To insure its compliance with the Regional Special Order by Consent, the Department must not accept new flow into its sanitary sewer system where capacity limitations exist. The Department will delineate areas of the sanitary sewer system as having potential capacity limitations if any of the following conditions exist:

1. There are unresolved, capacity-related overflows occurring as a result of rainfall events up to and including a 2-year rainfall event between the proposed point of connection and the discharge to the HRSD system.

2. The estimated 2-year peak hourly sanitary sewer flow exceeds the pump/lift station firm pumping capacity at stations between the proposed point of connection and the discharge to the HRSD system.

3. Unresolved excessive pump run time results from rainfall events up to and including a 2-year rainfall event at pump/lift stations between the proposed point of connection and the discharge to the HRSD system.
CAPACITY ASSURANCE PROGRAM CONDITIONAL FLOW ACCEPTANCE POLICY

4. For gravity systems, the peak flow creates a surcharge level within 1.5 feet of the rim of a manhole as a result of rainfall events up to and including a 2-year rainfall event between the proposed point of connection and the discharge to the HRSD system.

The Department may accept flow from new development and/or redevelopment in these areas only if capacity enhancement conditions outlined in the conditional flow acceptance letter have been met.

IV. Procedure to Accomplish Policy

1. The Department's Engineering Division will identify areas of the sanitary sewer system suspected of having capacity limitations and will communicate these areas to the Development Services Center (DSC). This identification of areas will be updated by the Department as new information becomes available.

2. The DSC will refer flow acceptance requests requiring a flow acceptance letter in areas suspected of having a capacity limitation to the Department for further analysis.

3. The Department's Engineering Division will conduct an analysis to confirm capacity limitations, identify capacity enhancement options, and select the preferred capacity enhancement. Capacity enhancements may include upgrading existing infrastructure consistent with the Regional Technical Standards, applicable codes, and regulations, and/or reducing Inflow/Infiltration (I/I) in the affected pump station service area(s).

4. The Department's Engineering Division will work with the DSC to develop and issue to the applicant a conditional flow acceptance letter that outlines the capacity enhancement conditions that must be met for flow acceptance.

5. Capacity Enhancement Considerations

   a. In areas with unresolved capacity-related overflows and/or unresolved excessive pump run times, the preferred capacity enhancement must be completed before the flow can be accepted by the Department.

   b. In areas where the 2-year peak hourly sanitary sewer flows exceed or nearly exceed the firm pumping capacity and/or a 2-year rainfall event results in peak flows that create surcharge within 1.5 feet of the manhole rim, the Department must commit to implementing the preferred capacity enhancement by having the enhancement included in the City Council approved Capital Improvement Program (CIP) first year funding before the flow can be accepted.

   c. For improvements that will be made through a Cost Participation Agreement, the Agreement must be fully executed and the improvements installed before the flow can be accepted by the Department.

6. Sizing of infrastructure improvements or enhancements will be determined on a case by case basis.
Appendix A – DPU Administrative Directives, Policies & Codes
January 2012

CAPACITY ASSURANCE PROGRAM CONDITIONAL FLOW ACCEPTANCE POLICY

7. Funding Capacity Enhancements
   a. The applicant submitting the flow acceptance request will pay for the capacity enhancements required by their project in the following instances:
      i. If the request involves the applicant completing an upgrade of an existing pump station, the applicant will also pay required connection fees but will not pay the Pump Station fee listed in the Virginia Beach City Code Section 28-4, subsection (d).
      ii. If the request involves the applicant completing an upgrade of an existing sanitary sewer, the applicant will also pay required connection fees and the Pump Station fee listed in the Virginia Beach City Code Section 28-4, subsection (d). The City Code states that the Pump Station fee must be paid by the applicant when the property owner must construct a sewer(s) and when the property to be served discharges through a publicly-owned pump station.
   b. If it is deemed necessary by the Department that the infrastructure upgrades provide capacity to accommodate future customers beyond what is needed for the applicant's request, the funding will be handled through a Cost Participation Agreement.
   c. The Department typically pays for capacity enhancements involving I/I abatement through the CIP. Voluntarily negotiated agreements with the applicant may be considered in order to shorten the timeframe for completing these CIP enhancements. In these cases, the applicant will pay required connection fees, including the Pump Station fee.

8. Implementation and management of the design and construction for capacity improvements or enhancements may be conducted by the Department or by the applicant, and this determination will be made on a case by case basis. The Conditions outlined in the conditional flow acceptance letter will be enforced by the DSC through:
   a. Site Plan Disapproval
   b. Site Plan Approval with "Holds" (i.e., hold occupancy or hold release of site plan or water meter)
   c. Bonding public improvements

V. Responsibilities and Authority

The interpretation and enforcement of this policy shall be the responsibility of the Engineering Division Manager or the Engineering Division Manager's designee.

Reviewed:

Robert S. Montague, Jr.  Date: 4/23/10
Business Division Manager

James W. Server, P.E.  Date: 4/20/10
Operations Manager
CAPACITY ASSURANCE PROGRAM CONDITIONAL FLOW ACCEPTANCE POLICY

Recommended:  
Gary L. Jones, P.E.  
Engineering Manager  
Date: 4/15/10

Approved:  
Thomas M. Leahy, Director  
Department of Public Utilities  
Date: 4/23/10

This policy shall become effective immediately upon the approval of the Director of Public Utilities.
I. **Purpose and Need for Policy**

To clarify how and when the Department of Public Utilities (Department) will accept the responsibility for payment of service charges for Dominion Virginia Power, Virginia Natural Gas and water utilities on Developer constructed sanitary sewer pumping stations.

II. **Policy**

For all sanitary sewer pumping stations constructed by Developers for ultimate ownership by the Department, it is the Developer’s responsibility to coordinate and pay for installation of utilities needed at the sanitary sewer pump station, typically electricity, natural gas, and water services. Moreover, the Department requires the Developer to pay all utility fees, the cost of extending natural gas and electric power to the sanitary sewer pump station and usage billings until the Department accepts the sanitary sewer pump station.

III. **Procedure to Accomplish Policy**

A. The Developer shall pay fees and charges as required in Administrative Policy "Fees and Charges to Builders and Developers for Properties Under Construction".

B. The Department will accept responsibility for electrical, natural gas and water service charges for Developer constructed sanitary sewer pump stations when the following are accomplished:

1. Acceptance and recording by the Department of a general warranty deed for the sanitary sewer pump station.

2. Payment to the City of all fees for inspection services related to the station, force main and sewers.

3. Payment to the Department for all appropriate fees, such as the emergency pump, SCADA RTU and landscaping fees.

4. Receipt by the Department of a Certificate to Operate (CTO) from the Virginia Department of Environmental Quality.

C. The Department’s Engineering Division will notify the appropriate utilities (Dominion Virginia Power, Virginia Natural Gas and the Business Division) of the date billing may
be transferred to the Department for any electric power, natural gas and water services. The Engineering Division shall notify Dominion Virginia Power and Virginia Natural Gas to read their meters as soon as practical thereafter and to send final billing to the Developer and to begin billing the Department for service.

IV. Responsibility and Authority

The interpretation of this policy shall be the responsibility of the Utility Engineering Manager or his designee.

Reviewed:  
Robert Montague  
Business Manager  
Date: 11/3/06

James W. Sarver, P.E.  
Operations Manager  
Date: 11/3/06

Recommended:  
Gary L. Jones, P.E.  
Utility Engineering Manager  
Date: 11/3/06

Approved:  
Thomas M. Leahy, III  
Director, Public Utilities  
Date: 11/3/06

This policy shall become effective immediately upon the approval of the Director of Public Utilities.
I. **Purpose and Need for Policy**

The purpose of this policy is to regulate connection of public or private, new sanitary sewer force mains to public gravity manholes and associated gravity sanitary systems. These connections have contributed to overflows, significant maintenance problems as well as material corrosion and objectionable odors due to Hydrogen Sulfide release.

II. **Policy**

Public Utilities standards require that any new sewer force main connection to an existing public sanitary sewer system be made at a pressurized sanitary sewer force main. Single family and duplex residences using grinder pumps and pressurized sanitary sewer force mains are exempt. Other connection situations may warrant exemption via a variance approved by the Department.

III. **Procedure To Accomplish Policy**

Request for an exemption to connect a sanitary sewer force main to a gravity system at a manhole will be evaluated on a case-by-case basis. To request an exemption, the applicant will provide data and engineering calculations showing that the proposed sanitary sewer system will not produce hydrogen sulfide above accepted levels as outlined in the US EPA Sulfide Control Manual. A downloadable spreadsheet to calculate dissolved sulfide is available on Public Utilities website on VBGov.com. As noted on the spreadsheet, dissolved sulfide may not exceed 0.1 mg/l. Additionally, an on-site generator is required for power outages to avoid the necessity for larger storage volume and thus longer retention times.

Other elements to consider prior to requesting an exemption are: distance from lift station to closest possible force main connection, construction impacts, public safety, long term maintenance, proximity of connection and associated odor to current or future residents or pedestrians.
IV. Responsibility and Authority

The interpretation and enforcement of this policy shall be the responsibility of Engineering Division Manager or his designee.

Reviewed:  
Robert S. Montague, Jr.  
Business Manager  
Date: 4-18-08

James S. Sarver, P.E.  
Utility Operations Manager  
Date: 4/17/07

Recommended:  
Gary L. Jones, P.E.  
Utility Engineering Manager  
Date: 4-18-08

Approved:  
Thomas M. Leahy, ill  
Director, Public Utilities  
Date: 4-21-08

This policy shall become effective immediately upon the approval of the Director of Public Utilities.
H2S Calculation Template Using Pomeroy Equations for
to Gravity Connection

The below values are inputs for the S and Z value equations...user must enter values highlighted in Column C

Project input: check forcemain line for H2S generation

dist => force main distance, feet

c => forcemain diameter, inches

T = retention time, minutes, before pump cycle start

V = calculated exit velocity of force main, fps

S = Velocity should be between 2 fps to 8 fps

q1 = discharge peak flow from pump, gpm

q2 = receiving gravity pipe peak flow, gpm (outlet pipe at manhole)

D = 0.00 gpm, eq1-q2

Hint: Minimize retention time to reduce sulfide buildup.

Use small retention volume to activate pump.

Requiree backup generator

Project input: check receiving gravity line for H2S:

S = slope, ft/100 ft

D = inch, pipe diameter
CITY OF VIRGINIA BEACH

POLICY NO. PU SOP/ENG-1182

DEPARTMENT OF PUBLIC UTILITIES

Date of Adoption: February 17, 2005

STANDARD OPERATING POLICY

Date of Revision: July 13, 2007

TITLE: Sizing Water Meters and Service Lines

PAGE 1 of 4

I. Purpose and Need for Policy
Accurate water meter selection and sizing for residential, industrial, and commercial applications are important because under or over sizing a water meter has negative impacts on the customer (low flow and/or pressure or high initial cost) and Public Utilities (low pressure complaints, lost revenues). This policy will outline the process for water meter and service line sizing.

II. Policy

III. Procedure
When sizing a water meter and/or service line, the designer and reviewer must understand the building's size, fixture types and quantities, usage occupancy and peak population. These factors will allow the proper determination of flow rate and enable the sizing of the proper water meter and service line, based on pressure loss, recollection accuracy and meter capability of handling the projected flow. The following complement the procedures presented in AWWA M22 and clarify its usage within the City of Virginia Beach.

A. Definitions
The following definitions are used:

1. Combined Fixture Value (CFV) - is the estimated or theoretical aggregate or maximum demand in gallons per minute (gpm) for all fixtures within a potable water plumbing system serviced via a single water meter.

2. Demand - the total amount of potable water required by a customer and comprised of any or all of the following demand sub-types: domestic, fire and fixed irrigation. The demand placed on a water meter is the fundamental factor to consider when sizing water meters. The total demand, especially when multiple water meters are required, must be considered when sizing service lines. Demand may be determined by actual historical usage data for existing customers or estimated by using AWWA M22 to determine the probable demand. However, for new projects, we will always use the estimated demand procedures outlined in AWWA M22 and amended herein. Typically, demand is comprised mainly as domestic need but may also include fixed irrigation system and/or fire needs.

   a. Domestic demand - pertains to the normal water uses within a building but excludes fire and fixed irrigation systems demands.
   b. Fire demand - flow requirement for any fire suppression (sprinkler) system required in commercial, institutional or residential buildings.
   c. Fixed irrigation system demand - the flow required by an in-ground irrigation system comprised of watering devices (sprinklers with spray or rotary heads) and conduit.
3. **Fixture Value** – the estimate of the peak instantaneous demand in gpm for a single supply fixture or appliance (these values are not the same as fixture unit or drainage fixture unit as defined by the International Plumbing Code). See Table 4-2. Suggested Fixture Values based on 60 psi, page 36 of AWWA M22.

4. Lower curve - refers to the lowermost curve shown in Figure 4-2, Water Flow Demand per Fixture Value - Low Range, page 27 in AWWA M22. Appropriately used for low domestic demands from usage occupancy types noted in the figure where a small population, static or transient, creates low demand on the building water fixtures. This applies also to certain commercial or industrial endeavors, i.e., home day care, business offices or drive thru restaurants where public traffic is typically minimal. This does not include dental or medical offices where procedures are performed.

5. **Meter** - a device for measuring water flow.

6. **Peak population** – the maximum population in a building that generates the greatest domestic demand for particular usage occupancy.

7. **Residential unit** – a single-family building intended for residential use, meaning: house, townhouse or duplex (each unit of a duplex is separately metered) but excluding multi-family buildings (apartments or condos).

8. **Service line** - the section of pipe connecting to the public main and delivering water to the meter. The minimum service line diameter for new services is 1-inch.

9. **Upper curve** - refers to the topmost curve shown in Figure 4-2, Water Flow Demand per Fixture Value - Low Range in AWWA M22. Appropriately used for high domestic demands from usage occupancy types noted in the figure where significant population, static or transient, creates high demand on the water fixtures. This applies also to certain high用水 using industries, manufacturers or businesses (such as medical and dental offices/facilities, day care centers, private schools) or other places dependent upon large public traffic (malls, theaters, cinemas, sports arenas) or large water users (garden centers, grocery stores).

10. **Usage occupancy** - how the tenant of a building is using the building. For example, usage types include, but are not limited to medical out patient surgical office, insurance business claims office, hotel, chip manufacturer or grocery store, etc.

**B. Determining Domestic Demand**

1. Determine the probable domestic demand based on the total number of fixtures in the building as depicted in the approved plumbing plan for the architectural drawings.

   a. **Count fixtures.** Sum up the Combined Fixture Value Total (cfv). See Figure 4-5, Water Customer Data sheet, page 30 of AWWA M22.

   1) For single-family residential units, if the cfv is 110 or less, use a 6/8-inch meter with the standard 1-inch service line. Do not calculate further unless fixed irrigation system and/or fire demands are also placed on the meter.

   2) If a single-family residential unit has a cfv greater than 110, the meter size would at least be 1-inch and we will require meter sizing and service line sizing calculations to be submitted by the engineer in accordance with the procedures outlined in AWWA M22 and herein.
Appendix A – DPU Administrative Directives, Policies & Codes
January 2012

b. Determine the public main peak demand residual pressure and service line losses and then calculate the discharge pressure at the meter (see Table 5-1, Minor Loss Through Meters). Use data from a fire hydrant test which is not more than 1-year old and taken at or within 500 feet of the site. If data is older than one-year, require the performance of a fire hydrant flow test. See below discussion for service line sizing.

2. Determine the Customer Peak Demand. For less than 1,300 cfl, use the upper or lower curve in Figure 4-2, Water Flow Demand per Fixture Value – Low Range. Adjust peak demand for the pressure factor (the AWWA table is based on 60 psi meter discharge) using the calculated discharge pressure at the meter (Table 4-1, Pressure Adjustment Factor). For high range values (above 1,300 cfl), use Figure 4-3, Water Flow Demand per Fixture Value – High Range.

3. Consider non-fixed irrigation, i.e., garden hose usage. If outside spigots were not denoted in the previous calculation for Customer Peak Demand and the building has outside spigots, add values for the number of spigots shown by the approved plumbing plan. Adjust for pressure factor as described previously.

4. Sum up the values for the estimated or probable “Total Fixed Demand.”

5. Consult Table 6-1, AWWA Meter Standards. Select the meter size required for Total Fixed Demand that most closely matches, without exceeding, the maximum flow rate of the meter. Remember, the Department of Public Utilities does not stock a ¾-inch water meter. So, the 5/8-inch water meter and the 1-inch water meter absorb the range of the ¾-inch water meter. When the Total Fixed Demand is 24 gpm or less, select the 5/8-inch meter. When greater, a larger water meter must be used.

C. Other Demands
   1. Fire Demand must be calculated in accordance with National Fire Protection Association (NFPA) Standard 13.

   2. Fixed Irrigation System flows are indicated by sealed landscape or plumbing plans or estimated using the approved site plan (using 100sf units times 1.15 for spray heads or 0.40 for rotary heads).

IV. Service Line Sizing
The minimum service line size is 1-inch and typically, as a rule of thumb, when meters are 1-inch or larger, service line sizes match meter sizes. However, calculations must verify that the correct service line size is designed. To calculate service line size, determine:

1. Pressure in main during peak flow condition
2. Pressure loss through service line
3. Pressure loss through meter

The engineer should also consider line losses on the private-side of the water meter and design that service appropriately. In many instances, the private-side line will be larger diameter than the service line; moreover, the private-side line must always comply with requirements of the IFC and local plumbing code. See paragraph V below.
Appendix A – DPU Administrative Directives, Policies & Codes
January 2012

V. Minimum Head and/or Flow Required for Customer

The approved plumbing plan should specify a minimum operating flow and pressure (for a residential unit, consider 10 gpm at 20 psi to be the minimum service at the meter cutoff). The designer must remember to consider pressure (head) loss in any anti-backflow device requirement.

If the pressure and/or flow required for the customer are greater than that available, consider:

1. Using a larger diameter private-side line,
2. Separating fire flow demand and/or fixed irrigation system,
3. Demand from domestic demand (i.e., separate irrigation meter),
4. Using a larger service line and/or meter,
5. Augmenting pressure by installing a private pump and tank system.

VI. Responsibility and Authority

The interpretation and enforcement of this policy shall be the responsibility of each Public Utilities Division Manager or an assigned designee.

Reviewed:

Robert S. Monteagle, Jr.
Business Manager

Date: 6/29/07

James W. Sasser, P.E.
Operations Manager

Date: 1/13/07

Recommended:

Gary L. Jones, P.E.
Utility Engineering Manager

Date: 5/30/07

Approved:

Thomas M. Leech, III
Director, Public Utilities

Date: 7/13/07

This policy shall become effective immediately upon the approval of the Director of Public Utilities.
I. Purpose and Need for Policy

This Standard Operating Procedure establishes policy regarding the sale of irrigation meters, and the continuation of existing irrigation meter accounts.

II. Policy

This procedure will apply to all requests for the sale and installation of irrigation meters within the City and will also apply to meters installed prior to this regulation.

III. Procedure To Accomplish Policy

A. Effective on the date of revision above, the Department of Public Utilities will resume the sale of irrigation meters.

B. Tap and meter fees and Water Resource Recovery Fees equivalent to the Drainage Fixture Unit assigned below shall be paid before installation of an irrigation meter. Fees are based on the size of the water meter and are charged at the rate in effect at the time of purchase.

<table>
<thead>
<tr>
<th>Water Meter Size</th>
<th>Water Resource Recovery Fee DPU Equivalency</th>
</tr>
</thead>
<tbody>
<tr>
<td>5/8&quot;</td>
<td>2</td>
</tr>
<tr>
<td>1&quot;</td>
<td>5</td>
</tr>
<tr>
<td>1-1/2&quot;</td>
<td>10</td>
</tr>
<tr>
<td>2&quot;</td>
<td>15</td>
</tr>
</tbody>
</table>

C. During periods of mandatory water conservation, irrigation meters may be removed, disconnected or turned off at the direction of the Director of Public Utilities. Meters removed for mandatory water conservation will be reinstalled without cost to the property owner/tenant after the Mandatory Water Conservation Ordinance is rescinded.
Standard Operating Procedure
Irrigation Meters

IV. Responsibility and Authority

The interpretation and enforcement of this policy shall be the responsibility of the Customer Service Division Manager or designee.

Recommended: 

Joseph P. Martin
Acting Customer Service Administrator

Approved: 

Clarence Warnstaff, P.E., Director
Department of Public Utilities

Date: 6/22/98

Date: 6/30/98

This policy shall become effective immediately upon the approval of the Director of Public Utilities.

5/23/98
Appendix A – DPU Administrative Directives, Policies & Codes
January 2012

CITY OF VIRGINIA BEACH

DEPARTMENT OF PUBLIC UTILITIES

STANDARD OPERATING POLICY

POLICY NO. PU SOP/ENG 1177

Date of Adoption: November 18, 2003
Date of Revision: January 17, 2007

TITLE: Record Drawing Process

Page 1 of 3

I. Purpose and Need for Policy

The purpose and need for this policy is to ensure that an accurate and technically correct set of record drawings are created and maintained for each Capital Improvement Program (CIP) construction project. Accurate records of the constructed water and sanitary sewer infrastructure are invaluable for ensuring efficient and effective system operation and maintenance, quality and responsiveness of services, and planning for system expansion in response to growing demands for services.

II. Policy

It is the ultimate responsibility of the Project Manager to ensure that record drawings are prepared and approved upon the completion of their assigned CIP construction projects, but the Contractor and Inspector also have responsible and major roles. At the completion of construction, a complete set of record drawings will include the Contractor’s Plan, Inspector’s Plan, and the A&E Record Drawing as defined below. Information from the record drawings will be entered into GIS and IMS databases. Final set of the Contractor’s Plan, Inspector’s Plan and A&E Record Drawing will be stored and maintained in Records Management (File Room).

III. Definitions

1. A&E - Architect and Engineer of record, the firm that designed the construction project.
2. A&E Record Drawing - Final Mylar copy and CD containing the raster image files in TIFF 4 format and the original CAD files of the record drawing prepared by A&E. Often times called “As Built”.
3. CAD - Computer Aided Design, referring to construction drawings in digital format.
4. CD - Compact Disc used to store digital files.
5. Contractor’s Plan - plan maintained by Contractor during construction, which records data required by Contract. This is a Contract Record. Data required is stated in the Supplemental Specification for Water and Sanitary Sewer Record Drawings.
6. GIS - Geographical Information System is a computer database used to record utility asset inventory records and to prepare maps.
7. GISB - the Geographical Information Services Bureau in the Engineering Division
8. IMS - Infrastructure Management System is a computer database used to store operations and maintenance records for utility assets.
9. Inspector’s Plan - plan maintained by Inspector during construction, which includes some information contained on Contractor’s Plan as well as testing information, etc.

IV-ENG
10. **PM or Project Manager** - the engineer in the Engineering Division who is assigned responsibility for managing CIP projects.

### IV. Procedure To Accomplish Policy

1. Project Manager notifies Contractor in Preconstruction Meeting that the Inspector will verify regularly that the Contractor's Plan is up-to-date and accurate.
2. The Contractor is responsible for maintaining data on Contractor's Plan on a daily basis. The Contractor's Plan should be kept clean and in good order throughout construction.
3. Project Manager and Inspector are responsible for verifying that the Contractor is maintaining the Contractor's Plans on a monthly basis, prior to approval of Contractor's monthly invoices. No exceptions.
4. Once project construction is complete, the Contractor's Plan will be hand delivered by Contractor to the Inspector with the Final Invoice. Final Invoice will not be paid until final, legible, accurate and complete Contractor's Plan has been received and approved by the Inspector.
5. After receiving the Contractor's Plan, the Inspector shall review to ensure the data satisfies the contract requirements. If the data does not satisfy all contract requirements, the Inspector shall process the final invoice.
6. The Inspector will work with the Contractor to reconcile any differences between the Contractor's Plan and the Inspector's Plan related to public and private utility locations. All revisions shall be noted correctly on both plans.
7. After review and approval of the Contractor's Plan, the Inspector shall submit both the Inspector's Plan and the Contractor's Plan to the Inspections Office for processing.
8. Inspections Office staff will mark the Contractor's Plan with the "Plan Stamp." This stamp will provide a signature and date line for the Inspector, Surveyor, and GISB to sign once they have completed their use of the plan.
9. The Inspections Office will process both sets of plans, complete any necessary paperwork, and mark the Contractor's Plan by applying red tape to the binding.

The intent in marking the plans with red tape is to provide a visible reminder to staff that this set of plans is the official record of project construction, and it should not be taken out of the office and should not remain out of the project files for an extended period of time.

10. After processing, the Contractor's Plan and the Inspector's Plan will be sent to Surveys for field data collection. The Contractor's Plan will remain in the office, and Surveys will use the Inspector's Plan in the field. On the Inspector's Plan, Surveys will note any differences between the Inspector's Plan and actual field conditions. Surveys will enter project information in the Map Maintenance Tracking database. This database is used to monitor and coordinate survey data collection, mapping updates, and asset data recordation by Surveys and GISB.

11. The Inspector will reconcile and make all necessary changes to the Contractor's Plan and/or the Inspector's Plan. The Inspector will initial any changes to the Contractor's plan not made by the Contractor.
12. The Inspections Office will make a copy of the Contractor's Plan for the Project Manager.
13. Surveys will take both the Inspector's Plan and the Contractor's Plan to the File Room. Surveys will also maintain digital survey data files for use by GISB.
14. GISB will check out the Inspector's Plan and import Surveys' digital data files to update
mapping and utilities asset records.

15. The Project Manager will submit the copy of the Contractor’s Plan to the A&E.
16. A&E will prepare A&E Record Drawings and forward electronic file in TIFF 4 format to Project Manager for review.
17. Project Manager will be responsible for coordinating internal review of TIFF 4 file and noting any discrepancies.
18. Project Manager forwards comments to A&E.
19. A&E incorporates comments from Project Manager and resubmits revised A&E Record Drawings in TIFF 4 format. The A&E will continue to revise and resubmit A&E Record Drawings in TIFF 4 format until the Project Manager approves the A&E Record Drawings.
20. When the A&E Record Drawings are approved by the Project Manager, the A&E will return the copy of the Contractor’s Plan and submit one Mylar copy and one CD containing both TIFF 4 and the original CAD formatted files of the A&E Record Drawings to the Project Manager for review and final approval.
21. The PM is responsible for coordinating the final review and approval of A&E Record Drawings (Mylar and digital files).
22. Once the approved A&E Record Drawings are received, the Project Manager forwards the Mylars and digital files (CD) to GISB’s GIS Coordinator to assign a flat file number and to verify CAD files are acceptable.
23. GISB forwards Mylars and CD to the File Room for filing.

V. Responsibility and Authority

The interpretation and enforcement of this policy shall be the responsibility of the Engineering Manager or his designee.

Reviewed:  
Robert S. Montague  
Business Manager  
Date: 2/9/07

James W. Server, P.E.  
Operations Manager  
Date: 2/9/07

Recommended:  
Gary L. Jones, P.E.  
Utility Engineering Manager  
Date: 2-9-07

Approved:  
Thomas M. Leahy, III  
Director, Public Utilities  
Date: 2-9-07

This policy shall become effective immediately upon the approval of the Director of Public Utilities.
I. **Purpose and Need for Policy**

   This standard operating policy establishes guidelines and policies to control the use, financial accountability, water quality impact and availability of fire hydrant meters for use by our customers as defined in Section 37-22.

II. **Policy**

   It is the policy of the Department of Public Utilities to provide portable fire hydrant meters to businesses and individuals requiring access to water from fire hydrants. A fire hydrant meter is a portable water meter used to measure the amount of water that flows through a fire hydrant.

III. **Procedure to Accomplish Policy**

   A. A completed hydrant meter request form from the individual or business is required. Requests will be processed by the Business Division. The Business Division staff will use the following criteria to evaluate the application:

      1. Previous billing/payment history.
      2. Condition of previous equipment, rented/returned.
      3. Possible water quality issues – Fire hydrant meters are not available for use in residential neighborhoods.

   B. Business Division staff will notify the customer if the request is approved or denied. If denied, the reason will be stated. If approved, the customer will be informed of the amount of the deposit, where to pay the deposit, and where to pick up the hydrant meter.

   C. Business Division staff will notify the Operations Storekeeper of each request to ensure the equipment is available and ready for pick up by the customer.

   D. Business Division staff will accept the deposit, issue a receipt, and provide a ticket to the customer.
E. The customer will take the receipt and ticket to the Operations Storekeeper to obtain the equipment. The Storekeeper will also provide an instruction sheet detailing the operation, safety precautions, and billing and equipment return instructions.

F. The Storekeeper will complete the ticket with the issued hydrant's serial number, the meter reading, and any additional equipment provided. A copy of the ticket will be forwarded to Business Division Billing to set up a billing record.

G. Fire hydrant meters are billed for actual water consumption, service availability, and utility tax approximately every 60 days. Business Division Billing will mail letters notifying customers when they are required to take the hydrant meter to the Operations Division on Dam Neck Road for a bi-monthly inspection and meter reading.

H. Customers will be billed for damage to fire hydrant meters. The customer of record will be billed for labor, materials, and equipment, plus a 25% administrative cost.

I. When the hydrant meter and equipment are returned, the Storekeeper will inventory to ensure everything is returned in satisfactory condition, take a final reading, and forward the information to Business Division Billing for final billing.

J. A deposit refund will be processed when all equipment is returned in satisfactory condition. Final billing charges will be deducted from the deposit.

K. The City reserves the right to revoke a hydrant meter authorization due to:
   1. Improper use of the hydrant/meter.
   2. Water quality problems in the surrounding area resulting from the hydrant use.
   3. Failure to appear for inspections and meter reading every 60 days as requested.
   4. The declaration of a mandatory water conservation condition.
   5. Removal, or damage, of the Reduced Pressure Zone (RPZ) Assembly.

IV. Responsibility and Authority

Interpretation of this policy shall be the responsibility of the Business Manager or assigned designee.
Title: Procedures for Authorization of Fire Hydrant Meter Rentals  

Reviewed:  
Gary L. Jonge, P.E.  
Engineering Manager  
2/28/08  

James W. Sarver, P.E.  
Utility Operations Manager  
2/28/08  

Recommended:  
Robert S. Montague, Jr.  
Business Manager  
2/28/08  

Approved:  
Thomas M. Leahy, III  
Director, Public Utilities  
2/28/08  

This policy shall become effective immediately upon the approval of the Director of Public Utilities.
Criteria for Water Hydrant Meter Request

Company Name: ________________________________

Contact Person's Name: _________________________

Billing Address: ____________________________________________

Phone Number: ________________________________

Number of Hydrant Meters Requested: ________________
($650 deposit required for each meter)

Duration of time you expect to need the hydrant meter: __________________________

Address(es) where water will be used: _______________________________________

How will water be used: ____________________________________________

How much water will be used: __________________________

Economic impact of not being granted request: ________________________________

Mail responses to: Department of Public Utilities
Municipal Center
Virginia Beach, VA 23456
Fax #385-4925

Please feel free to add additional written information that will assist the decision process.
City of Virginia Beach
Fire Hydrant Meter Rental Rules and Regulations

The following information is provided regarding the fire hydrant meter you have received. Although you have paid a deposit for the use of this meter, the meter remains the property of the City of Virginia Beach and may be recalled at any time. The City of Virginia Beach waives of any liability in claims or damages resulting from the use of hydrants. In order to reduce the potential impact to water quality, the following procedures must be observed when using the hydrant meter:

1. Fire hydrant meters are equipped with a backflow prevention assembly for the protection of the City water supply. The fire hydrant meter with backflow prevention assembly is considered ONE UNIT. This unit which is referred to from here on as the FHM/BBP Unit must remain fully assembled and be used as one piece at all times.

2. FHM/BBP Units are provided to customers for use in Virginia Beach ONLY.

3. Utility charges are assessed in accordance with charges established in City Code Section 37-46, 37-47 and 35-110. Utility Billings will begin with the establishment date of the deposit. Daily charges for service availability and utility tax are due on the meter with or without the registration of water along with a setup fee of $20.00 (on your first bill). In addition, water will be billed based on the current rate per one thousand (1,000) gallons of usage.

4. Approximately every 90 days, Public Utilities/Business Division will notify you by mail to take the FHM/BBP Unit to the Public Utilities Operations Division on Dam Neck Road for inspection and reading. Occasionally, the FHM/BBP Unit will need to be returned for maintenance. The City will provide a replacement unit in this instance. The permanent backflow prevention assembly attached to the FHM/BBP Unit, will be tested yearly.

5. DO NOT use fire hydrants located in residential neighborhoods. Using these hydrants may cause severe water quality problems in these areas.

6. DO NOT use private fire hydrants.

7. The Customer will ensure that hydrant meter use complies with current City and State Erosion and Sediment Control Regulations, Virginia Stormwater Management Handbooks and other applicable ordinances, codes, and laws. This compliance includes ensuring that hydrant meter use does not result in sediment-laden runoff entering the street and City storm drain system, or any adjacent sensitive or environmental areas.

8. Before connecting the FHM/BBP Unit, slowly open the hydrant until water begins to run. The arrow on the top of the hydrant indicates the direction to open the hydrant. Open one or two turns and allow water to gently run until clear (usually no more than three minutes). Once the water is clear, slowly close the hydrant.

9. ALWAYS OPEN AND CLOSE FIRE HYDRANTS VERY SLOWLY! As a rule-of-thumb, when opening the fire hydrant nut to open and close the hydrant, the operator must gradually complete one (1) turn in a ten (10) seconds period. Failure to do so may cause personal injury to the operator, as well as damage to the water system.

10. After connecting the FHM/BBP Unit, slowly open the hydrant until it is fully opened.

11. Maintain a constant flow. Fluctuating the rate of flow or quickly opening/closing the hydrant may stir sediment in the water lines, causing discoloration of the water and affecting the quality of water you receive as well as the quality of the water in the surrounding areas.

12. The City reserves the right to revoke a hydrant meter authorization due to:

   A. Improper use of the FHM/BBP Unit
   B. Water quality problems in the surrounding area resulting from the hydrant use
   C. Failure to appear for scheduled inspections, backflow assembly tests, and meter readings.
   D. The declaration of a mandatory water conservation condition.

The FHM/BBP Unit and equipment must be returned to:
Department of Public Utilities
Operations Division Storeroom
3500 Dam Neck Rd
Virginia Beach, VA 23456

*If you have any questions regarding the operation of the FHM/BBP Unit, please call the Public Utilities Operations Division at 385-1400. Billing questions should be directed to Public Utilities Business Division at 385-4631.
Appendix B – Standard Legend for Record Drawings
Appendix B – Standard Legend for Record Drawings
January 2012

PROPOSED STRUCTURES

LEGEND

EXISTING STRUCTURES & FEATURES

City of Virginia Beach – DESIGN STANDARDS MANUAL
B-1