Town of Kilmarnock
Design Standards for
Water Distribution and Sanitary Sewer Systems
Kilmarnock, Virginia

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Prepared by
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APPENDICES

1.0 WATER DISTRIBUTION AND SANITARY SEWER SYSTEMS

1.1 General

The Town of Kilmarnock (Town) requires that the Hampton Roads Planning District Commission (HRPDC) Regional Construction Standards Sixth Edition with amendments, dated June 2016, together with the Kilmarnock Special Provisions to the Regional Construction Standards (see Appendix A) and the criteria presented in this document, be followed for the design and construction of all water distribution and sanitary sewer systems unless otherwise authorized by the Town of Kilmarnock. The Regional Construction Standards may be obtained by contacting the Hampton Roads Planning District Commission, 723 Woodlake Drive, Chesapeake, VA 23320, phone (757) 420-8300.

The Town reserves the right to waive or modify any or all parts of the Design Standards in specific instances as he deems appropriate, except where the Virginia Department of Health Waterworks Regulations or the Department of Environmental Quality Sewage Collection and Treatment Regulations would be violated by such a waiver.

All site and subdivision plans shall be sealed by a Professional Engineer or Land Surveyor licensed in the Commonwealth of Virginia. Any plans submitted without a Professional seal will be returned without review.

When a Professional Engineer or Surveyor (Professional) with a current said professional license with the Commonwealth of Virginia prepares design documents for a specific project and incorporates the HRPDC Regional Construction Standards and/or Kilmarnock's Design Standards for Water Distribution and Sanitary Sewer Systems into that design by reference, the Professional's signed and dated seal of the particular plans, specifications and drawings for that project represents their approval of the HRPDC Regional Construction Standards and/or Kilmarnock's Design Standards as incorporated by reference into such particular plans, specifications and drawings for such project. In other words, the Professional who stamps or seals any plans, specifications, reports or other documents incorporating the HRPDC Regional Construction Standards and/or Kilmarnock's Design Standards by reference is responsible for assuring that such plans, and the HRPDC Regional Construction Standards and/or Kilmarnock's Design Standards incorporated into such plans by reference, are adequate and appropriate for the particular

project. The ultimate decision about what goes into such plans, specifications, reports, or other documents for a specific project must be that of the Professional who signs and seals them.

1.2 Design of Facilities

Design of all public gravity sanitary sewer systems to be dedicated to the Town of Kilmarnock shall be performed by a Professional Engineer or Professional Land Surveyor with Part A and B license certified by the Commonwealth of Virginia. Water systems, pump systems, well facilities, and sanitary sewer pressure systems shall be prepared by or under the supervision of a licensed professional engineer legally qualified to practice in the Commonwealth of Virginia, and will require current Professional Engineers certification. All designs shall meet or exceed the latest edition of the Virginia Department of Health Waterworks Regulations, the Department of Environmental Quality Sewage Collection and Treatment Regulations, and the Kilmarnock Design Standards (including the HRPDC Regional Construction Standards)

Virginia Department of Health (VDH), Department of Environmental Quality (DEQ), and Hampton Roads Sanitation District (HRSD) approvals are required for, but not limited to, the following:

DEQ:

- All gravity sanitary sewer projects with a 40,000 gpd or greater average design flow or, 100 or more connections regardless of phasing
- All pump stations with a 20 gpm or greater pump rate.
- All pump stations discharging into a common force main with one or more other stations.
- The approval by DEQ may require a Certification by the Professional that all SCAT Regulation requirements are met, if DEQ does not review the project. The Certification shall be as required by the DEQ Certificate to Construct application.

VDH:

- All water mains.
- All water production facilities (including wells).
- All master metered projects which have on-site, private water distribution piping larger than 8-inches in diameter or serving more than 14 residential connections.

It is the responsibility of the Applicant to coordinate submittals to and receive approval from the above agencies. A copy of the developer's/engineer's transmittal to these agencies, where required, shall be included as part of the site plan submittal. Agency approvals are required prior to final plan approval by the Town.

1.3 Vertical and Horizontal Survey Datum Control

Vertical and horizontal survey datum control shall be based upon Horizontal NAD 83 (1996), Vertical NAVD 88. A minimum of one permanent benchmark shall be established for each project.

1.4 Contractor Licensing

Contractor registration shall be in accordance with Title 2.2 Chapter 43 of the Code of Virginia. The Contractor responsible for installing the water and sanitary sewer facilities will be required to provide their State Contractor's License number.

2.0 SYSTEM DESIGN

2.1 Water Distribution Pressure

- A minimum residual pressure of 20-psi shall be maintained throughout the water distribution system under any condition.
- Where the pressure at the service tap exceeds 80 psi, the provisions of the Uniform Statewide Building Code shall apply. Pressures may exceed 80-psi for areas where the finish floors are less than 70-feet in elevation.
- Flows required for fire protection shall be in accordance with applicable requirements of the National Fire Protection Agency, Insurance Services Office, State and local agencies, and subject to the approval of the Fire Chief of the Town of Kilmarnock.
- A water distribution system hydraulic analysis, with fire flow analysis, showing the hydraulic gradient at key points shall be included with plan submittals requiring water main extension of the Kilmarnock water system or as required by the Town of Kilmarnock.

2.2 Acceptable Water Main Sizes

The Town of Kilmarnock permits 4, 6, 8, 12, 16, 20 and 24-inch diameter mains as part of its distribution system. Proposed mains larger than 20-inch in diameter shall be coordinated with the Town at the conceptual plan stage. The minimum pipe size where fire protection is to be provided or required shall be eight inches in diameter unless otherwise approved by the Fire Chief and Town of Kilmarnock.

Pipes of smaller diameter may be used in the following instances where fire protection is not required, and justification is provided with a hydraulic analysis including the proposed and future domestic and irrigation water uses as follows:

- Six-inch pipe and lesser diameter pipe may be used if 40-psi minimum pressure and flow of three (3) gallons per minute plus irrigation demands per connection can be maintained.
- Four-inch pipe may be used when the run is less than 600-feet but more than 300-feet, and a flow rate of three (3) gallons per minute plus irrigation demands per connection, with a 40-psi minimum pressure can be maintained.

- Two-inch pipe may be used when the run is less than 300-feet, and a minimum pressure of 40-psi can be maintained with a flow rate of three (3) gallons per minute plus irrigation demands.

2.3 Water Main Pipe Materials

Water mains shall conform to the HRPDC Regional Construction Standards, inclusive of Town of Kilmarnock Special Provisions.

2.4 Acceptable Water Service Connection Sizes

The acceptable water service connection sizes are 5/8, 3/4, 1, 1-1/2, 2, 4, 6, 8 and 12-inches in diameter. A gate valve shall be installed at the tee for all service connections 4-inches and larger.

2.5 Cover

Water distribution systems and sanitary force mains shall have a minimum of 36 inches and a maximum of 42 inches of cover, measured from the top of the pipe to the established finished grade above the pipe, unless otherwise approved by the Town. Water service lines shall have a minimum of 18 inches and a maximum of 2 feet of cover. During design, site layout of other infrastructure (i.e. storm sewer, gravity sanitary sewer, etc) shall be considered in minimizing the depth of pressure mains.

2.6 Easements

Permanent easements for water mains and services and for sanitary sewer mains and laterals shall be provided on all private property and shall be a minimum width of 20-feet. (Combined water and sanitary sewer easements shall be a minimum of 30-feet.) For gravity sanitary sewers over 12-feet deep, the width of the easement shall be a minimum of 30-feet. Additional easement width may be required by the Town. Prior to considering an easement as permanent, all surface conditions must be restored to original or better condition. The easement shall be stabilized within 30 calendar days of the completion of construction. Easement plats and deeds shall be recorded prior to site plan approval, except where the easements will be recorded as part of a subdivision plat. Any proposed offsite easements shall be secured by the Developer prior to plan approval by the Town.

No building or permanent structure shall be constructed within a Town Utility Easement. No trees, shrubs, structures, fences, irrigation mains, invisible pet fences or other obstacles shall be placed within an easement which would render the easement inaccessible by equipment. Shrubs shall be a minimum of 5 feet, and trees a minimum of 10 feet, from the center of water and sanitary sewer pipelines. The Town of Kilmarnock will not be responsible for replacement of trees and shrubs placed within the easement.

Water and sanitary sewer easements are exclusive and shall be designated on the plans and plat as "Town of Kilmarnock Utility Easement," with the width specified, unless otherwise authorized by the Town. The following note shall be added to all plats containing Town of Kilmarnock Utility Easements:

- "Easements denoted as "Town of Kilmarnock Utility Easements" are for the exclusive use of the Town of Kilmarnock and the property owner. Other utility service providers desiring to use these easements with the exception of perpendicular utility crossings must obtain authorization for access and use from the Town of Kilmarnock and the property owner. Additionally, the Town of Kilmarnock shall not be held responsible for any damage to improvements within this easement, from any cause."

Any existing Town of Kilmarnock easement requiring abandonment or extinguishment will require approval by the Town of Kilmarnock. Appropriate materials (plat, deed, exhibits, etc) including fees shall be submitted by the Developer/Engineer for presentation to the Town.

2.7 Dead Ends and High Points

Dead ends shall be minimized by looping of all water lines where possible. Where dead-end lines occur, they shall be provided with a below grade flushing hydrant. The flushing device shall not be directly connected to any sanitary sewer. Approved manual air release devices shall be installed at all system high points and blow-off assemblies shall be installed at all system low points for sediment removal. All devices shall be inspected by the Town prior to backfilling. Consideration shall be given to providing a suitable means of conveying flush water to an adequate outfall channel, thus precluding potential erosion problems.

2.8 Extension Provisions

Provisions shall be made for logical future water and sanitary sewer extensions. Future water main and sanitary force main extensions shall be provided with a gate valve and a minimum of a full joint of pipe beyond the gate valve. This pipe shall be properly restrained, plugged, blocked, pressure tested, and disinfected (water mains only) along with the rest of the piping system. After passing inspection, the gate valve shall be closed. A temporary blow-off assembly shall be installed at the end of all extensions. When the gravity sewer is extended, the manhole shall be cored for the new extension.

2.9 Hydraulic Analysis

A hydraulic analysis is required for all water system design projects requiring an extension of the water distribution system, and/or installation of new fire hydrants and/or as required by the Town. The hydraulic analysis shall be used to verify flow demands and pressure availability for the proposed project and to justify pipe sizes. The analysis shall also demonstrate the effect the proposed project will have on the existing distribution system. The hydraulic analysis shall include as a minimum the following:

A. Under peak hour demands (excluding fire demands), the water distribution system shall maintain pressures above 40-psi.
B. Under maximum day plus fire demands plus applicable irrigation demands, the water system shall maintain pressures above 20-psi.
C. Water system layouts shall be designed to minimize dead ends. Looping water lines is a standard practice to eliminate dead ends.
D. Velocity in any pipeline (excluding fire hydrant six-inch runs) shall not exceed 5 fps under any condition.
E. Head losses in any pipeline (excluding fire hydrant six-inch runs) shall not exceed 20 psi per 1,000 feet of pipeline.
F. Provide a separate hydraulic analysis for each phase of the project to confirm adequate system design.
G. The water model calculations must be sealed, signed and dated by a Licensed Professional Engineer, currently licensed by the Commonwealth of Virginia.

H. The hydraulic analysis shall be neatly organized and bound. Provide a summary describing the project, the basis of the calculation procedures performed, name and version of the software. The analysis shall be provided in printed form as well as electronic form. The electronic copy shall include the input data for inclusion in the Town system model.

I. Provide a node map that includes pipe numbers, reservoirs, pumps, junction numbers, contours to check elevations, locations of fire hydrants, and lot locations.

J. Provide in the model, irrigation demands that might be applied to this development. If no irrigation demands are included in the model, then provide justification of how irrigation will not be allowed for this project. If irrigation demands are included for this development, then describe how the irrigation demands were developed and what mechanisms will be in place to control them. An example of justification might include the homeowner covenant documentation prohibiting outdoor irrigation of all kinds or allowing irrigation under specific circumstances that support the irrigation demand calculations. Provide a written discussion of irrigation demands with the analysis.

K. Provide a software generated date/time stamp on all water model pages.

L. Provide in the hydraulic analysis the following:

1. Fire hydrant flow tests for which the model is based and a description of input assumptions such as reservoir data and pump data that simulates the flow test.
2. Listing of all inputs for all pipes, nodes, pumps, reservoirs, etc. used in the model.
3. Include Average Day Demand Analysis.
4. Include Maximum Day Demand Analysis.
5. Include Maximum Day Demand + Fire Flow + any applicable irrigation demands. The water system must maintain 20 psi at all nodes.
6. Include Peak Hour + any proposed irrigation demands. The pressure in the system must be maintained above 40 psi at all nodes.
7. Include a global fire flow analysis.
8. No pipe velocities shall exceed 5 fps, under any condition.
9. No pipe head losses shall exceed 20 psi per 1,000 feet of pipe.

10. Provide separate hydraulic analysis for each phase of the project to confirm adequate system pressures and flows during phase development. Apply the fire flow within the phased area.
11. Pipe reports must include the following information at a minimum:
    a. Pipe Number
    b. Starting Node number and Ending Node number
    c. Status
    d. Pipe Diameter (inches)
    e. Pipe Length (feet)
    f. C-Factor (C-Factor of 130 is the maximum allowed)
    g. Discharge (gpm)
    h. Velocity (fps)
    i. Head losses (ft)
    j. Minor losses (ft)
12. Junction reports must include the following information at a minimum:
    a. Junction number
    b. Elevation (ft)
    c. Demand (gpm)
    d. Description (description for calculating demand)
    e. Calculated demand (gpm)
    f. Pressure Head (ft)
    g. Residual pressures at all nodes (psi)
    h. Hydraulic Grade Line (ft)
13. Reservoir report must include the following information at a minimum:
    a. Label
    b. Elevation (ft)
    c. Hydraulic Grade Line (ft)
    d. Inflow (gpm)
    e. Outflow (gpm)

14. Pump report must include the following information at a minimum:
    a. Label
    b. Status
    c. Elevation (ft)
    d. All input information
    e. Intake pump grade (ft)
    f. Discharge pump grade (ft)
    g. Discharge (gpm)
    h. Pump head (ft)

2.10 Water and Sanitary Sewer System Data Sheets

A. Water Data Sheet: Provide a completed Water Data Sheet with all water system projects. The Water Data Sheet shall be completed as follows:

1. Date: Provide the date the Water Data Sheet was completed. If revisions are necessary, add each revision date.
2. Provide the following information under the General Information:
    a. Provide the project name.
    b. Provide the project address: Provide the project address if available or a description of the location of the project.
    c. Developer: Provide the firm name of the responsible party for the development.
    d. Submitted By: Provide the name of the firm submitting this project for review.
    e. Contact Person: Provide the name of the contact person the Town may contact to address questions concerning the application.
    f. Address: Provide the address of the contact person.
    g. Provide the phone and fax numbers and the e-mail address of the contact person for this application.
3. Provide the following information requested under Design Information as follows:
    a. Source of Water: List the source of water for this project.
    b. Flow information shall be in accordance with the types of development, units, flow, and flow duration in accordance with the Flow Demands Table on page 20. Any deviations from this Table will require supporting documentation and will require VDH approvals.
        1. Total Flow (GPD): Provide the calculated total GPD based on the project development type.
        2. Irrigation Demand (gpm): Provide the irrigation demands that are applicable to this project. If no irrigation demands are included in this project, then no in-ground irrigation systems will be allowed with this project.
        3. Average Day Demand (gpm): Provide the calculated average day demand using the values associated with Flow Demands Table based on the number of units, flow rate and flow duration for each development type for master planning purposes and

residential developments. For site specific site projects, the demand shall be calculated based on the International Plumbing Code (IPC) for fixture counts and flow values. The IPC flow value, which is a peaked demand, shall be divided by a factor of 4 for the Average Day Demand.

4. Maximum Day Demand (gpm): Provide the calculated maximum day demand based on the average day demand with a peaking factor of no less than 1.7. Different peaking factors must be supported with documentation and will be subjected to VDH approvals.
5. Peak Hour Demand (gpm): Provide the calculated peak hour demand based on the average day demand with a peaking factor of no less than 4.0. Different peaking factors must be supported with documentation and will be subjected to VDH approvals.

c. Hydraulic Analysis: Provide the combined volume of the peak hour demand plus the irrigation demand and at what minimum residual pressure as supported by the hydraulic model.

4. Provide the Fire Hydrant(s) Flow Information as follows:
   a. Provide the actual fire hydrant flow test information and attach a copy to the hydraulic analysis. Information to be provided is the fire hydrant number or address, static pressure (psi), residual pressure (psi), pitot pressure (psi), residual flow (gpm) and the estimated flow at 20-psi and the date the fire hydrant flow test was performed.
   b. Provide the fire flow volume required for this project as stipulated in Section 2.11. Deviations from the Town of Kilmarnock required fire flow volumes must be approved in writing by the Kilmarnock Fire Department and the supporting documentation attached.
   c. Hydraulic Analysis: Provide the volume (gpm) of the total fire flow plus maximum day demand plus any applicable irrigation demands and the minimum pressure in psi.
   d. Number of Existing Fire Hydrants: Provide the number of existing fire hydrants used to support this project.
   e. Number of Proposed Fire Hydrants: Provide the number of proposed fire hydrants to be added to support this project.

f. This sheet will be sent by the Town of Kilmarnock to the Kilmarnock Fire Department for their approval. The Fire Department approval will be required as a component to the Town approval of this Water Data Sheet.

5. Provide the Water Distribution Information as follows:
   a. Water Distribution Piping: Provide the diameter (inches), length (feet) and pipe materials (DI, PVC, etc) for the water distribution system piping for this project. The length of pipe must correspond to the pipe within proposed Town easements or pipe within public right-of-ways. If multiple phases or sections of a project are anticipated, include only the piping proposed on the phased site plan.
   b. Water Meter Assemblies: Provide the size (inches) and the number of each meter size for the water distribution system submitted. Water meter sizing for commercial developments shall be calculated using the International Plumbing Code as adopted and amended by the Uniform Statewide Building Code (latest edition) for fixture counts and flow values and AWWA Manual - M22 for water meter size based on the calculated flow rates. Provide a copy of the water meter sizing calculations with this analysis. Also provide calculations for justification of irrigation meters if a separate irrigation meter is proposed. Detector Check Valve water meters shall be listed individually. If multiple phases or sections of a project are anticipated, include only those water meters proposed on the phased site plan.
   c. The use of multiple meters in lieu of a single, larger meter, is prohibited unless as authorized by the Town of Kilmarnock.
   d. The water service line must be represented by the meter size.
   e. Submit calculations which verify the existing or proposed water service line velocities do not exceed 5 feet per second based on the peak hour demand.
   f. Casing Pipe: Provide the casing pipe diameter (inches) and length (feet).

WATER DATA SHEET

Date:_____ Revised: _____

I. GENERAL INFORMATION:

a. Project Name: _____

b. Project Address: _____

c. Developer: _____

d. Submitted By: _____

e. Contact Person: _____

f. Address: _____

_____

g. Phone: _____ Fax: _____ Email: _____

II. DESIGN INFORMATION:

a. Source of Water: _____

b. Flow Information:

Type of Development	Number of Units	Flow (GPD/Unit)	Flow Duration (Hr)	Total Flow (GPD)
Totals				

Type of Development	Irrigation Demand (gpm)	Average Day Demand (gpm)	Maximum Day Demand (gpm)	Peak Hour Demand (gpm)
Totals				

c. Hydraulic Analysis: Peak Hour Demand (gpm) + Irrigation Demand (gpm):
_____ @ _____psi > 40 psi (Node _____)
(Attach a hydraulic analysis that supports the above flow and pressure results)

WATER DATA SHEET (continued)

Date: _____ Revised: _____

Project Name: _____

Project Address: _____

III. **FIRE FLOW INFORMATION:**

a. Actual Fire Flow Test Information: *(Attach a copy of fire flow test with this form.)*

Date Performed: _____ Nozzle Size: 2-1/2 inch

Hyd. No. _____ Static _____ psi Residual _____ psi

Hyd. No. _____ Pitot _____ psi Flow _____ gpm

Hyd. No. _____ Pitot _____ psi Flow _____ gpm

Hyd. No. _____ Pitot _____ psi Flow _____ gpm

Total Residual Flow _____ gpm

Calculated Flow @ 20 psi _____ gpm

b. Fire flow to support this project per Town Standards Section 2.11: _____ gpm @ 20 psi

c. Fire flow to support this project per Kilmarnock Fire Department (provide supporting documentation if different from the Town fire flow standards above) _____ gpm @ 20 psi

d. Hydraulic Analysis: Fire Flow + Maximum Day Demand + any applicable irrigation demands:

_____ gpm @ _____ psi. > 20 psi (Node_____)
(Attach a hydraulic analysis that supports the above flow and pressure results)

e. Number of Existing fire hydrants: _____

f. Number of Proposed fire hydrants: _____

NOTE: A maximum single flow from any fire hydrant shall not exceed 1000 gpm

Fire Department Approval (Town use only):

Approved by: _____ Date: _____

WATER DATA SHEET (continued)

IV. WATER DISTRIBUTION INFORMATION:

a. Water Distribution Piping (Include Fire Hydrant piping, exclude service lines smaller than 4-inch diameter):

Pipe Diameter (Inches)	Pipe Length (Feet)	Material Type (DI, PVC, etc)
Totals		

b. Water Meter Assemblies:

Water Meter Size (Inches)	Quantity

Note: Water meter sizing for commercial site plans shall be calculated using the International Plumbing Code as adopted and amended by the Uniform Statewide Building Code (latest edition) for fixture counts and flow values and the AWWA Manual – M22 for water meter size based on the calculated flow rates. Meter sizing shall be based on not exceeding 80% meter capacity unless approved otherwise by the Town of Kilmarnock. Provide a copy of the water meter sizing calculations with this form. Submit calculations which verify the existing or proposed water service line velocities do not exceed 5 feet per second based on the peak hour demand.

Casing Pipe:

Diameter _____ (Inches), Length _____ (Feet)

Diameter _____ (Inches), Length _____ (Feet)

B. Sanitary Sewer System Data Sheet: Provide a completed sanitary sewer data sheet with all sanitary sewer system projects. The Sanitary Sewer System Data Sheet shall be completed as follows:

1. Date: Provide the date the Sanitary Sewer System Data Sheet was completed. If revisions are necessary, add each revision date.
2. Provide the following information under General Information:
    a. Provide the project name.
    b. Provide the project address: Provide the address if available or a description of the location of the project.
    c. Developer: Provide the firm name of the responsible party for the development.
    d. Submitted By: Provide the name of the firm submitting this project for review.
    e. Contact Name: Provide the name of the contact person the Town may contact to address questions concerning the application.
    f. Address: Provide the address of the contact person.
    g. Provide the phone and fax numbers and the e-mail address of the contact person for this application.
3. Provide the following information requested under Design Information as follows:
    a. Sanitary Sewer System: Provide the name of the collection basin or receiving pump station.
    b. Design Population: Provide the breakdown of the proposed development such as 100-single-family homes and/or 10,000-gross square feet Office Building, etc. This item and flow duration shall reflect the type of development listed in the Flow Demands Table.
    c. Sanitary Sewer System Piping: Provide the diameter (inches), length (feet) and pipe materials (DI, PVC, HDPE, etc.) for the sanitary sewer gravity and force main system piping for the development. The length of pipe must correspond to the pipe within proposed Town easements or pipe in public rights-of-way. If multiple phases or sections of a project are anticipated, include only the piping proposed on the phased site plan.
    d. Sanitary Sewer Manholes: Provide number of standard manholes, number of 60-inch diameter manholes, and their respective average depths.

e. Casing Pipe: Provide the casing pipe diameter (inches) and length (feet).

SANITARY SEWER SYSTEM DATA SHEET

Date: _____ Revised: _____

I. GENERAL INFORMATION:

a. Project Name:

b. Project Address: _____

c. Developer: _____

d. Submitted By: _____

e. Contact Person: _____

f. Address:

g. Phone: _____ Fax: _____ Email:

II. DESIGN INFORMATION:

A. Sanitary Sewer System: _____

B. Design Population: (attach chart if additional space is required)

Type of Development	Number of Units	Flow (GPD/Unit)	Flow Duration (Hr)	Total Average Flow (GPD)	Total Peak Flow (GPM)
Totals					

C. Sanitary Sewer System Piping: (include 6-inch sewer laterals)

Pipe Diameter (Inches)	Piping System (Gravity or Force Main)	Length (Feet)	Material (DI, PVC, etc)

D. Sanitary Sewer Manholes:

Standard Manholes: _____, Average Depth: _____

60-inch Manholes: _____, Average Depth: _____

E. Casing Pipe:

Diameter _____(inches), Length: _____ (feet)

Table 1: Flow Demands

Type of Development	Contributing Design Units	Flow or Demand (GPD/Unit)	Flow or Demand Duration (hours)	Sewer Flow Peaking Factor	Water Demand Peaking Factor
Dwellings	Per Person	100	24	2.5	(6)
Trailer Courts, Apartments, Condos, Townhomes & Timeshares	Per Person	100	24	2.5	(6)
Schools	Per Person	10	8	3	(6)
Boarding Schools	Per Person	75	16	3	(6)
Hotels & Motels	Per Room	130	24	3	(6)
Restaurants (including fast food)	Per Seat	30	16	3	(6)
Service Stations	Per Gross SF	0.4	16	3	(6)
Shopping Centers	Per Gross SF	0.2	12	3	(6)
Hospitals	Per Bed	300	24	3	(6)
Nursing Home/Assisted Living	Per Bed	160	24	3	(6)
Doctor's Office in Medical Center	Per Gross SF	0.25	12	3	(6)
Laundromats	Per Machine	500	16	3	(6)
Community Colleges	Per Student and Faculty	10	12	3	(6)
Theaters (auditorium type)	Per seat	2.5	12	3	(6)
Picnic Areas	Per Person	5	12	3	(6)
Camps, Resort day & Night with Limited Plumbing	Per Site	50	24	3	(6)
Luxury Camps With Flush Toilets	Per Site	100	24	3	(6)

Type of Development	Contributing Design Units	Flow or Demand (GPD/Unit)	Flow or Demand Duration (hours)	Sewer Flow Peaking Factor	Water Demand Peaking Factor
Warehouse	Per Gross SF	0.05	24	3	(6)
Convenience Store	Per Gross SF	0.3	24	3	(6)
Office Building	Per Gross SF	0.1	12	3	(6)
Fitness Center	Per Gross SF	0.1	16	3	(6)
Religious Assembly	Per Seat in Main Assembly Room	2.5	6	3	(6)
Heavy Industrial	Per Gross SF	0.35(1)	16	3	(6)
Light Industrial	Per Gross SF	0.10(1)	16	3	(6)

Flow Demand/Projection Notes:

(1) The stated flow per day per unit is provided as a guide and should only be used if known data for similar heavy or light industrial facilities is not available.

(2) For undeveloped property zoned other than residential, average daily flows may be projected at a rate of 1,000 gpd per acre. Consideration should be given to designated wetlands and Chesapeake Bay Preservation Act Resource Protection Areas (CBPA RPA) which should be excluded from the gross acreage. A peaking factor of 3 shall be used.

(3) For undeveloped property zoned residential, average daily flows may be projected at a rate of 100 gpd per person based on the zoning density. A peaking factor of 2.5 shall be used.

(4) Flow duration should be taken into account for design of onsite infrastructure and when discharging into publicly owned force mains, but need not be considered for downstream publicly owned gravity collection systems. Additionally, the SCAT Regulations require a peaking factor of 4 be applied to the average daily flow when designing laterals and sub-mains. For example, in designing an on-site sanitary sewer lateral or an on-site private pump station for a shopping center that has a gross square footage of 7,500 SF, the flow duration should be applied as follows:

7,500 SF x0.20gpd/SF = 1,500gpd
1,500 gpd/ (12 hour duration x 60 min/hr) = 2.08 gpm
2.08 gpm x 4 (peak factor per SCAT regulations) = 8.32 gpm

(5) Sound engineering judgment must be used in all application of these flow projection guidelines.

(6) Water Demand Peaking Factors shall be as defined in Section 2.10 for Average Day, Maximum Day (1.7 x Average Day) and Peak hour Demands (4 x Average Day).

(7) For all undeveloped property, water demands shall be based on the number of residential units and/or commercial square footage anticipated for the development either by current zoning or where limited by Proffers. Peaking factors shall be as defined in Section 2.10.

2.11 Fire Flow Requirements

Fire flow demands are specified by the Town of Kilmarnock Fire Department and are based on the designated zoning, use, and specific type of construction. The zoning categories are:

A. Residential: To include, but not limited to, Single-family, Manufactured Homes, Apartments, Townhouses, Condominiums, Motels, etc.
B. Commercial: To include, but not limited to, Offices, Small Businesses, Hotels, Shopping Centers, Food Markets, Small Buildings, Churches, etc.
C. Industrial: To include, but not limited to, Plants, Factories, Larger Buildings, Industrial Facilities, etc.

The fire demand ranges from 1,000 gpm to 4,500 gpm. The following table shows the guidelines for specified fire demands based on project type. The maximum flow allowed for a single fire hydrant is 1,000 gpm. If the project has a required demand greater than 1,000 gpm, then additional hydrants must be included for the project to meet the specified demand. Each project's fire flow requirements shall be specified by the Fire Chief for the Town of Kilmarnock Fire Department. Available fire flows for existing fire hydrants shall be verified by a fire hydrant flow test performed by the Town and/or the Town of Kilmarnock Fire Department.

FIRE FLOW DEMANDS

Single-family		1,000 gpm
Apartments/Townhouses/Condominiums		2,500 gpm
Motels/Hotels/High Rise Apartments		2,500 gpm
Commercial	Light	2,500 gpm
	Heavy	3,500 gpm
Industrial	Light	3,000 gpm
	Heavy	4,500 gpm

2.12 Thrust Restraints

Thrust restraints shall be provided at all pipe fittings, bends, tees, and valves. Thrust restraints shall consist of retainer glands. Manufactured joint restraints may be used, where appropriate, in place of retainer glands.

Manufactured joint restraints shall be supplied by the same manufacturer as the pipe material and shall be subjected to the same submittal and compliance requirements as the approved pipe. Fire hydrant assemblies shall be restrained at least one full joint of pipe in each direction on the mainline.

2.13 Connection to Existing Water and Sanitary Sewer Mains

All connections to existing water systems to include saddles, service lines, tapping sleeves and valves and direct taps, and connections to existing sanitary sewer systems to include saddles, laterals, manhole connections, force main connections, etc., shall be scheduled with the Town of Kilmarnock. The connections shall be made only in the presence of the Town of Kilmarnock. Connections to sewer laterals shall be made to the standpipe, unless approved otherwise by the Town.

All water service connections shall be metered. Private water and sanitary sewer services and plumbing shall conform to the Uniform Statewide Building Code (latest edition).

2.14 Minimum Grades

Sanitary sewers shall have a uniform slope and straight alignment between manholes (unless approved otherwise by the Town), and be designed and constructed to achieve total containment. Minimum grades shall not be less than those required to produce a velocity of approximately two (2) feet per second when the size pipe selected is flowing full and using an "n" value of 0.013 in the Manning Equation. Minimum grades shall be as follows:

Sewer Size (inches)	Minimum Slope (Feet per 100 Feet)
8	0.40
10	0.28
12	0.22

15	0.15
18	0.12
21	0.10
24	0.08
27	0.067
30	0.058
36	0.046

2.15 Maximum Velocity

Generally, the maximum permissible velocity in gravity sewers shall not exceed fifteen (15) feet per second. Where velocities greater than fifteen (15) per feet per second are expected, special provisions shall be made to protect against internal erosion by high velocity. The pipe shall conform to appropriate ASTM or AWWA specifications which provide protection against internal erosion. Drop manholes shall be provided to break steep slopes to limit the velocities in connecting sewer pipes between manholes. Where drop manholes are impractical, the sewer main shall be ductile iron or other abrasion resistant material. Sanitary sewer on 20% slope or greater shall be anchored with concrete anchors in accordance with Section 21.05.03 of the SCAT Regulations. Suggested minimum anchorage is as follows:

A. Not over 36 feet center to center on grades 20 percent and up to 30 percent.

B. Not over 24 feet center to center on grades 30 percent and up to 50 percent.

C. Not over 16 feet center to center on grades 50 percent and over.

2.16 Junctions

At all junctions where a smaller sewer joins a larger one, the invert of the larger sewer shall be lowered to maintain the same energy gradient. This may be accomplished by one of the following methods:

A. Positioning the 0.8 depth point of both sewers at the same elevation, or

B. Positioning the crown of both sewers at the same elevation.

2.17 Manholes

Manholes shall be designed to include the following:

A. Manholes shall be installed at the end of each line of eight (8) inch diameter or greater; at all changes in grade, size, or alignment; at all intersections; and at distances not greater than 400-feet.

B. Manholes for sewers up to 24-inches in diameter shall not be less than 48-inch inside diameter.

C. Manholes for sewers larger than 24-inches in diameter shall not be less than 60-inch inside diameter.

D. Manholes 10 feet and over in depth shall be 60-inch diameter.

E. Manhole top elevations shall be above the 100-year Flood Elevation or shall be sealed with a watertight frame and cover with approved casting or inserts. Ventilation of gravity sewer systems shall be provided where continuous watertight sections greater than 1,000-feet in length are incurred.

F. Minimum elevation difference across manhole from inlet to outlet shall be 0.1 feet.

G. Epoxy manhole coatings shall be provided where pump station force mains or low pressure lines with five (5) or more residential grinder pumps connect to a manhole. A minimum of three (3) manholes and 1200 feet downstream of these force main connections shall be coated. Plans shall clearly designate the manholes requiring coating, the coating manufacturer and minimum Type A coating as defined in the HRPDC standards. The Town of Kilmarnock reserves the right to require additional manholes for epoxy coating where deemed necessary.

H. Interior drop connections shall be constructed when the vertical difference between the invert of the outlet pipe and the invert of the inlet pipe is 24-inches or greater. Where drop connections are required, manholes shall be a minimum of 60-inch. Where the difference in elevation between the incoming sewer and the manhole invert is less than 24-inches, the invert shall be filleted to prevent solids deposition.

2.18 Minimum Sizes

No public sanitary sewer shall be less than 8-inches in diameter, except collector lines serving six (6) connections or fewer on cul-de-sacs. The minimum size for a single lateral connection is 6-inches in diameter. The Town reserves the right to specify the size of any sanitary sewer main or lateral.

2.19 Sewer Pipe Materials

Gravity sewer pipe materials shall conform to the HRPDC Regional Construction Standards, inclusive of Town of Kilmarnock Special Provisions.

2.20 Depth of Sewers

All sewers shall be constructed in such a manner that a minimum of 3-feet of cover is maintained between the top of the pipe and the finished grade elevation. Where conditions dictate that the cover be less than 3-feet, ductile iron pipe will be required, and the installation shall be approved by the Town.

2.21 Surface Water Crossing

Surface water crossings, both over and under water, present special problems and should be discussed with the Town as well as DEQ and/or the Army Corps of Engineers prior to final plan preparation. Water and sanitary sewer mains passing over surface water shall be adequately supported, protected from damage due to freezing, accessible for repair or replacement, and located above the 100 year flood level. Water and sanitary sewer mains passing under surface water shall be of a special type of construction utilizing flexible watertight joints. Also, for pressure pipelines, valves and sample taps shall be located at both ends of the surface water crossing for testing and repairs. The valves shall be easily accessible and not subject to flooding. Sample taps shall also be available at a reasonable distance from each side of the crossing. All surface water crossings shall be approved by DEQ and/or the Army Corps of Engineers prior to construction.

2.22 Pipe Crossing Separation

Pipe separation at crossings between water, sanitary sewer, storm, gas, or other pipe systems shall be 18-inches unless approved by the Town. Where the Town allows less than 18-inches separation, the

pipe crossing shall comply with HRPDC Standard Detail WS_09. Reference the HRPDC Regional Construction Standards, Section 805, for additional requirements regarding separation of water mains and sewers.

2.23 Proximity to Best Management Practices (BMP's)

Unless authorized by the Town, water and sanitary sewer mains, appurtenances and easements shall not be placed within a BMP, stormwater structure, or associated embankment. BMP's or stormwater structures shall not be constructed within existing water or sanitary sewer easements.

2.24 Plan Clarity

Water and sanitary sewer force main appurtenances such as valves, fittings, air release valves, etc., shall be shown in both plan and profile views. Plan of development shall be clear and concise. It is necessary to call the appurtenances out in only one location, with stationing and offset annotated, as long as they are depicted graphically in both. Water and sanitary sewer pipe material (PVC or DIP) shall be clearly identified on the plan and/or profile.

Plan revisions and/or slip-sheeting during the site plan submittal process shall be properly described in the border revision block with date of revision. Any plan revisions made after site plan approval shall also include "clouding" the revision for clarity.

HRPDC references to the applicable standard details shall be provided on the plan, either individually labeled or tabularized. Standard details shall not be provided on the plan unless modified. If modified, the engineer shall clearly identify those modifications on the detail.

2.25 Grease Traps

Grease traps are required for all restaurants or other commercial establishments expected to discharge FOG (fats, oils, and grease) to the wastewater collection system. Grease trap design shall comply with the International Plumbing Code. Provide a tee with a 4-inch vertical standpipe and a cast iron clean-out frame and cover to be used as a sampling station for the proposed grease traps. This sampling station should be located within 5-feet from the grease trap on the effluent side.

2.26 Grinder Pumps

The use of grinder pumps shall be approved by the Town. The grinder pump assembly should be no closer than 10' to any structure and installed in a manner that maintains accessibility for personnel and equipment. The force main should be routed to avoid landscaping, driveways, and other inaccessible areas. The grinder pump shall be placed as close as possible to the connection point of the public system.

2.27 General System Design Considerations

A. Buried ductile iron pipe and fittings shall have mechanical or push-on joints. Above ground ductile iron pipe and fittings shall have flange joints or restrained joint mechanical joints as appropriate and approved by the Town. For flange piping, use of multi-gaskets and spacers are prohibited.

B. Where PVC pipe less than 4-inches in diameter is specified to be used in rights-of-way and where subjected to surface (vehicular) loads, schedule 80 pipe shall be required. On water service lines, PVC schedule 80 pipe may only be used in lieu of copper pipe where the installation exceeds 80-linear feet.

C. Valves shall be installed on all temporary dead-end pressure pipelines, on small branching mains as close as possible to the larger main, and on loop networks. Valves shall also be placed on water mains so that a break or failure will not affect more than 800-linear feet of main. Valves shall be located at the tee for all intersecting water mains and sanitary sewer force mains. Provide at intersecting mains one valve per the number of connecting waterlines (i.e. provide four (4) valves for an intersecting cross fitting).

D. Air release valve assemblies shall be constructed at all high points along pressure pipelines. Where practical, high points shall be eliminated by slight adjustments to the pressure pipeline profile. Blow-off assemblies shall be constructed at all system low points for sediment removal. Locations of manual air release valves and blow-offs shall be shown on the construction plan and profile drawings.

E. Blow-off assemblies shall be constructed at all dead end points along the water mains. Locations for the blow-off assemblies shall be shown on the construction plan and profile drawings.

F. Fire Hydrant Locations: Fire hydrants shall be installed in the public right-of-way or in a Town of Kilmarnock easement. Fire hydrants shall be located in non-traffic areas (i.e., in an island or behind a curb). Fire hydrants shall be installed at an intersection whenever possible. Fire hydrants installed at an intersection shall be located at the curb's point of curvature. All other fire hydrants shall be located in-line with a property line perpendicular to the right-of-way line, whenever possible. In townhouses, condominiums, apartments, commercial and industrial areas, fire hydrants shall be located in a raised island (grass or concrete) when not at an intersection. Each fire hydrant location shall be approved by the Town and the Kilmarnock Fire Department. In addition, fire hydrants shall be located on the following:

   1. On highways divided by a median strip, hydrants shall be located on each side of the right-of-way as per the fire hydrant spacing requirements.

   2. On cul-de-sacs the distance between the last fire hydrant and the end of the cul-de-sac shall not be more than one-half (½) distance specified in the fire hydrant spacing.

   3. The Town of Kilmarnock, in consultation with the Fire Chief, may require that additional fire hydrants be provided on the site at specified locations in order to ensure adequate fire suppression capabilities and to allow the system to be flushed periodically of accumulated sediments.

   4. For developments that are served by independent water production facilities, the water source and facilities shall be constructed to provide adequate fire protection.

G. Fire Hydrant Spacing Requirements: Fire hydrant spacing is specified by the Kilmarnock Fire Department. The hydrant spacing ranges from 400-feet for commercial/industrial areas to 600-feet for single-family residential areas.

H. Sanitary sewer cleanouts shall be placed at the property line or right-of-way line by the contractor, builder or homeowner. Sanitary sewer cleanouts shall not be installed in driveways, sidewalks, or bike paths except when approved by the Town, and will require the frame and cover for heavy loads (HRPDC Regional Construction Standards Detail SS_12). The Engineer shall evaluate this requirement where subdivision lots and/or sites have minimal roadway frontage and cleanout locations will be likely located within driveways, whether or not shown on the plan. In this instance, SS_12 cleanouts shall be clearly specified on the plan. The Town reserves the right to require SS_12 cleanouts be provided at its direction. No cleanout shall have an invert elevation greater than 4.5 feet below grade.

I. New water mains shall be located outside the roadway whenever possible, but still within the VDOT right-of-way.

2.28 Water Meter

Water meters shall be manufactured by Zenner with an Itron encoder connector and shall register in gallons. The Town shall purchase and install meters 1-inch and smaller. The Contractor shall purchase and install meters larger than 1-inch under the supervision of the Town. Meter type/model shall be approved by the Town prior to the Contractor purchasing the water meter. Meters may not be more than two months out of date at the time of installation.

Parameters for designing/installing water meters and service connections shall include the following:

A. Water meter box installation shall maintain a minimum 18-inch horizontal edge-to-edge clearance from driveways and/or drive paths, sidewalks or bike paths, unless approved otherwise by the Town.

B. Water meter relocations shall require a new tap when landscaping or other physical features require relocation of the existing service more than 5-feet.

C. Water service lines shall be perpendicular to the main, except in cul-de-sacs.

2.29 Detector Check Valve

A detector check valve with a backflow prevention device located downstream is required at the following locations:

A. Master meters for entire water systems.

B. Fire services or automatic sprinkler services.

Locations of backflow prevention devices shall be approved and inspected by the Town.

2.30 Backflow Prevention Devices

Approved backflow prevention devices and assemblies are those that meet AWWA standards, and are approved by ASSE and the USC-FCCC (University of Southern California Foundation for Cross Connection Control and Hydraulic Research). Flow orientation, access, and installation of backflow preventers shall be provided in accordance with USC-FCCC guidelines and as specified by the installation instructions of the approved manufacturer. Only testable devices that meet or exceed current and future hazards to the Town's distribution system shall be approved and accepted by the Town. Backflow prevention assemblies shall not be installed in locations subject to flooding such as underground vaults. Protection of backflow preventers shall meet current code requirements and outdoor enclosures for backflow preventers shall comply with ASSE 1060.

2.31 Constructing Water and Sanitary Sewer Pipelines in Fill Areas

When water and sanitary sewer pipelines are proposed to be constructed in fill areas, the design engineer shall include on the plans special construction notes and/or details that will address suitability of fill material and compaction requirements to ensure no settlement below or above the utility lines and sanitary sewer manhole structures. Compaction tests shall be performed by a qualified testing agency at 100-foot intervals along the pipeline alignment (a minimum of two test locations per fill area) at no more than 5-feet vertical intervals. Compact each layer of backfill material to 95% maximum density in accordance with Virginia Test Method -1 (VTM-1) from existing grade to minimum 1-foot above the utility. Test results, certified by a registered professional engineer licensed in the Commonwealth of Virginia, shall be forwarded to the Town prior to final acceptance.

The water or sanitary force main pipe lines installed in fill areas shall be restrained joint ductile iron pipe extending at least 40-feet on either side of the fill into native ground.

2.32 Subsurface Utility Locating

Test holes shall be performed and information incorporated in the design for all existing pipe crossings where conflicts with proposed utilities may occur. As part of the site plan process, the developer/engineer shall provide test hole data sheets to the Town which substantiate the horizontal and vertical location of each crossing/connection.

2.33 Master Utility Plan Development

Where required by the Town of Kilmarnock, Master Utility Plans with associated hydraulic modeling and calculations shall be submitted prior to site plan submittal. Generally, Master Utility Plans shall be submitted for large scale developments, projects being developed in phases, and developments requiring multiple water and or sewer pump station facilities.

2.34 Removal and Abandonment of Services

When lot lines are extinguished or moved, or development plans change after water and sanitary sewer services have been installed, it is necessary to remove and abandon services so that only one of each is provided for a given lot. Costs associated with the abandonment of services shall be borne by the property owner or developer desiring to extinguish or modify lot lines. Following are the acceptable methods of removing and abandoning these services:

A. The water service pipe shall be disconnected from the water main which shall involve removal of the service saddle and installing a full circle stainless steel repair band, with all stainless steel hardware, on the existing water main. The work shall be inspected by the Town.

B. Sewer lateral abandonment is to be done by cutting the lateral 2 inches from the factory wye on the service connection at the main and installing a cap on the lateral stub. A minimum of a one foot section of lateral is to be removed between the cap and the remainder of the lateral to be abandoned. The low end of the lateral to be abandoned shall have a grout plug installed. Alternatively, the sewer main may be lined with a 2 foot long cured-in-place liner centered on

the service connection to the main in order to seal off the lateral to be abandoned from the main. The standpipe end of the lateral to be abandoned shall be cut down to 2 feet below grade and capped after filling the abandoned lateral with flowable fill. The work shall be inspected by the Town.

C. The Town requires sewer lateral abandonment at manholes to be done by filling a 12-inch section of the lateral to be abandoned with a grout plug from inside the manhole. The standpipe end of the lateral to be abandoned shall be cut down to 2 feet below grade and capped after filling the abandoned lateral with flowable fill. The work shall be inspected by the Town.

D. Abandonment of grinder pump force mains connected to public force mains shall require removal of the grinder pump force main and installation of a full circle stainless steel repair band, with all stainless steel hardware, on the public force main where the force main to be abandoned had been connected. The abandoned force main shall be filled with flowable fill. The work shall be inspected by the Town.

2.35 Street Trees in Right of Ways

When landscaping requirements dictate that street trees are to be planted within rights-of-way where water and sewer utilities are proposed or are existing, the following shall apply:

A. Trees shall be selected that have root systems with minor invasive qualities.

B. The trees shall not be planted closer than 5 feet from the outside edge of water mains, water meters, water service pipes, fire hydrants, valves, sewer gravity mains, sewer force mains, sewer cleanouts, and sewer laterals.

3.0 PROJECT CLOSEOUT

3.1 Record Drawings

Record drawings are required at the completion of all water and sanitary sewer system projects constructed for, or dedicated to, the Town of Kilmarnock and shall include the following:

A. **Record Drawings for Town of Kilmarnock CIP Projects and Development Projects**: Prior to acceptance of the water and sanitary sewer system improvements by the Town of Kilmarnock, two (2) complete sets of preliminary record drawings for the project shall be submitted to the Town for review and approval. The record drawings shall show the location of all easements, above ground appurtenances, service connections, water, sanitary sewer, and storm sewer system components (including type, material, and material class of pipe), appurtenances, and all other data necessary to operate, maintain, and locate the water, sanitary sewer, and storm sewer system improvements. All fire hydrants, water main valves, tees, bends, blow-off valves, air release valves, water meter boxes and service lines, manholes, cleanouts and laterals, storm structures, force main valves, bends and fittings, air release valves, offsets, abandoned facilities and repairs shall have dimensions on the drawings to a minimum of two (2) permanent structures, such as property pins, edge of pavement, etc. Record drawings shall include elevations for all sanitary sewer and storm manhole rims, inverts, and cleanouts. All record drawings shall be stamped by a Engineer or Surveyor with a current license in the Commonwealth of Virginia confirming that the water, sanitary sewer, and storm sewer system was installed within plus or minus one (1) foot horizontal dimensions for the locations indicated on the record drawings. Vertical and horizontal survey datum control for record drawings shall comply with Section 1.3 of these Design Standards. Water mains along roadways shall be dimensioned from the edge of pavement to the main every 50 feet. The Town of Kilmarnock reserves the right to require additional dimensioning on the record drawings for areas of long distances between fittings.

B. **Final Inspection Requirements for Development Projects**

1. No final inspection will be scheduled until all property pins are installed, flagged, and staked, installation of all other utilities serving the development (to include Virginia Power, Telephone, Gas, Cable, and others) is complete, and record drawings are submitted. Record drawings shall be submitted in accordance with Section 3.1.A and delivered fifteen (15) days prior to scheduling the final inspection.

2. A letter shall be provided by the Developer/Owner confirming that all utilities (i.e. electric, gas, cable, telephone and others) have been installed. The letter shall include the cost associated with the installation of the water and sanitary sewer system, both on-site and off-site.

3. A copy of the recorded plat and/or related documentation shall be submitted to the Town of Kilmarnock. Easement dedication shall comply with Section 2.6.

4. The Developer/Owner will provide a signed letter by the Engineer or Surveyor of record stating that the construction work was completed according to the approved plans and specifications. This statement will be based upon inspections of the construction, during and after construction.

5. Contractor shall provide personnel responsible for exercising all valves in the presence of the Town during the final inspection walkthrough.

3.2 Warranty (Development Projects)

The Developer/Contractor will be responsible for, and obligated to, correct all deficiencies in construction and installation of the project for one-year from the date of acceptance of the facilities by the Town of Kilmarnock. This will include repairs to any valves, meters, meter boxes, yokes, piping, manholes, manhole frames and covers, cleanouts, cleanout boxes, etc., damaged by subcontractors, builders or others, or to correct defects in installation or materials.

In addition to the above stated one (1) year warranty, the developer or contractor shall for all equipment installed for which the manufacturer thereof has a standard guarantee in excess of the one (1) year, transfer to the Town of Kilmarnock all necessary warranties to properly guarantee such equipment by the manufacturer for the standard term of the manufacturer's guarantee.

3.3 Dedication (Development Projects)

Following verification of the record drawings and completion of the punch list, the developer/owner will formally dedicate the water distribution, sanitary sewer, and storm sewer system, easements, and/or property to the Town of Kilmarnock. Such dedication will be acknowledged in writing by the Town.

Through the Engineer or Surveyor of record for the project submit: one (1) paper copy of the recorded plat for any easements; one (1) paper copy, one (1) reproducible mylar drawing, and one (1) disk with the record drawing information in electronic AutoCAD compatible format. Coordinates in the AutoCAD compatible file shall be Virginia coordinate system in accordance with Section 1.3.

3.4 Water Meter Allowance

No water meter shall be installed in any subdivision or development prior to substantial completion of water and sanitary sewer systems. Substantial completion includes completion of all required tests, except CCTV, and verification from an acceptable laboratory that the water is bacteria free. The Town of Kilmarnock will not accept any utility until final completion requirements of Section 3.1 have been met.

At the time of substantial completion, the Developer/Owner has two options before water meters may be installed in residential developments:

1. Wait until all water and sanitary sewer utilities are fully accepted by the Town. This will require installation of all other utilities (i.e. natural gas, electricity, telephone, TV cable, etc), completion of all deficiencies identified by the Town in pre-final punch list, and submittal and approval of record drawings for the water and sanitary sewer desired for acceptance by the Town.

2. Submit cash deposit or a letter of credit (the "deposited funds") to the Town that can be used to complete deficiencies not corrected by Developer/Contractor. Entire deposited funds or unused portion will be returned to Developer/Contractor once the Town accepts the utilities. When

requested by Developer, the Town will identify deficiencies in pre-final punch list. If not corrected immediately, a plan for correction must be submitted to the Town within 30 days of receipt of notice of deficiencies. All deficiencies identified must be completed within 60 days of receipt of Notice of Deficiency. If not, the Town will use deposited funds to correct deficiencies. The Town will assess an administrative fee of 25% over costs for managing correction of deficiency. Deposited funds will be $500 per meter multiplied by the total number of meters approved for the site plan and is to be made at the time of substantial completion. There is a $12,000 minimum deposit.

4.0 WATER FACILITIES AND PUMPING STATIONS

4.1 Wells, Storage Tanks and Water Production Facilities

Wells, storage tanks, water production and pumping stations shall meet or exceed all applicable requirements of the Commonwealth of Virginia Department of Health, the American Water Works Association, and the National Fire Protection Association; and shall be submitted to the Town of Kilmarnock for review and approval. All water production facilities shall be dedicated to the Town and shall be equipped with an approved alarm system, standby power supply and disinfection facilities.

Water production facilities shall be designed and constructed in accordance with the latest Town constructed facility in regard to operation, controls, SCADA (Supervisory Control and Data Acquisition), layout, construction materials, equipment, disinfection and other related appurtenances. The size of storage and production facilities shall be based on the needs of the development and as approved by the Town.

4.2 Wastewater Pumping Stations

A. General Requirements

1. The design of sewage pumping stations and force mains is an engineering matter and is not subject to detailed recommendations or requirements.

2. Sewage pumping stations and force mains are to be provided solely for the conveyance of sanitary wastes. Under no circumstances shall roof, foundation, surface or sub-surface or any other form of storm drainage be allowed to pass through the proposed facility.

3. A detailed engineering report shall be submitted to and approved by the Town prior to design. The report shall fully evaluate the proposed sanitary drainage area and the overall effect upon present and future Town facilities.

4. The design must conform to the minimum standards set forth in the Commonwealth of Virginia Sewage Collection and Treatment Regulations (SCAT Regulations). Town

requirements for specific equipment and submittals will be detailed during engineering review.

5. All sewer pump stations shall be required to be provided with SCADA.

B. Technical Design

1. The sizing and configuration of the pumping station and the sizing of the attendant force main shall be within the parameters set forth in the engineering report. The facilities to be provided shall be based on ultimate flows unless an interim flow design shall have been incorporated in the approved engineering report.

2. Single pit submersible pump stations are the preferred type of pump station in the Town.

3. An ample, all-weather road, including full-thickness paving (with base course), storm drainage and parking, shall be provided for easy access to the pumping station. Pavement design shall be full thickness bituminous pavement unless otherwise specified.

4. The architecture of the pumping station shall be considered. Site grading, seeding or sodding, trees or shrubs shall be provided to present a finished appearance, as approved by the Town, consistent with the zoning and general appearances of the surrounding area. Approved fencing with gates shall be provided as deemed necessary to properly protect the facility. Buildings shall be constructed of “maintenance-free” materials (i.e., vinyl siding, aluminum soffits, brick veneer, etc.). Pre-fabricated concrete utility structures are generally acceptable provided that they otherwise comply with zoning requirements.

5. The Design Engineer shall determine the "Reliability Class" in accordance with the SCAT Regulations and shall comply with the requirements thereof. Each pumping station shall have a permanently installed emergency generator.

6. The Design Engineer shall consider the need for protection of the pumping station and force main against hydrogen sulfide attack and shall provide the proper equipment if such protection is found necessary.

7. The Design Engineer shall consider the need for odor control in the design of the pump station and force main. At a minimum, odor control chemical feed shall be provided at the pump station when odor control facilities are required. The Town may also require the installation of vapor phase odor control at force main discharge points and/or air/vacuum valves on the force main.

8. All motor control and other electrical equipment shall be housed in a weatherproof, above-ground building. Adequate provisions shall be incorporated for the proper ventilation, drainage and flood protection in order to insure maximum reliability, electrical and personnel safety.

9. All pumping station wet wells shall be considered explosion hazardous and conform to the latest edition of the National Electric Code (NFPA No. 70).

10. All pumping stations shall be of sufficient size and contain adequate clearances to provide ample room for maintenance and equipment replacement.

11. Consideration shall be given to the need for a water supply well in locations where a public water supply is not available.

12. Force mains shall have a positive slope from the pumping station to the point of discharge unless unusual conditions make it impractical. Consideration shall be given to extra depth of bury in lieu of combination valves. Every effort shall be expended to maintain the force main below the hydraulic gradient. Where a relief valve is required, a combination valve shall be provided and installed inside a standard manhole with adequate means of drainage.

13. In cases where the hydraulic gradient dips below the force main, a combination valve of sufficient size shall be provided to allow the force main to drain by gravity below that point. For purposes of these specifications, such force mains shall be known as “pressure sewers” and the point of hydraulic grade crossing the force main shall be known as the “high point”. Pressure sewer design is a complex hydraulic problem that must be evaluated carefully by the design engineer. Care shall be taken to ensure that the pressure sewer will flow by

gravity from the high point under all hydraulic conditions or that expansion capacity is provided in the station and/or lines to allow flow under pressurized conditions in the future.

14. All high points in force mains shall have air valves installed. Generally, combination valves should be provided on force mains unless justification can be shown that air relief only or air/vacuum valves should be installed instead.

15. Every effort shall be made to maintain a full force main under operating conditions.

16. Sizing of main shall be such that velocity shall not be below 2 feet per second.

17. All force mains shall be ductile iron or polyvinylchloride (PVC). PVC and HDPE may be used for directional drilling with Town approval. Force mains that may be subjected to sulfide attack shall be PVC or ductile iron with an epoxy lining.

18. Design Engineer shall consider ground conditions in the case of ductile iron and provide suitable cathodic protection where necessary.

19. Steel casing pipe shall have a minimum yield strength of 35,000 p.s.i. and a minimum internal diameter of 4-inch greater the largest external diameter of the carrier pipe. The wall thickness of casing pipe shall be sufficient to resist loads to which it will be subjected, but in no case less than 0.250 inches.

20. All sewer pump stations are to have TVSS (Electrical Surge Suppression) along with lightining protection installed in electrical panels.

21. All Variable Frequency Drives should have proper fan ventilation and temperature control.

22. Where a grinder is required in a wet well, the grinder motor shall be water and explosion proof.

C. Capacity Design

1. Capacity design for the pumping station and force main shall take into consideration such parameters as minimum, average and peak station inflows as well as minimum, average and maximum pumping rates.

2. Pump selection and force main sizing shall be based on a hydraulic analysis of the required flows, pipeline velocities and receiving gravity sewer capacities. Normal operation greater than 100 psi will not be acceptable. Systems with pressures greater than 80 psi must provide surge and hammer protection through cushion swing check valves and/or surge relief valves.

3. Consideration must be given to designs which produce minimum power requirements to accomplish the functions required. If requested, supporting data shall be furnished to the Town. This may require the use of variable frequency drives or reduced voltage starters (a.k.a. soft starts). The Town reserves the right to require such items be incorporated into the design if, in its judgment, such installation shall be beneficial to station operation.

D. Drawings

1. Plans and specifications shall include provisions for excavation, foundation, backfill, dewatering, sheeting and bracing, protection of the public, materials, material testing, details of construction of pump station and appurtenances and other items as may be applicable to the project, all in accordance with good engineering practice. Plans shall include elevations showing site appearance of the station, sections, details, electrical details and a site plan showing existing topographic information such as pavement, storm drains, utilities, trees, shrubbery, property lines, and appropriate elevations as well as new construction including layout dimensions and final elevations.

2. The plans shall be clear and legible. They shall be drawn to a scale that will permit all necessary information to be clearly shown. Plans shall not be larger than 24 inches x 36 inches.

3. Dimensions and relative elevation of structures, finished floor elevations, the location and size of piping, surface water levels, 100-year flood level, and ground elevations shall be shown.

4. Plans submitted for approval shall be accompanied by technical specifications, hydraulic calculations, pump curves, and pump cycle calculations.

5.0 GENERAL NOTES

5.1 General Notes for Water Distribution and Sanitary Sewer Systems

The following notes shall be provided on all Developer constructed water distribution and sanitary sewer system facility construction plans and specifications and compliance is required by the Contractor/Developer:

A. All components of the water distribution and sanitary sewer system shall be installed and tested in accordance with the latest edition of the Town of Kilmarnock Design Standards for Water Distribution and Sanitary Sewer Systems, the HRPDC Regional Construction Standards (latest edition), the Virginia Department of Health Waterworks Regulations, and the Department of Environmental Quality Sewage Collection and Treatment Regulations. The Contractor shall use only new materials, parts, and products on all projects. All materials shall be stored so as to assure the preservation of their quality and fitness for the work. A copy of the Town of Kilmarnock Design Standards and HRPDC Regional Construction Standards must be kept on-site by the contractor during time of installing, testing, and conveying facilities to the Town.

B. The Contractor/Developer shall acquire a Certificate to Construct Water and Sanitary Sewer Facilities prior to commencement of construction of any water or sanitary sewer facilities.

C. A preconstruction meeting shall be held between the Town, the Developer, the Contractor including relevant subcontractor(s), and the Project Engineer. It shall be the responsibility of the Contractor to schedule this meeting with the Town and coordinate with the other attendees.

D. The Developer's representative shall submit shop drawings for all materials and receive Town approval prior to commencement of construction. All materials ordered and installed prior to the Town's review and acceptance will be at the Contractor's/Developer's risk.

E. Pipe lines and services shall be installed after grading to within 6-inches of final grade and prior to placement of base material.

F. All water mains shall be fully flushed, pressure tested, and disinfected and satisfactory bacteriological samples obtained, in accordance with the Town of Kilmarnock Design Standards. Flushing of water mains shall be scheduled with the Town Inspector a minimum of 3 business days prior to the flushing. Contractor shall provide the required duration and volume to the Inspector. Flushing will be scheduled Tuesday through Thursday, unless authorized otherwise by the Town, and will be on a first come-first serve basis.

G. Routine periodic inspections during construction will be provided by the Town. These inspections do not relieve the Developer/Contractor/Owner from his obligation and responsibility for constructing a water distribution and sanitary sewer system in strict accordance with the Town of Kilmarnock Design Standards and HRPDC Regional Construction Standards.

H. Any field modifications or changes to the approved plans shall be verified and checked by the Engineer of Record and approved by the Town prior to any field modifications or changes. All approved changes and field modifications shall be accurately indicated on the record drawings.

I. All lots shall be provided with water service and sanitary sewer connections. The connections shall be extended from the main to the property line or easement line, and shall terminate with a yoke in a meter box, or at the clean out, set at final finished grade. The Town shall purchase and install meters 1-inch and smaller. The Contractor shall purchase and install meters larger than 1-inch under the supervision of the Town. Meter type/model shall be approved by the Town prior to the Contractor purchasing the water meter. Meters may not be more than two months out of date at the time of installation.

J. Any required easements, permits and approvals shall be acquired by the Developer prior to commencement of water main and/or sanitary sewer construction.

K. The Contractor shall comply with all applicable laws, ordinances, rules, regulations and orders of any public body having jurisdiction. The Contractor shall erect and maintain, as required by the conditions and progress of the work, all necessary safeguards for safety and protection. The Contractor shall also notify "Miss Utility" at 1-800-552-7001 or 811 prior to performing any underground excavation.

L. Water meter box installation shall maintain a minimum 18-inch horizontal edge-to-edge clearance from driveways and/or drive paths, sidewalks, bike paths, curbing and adjacent water meter boxes.

M. Only Town of Kilmarnock personnel are authorized to operate valves on existing Town water mains and sanitary force mains. Once a system has been hydraulically energized, the Town will be responsible for operating the valves. The Contractor shall contact the Town of Kilmarnock Public Works at 804-435-1552 ext. 21 if there is an emergency or need to open/close a valve.

N. Any existing unused well(s) shall be abandoned in accordance with State Private Well Regulations.

O. Bedding of Town utilities shall be in accordance with HRPDC Detail EW_01, Type III for rigid pipe and Type IV for PVC pipe.

P. No trees, shrubs, structures, fences, irrigation mains, invisible pet fences or other obstacles shall be placed within an easement which would render the easement inaccessible by equipment. Shrubs shall be a minimum of 5 feet, and trees a minimum of 10 feet, from the center of water and sanitary sewer pipelines.

Q. All pressure pipelines shall have joint restraint. Fire hydrants shall be restrained at least one full joint of pipe in each direction on the mainline.

R. Proposed water and sanitary sewer systems shall maintain a minimum horizontal separation of 5-feet from other utilities and structures, including but not limited to storm sewers, street lights, etc. Water and sanitary sewer facilities shall have a minimum 10-foot horizontal edge-to-edge separation.

S. Any proposed backflow prevention device and/or grease trap must be inspected by the Town of Kilmarnock.

T. The Contractor/Developer shall acquire a Certificate to Construct Water and Sanitary Sewer Facilities prior to commencement of construction of any water or sanitary sewer facilities.

U. Plumbing inside of proposed buildings must be inspected by the Town for potential cross connections. Any cross connections must be protected by the appropriate backflow prevention device(s).

V. Easements denoted as "Town of Kilmarnock Utility Easements" are for the exclusive use of the Town and the property owner. Other utility service providers desiring to use these easements with the exception of perpendicular utility crossings must obtain authorization for access and use from the Town and the property owner. Additionally, the Town shall not be held responsible for any damage to improvements within this easement, from any cause.

W. The Town of Kilmarnock shall not be held responsible for any pavement settlement due to pipe bedding, backfilling, backfill materials or compaction for water or sanitary sewer facilities for this project.

X. Fire hydrants to be installed within existing or proposed VDOT rights-of-way shall be located in accordance with VDOT Requirements.

Y. Privately owned utilities, (e.g., water and sewer lines and private fire service mains), shown on this plan are regulated by the Virginia Uniform Statewide Building Code. These privately owned utilities must comply fully with the International Plumbing Code, the National Fire Protection Association Standard 24, and the Virginia Statewide Fire Prevention Code. Contractors working from this site plan are cautioned not to install or conceal privately owned site utilities without first obtaining the required permits and inspections.

Z. Sanitary sewer laterals shall not connect to the mainline within 5-feet of a manhole. Laterals upstream and within 5-feet of the manhole shall connect directly into the manhole where necessary.

AA. All private Underground Fuel Storage tanks shall have leak monitors and secondary containment in accordance with Virginia State Department of Environmental Quality requirements.

5.2 General Notes for Water Production Facilities

The following notes are a supplement to the Town of Kilmarnock General Notes for Water Distribution Systems and shall be provided on all Developer constructed water production facility construction plans and specifications and compliance is required by the Contractor/Developer:

A. All well facilities shall be designed by a Commonwealth of Virginia Licensed Professional Engineer (Consultant), and the design, construction and installation shall be in accordance with the following:

   1. Commonwealth of Virginia Department of Health (VDH) Waterworks Regulations.

   2. Town of Kilmarnock Design Standards.

B. Construction plans shall be submitted through the Town for review and approval. The Developer/Contractor/Consultant shall supply minimum three (3) sets of construction plans and specifications detailing all phases of the well and water production construction including testing, materials, shop drawing submittals, painting and installation. These shall be submitted to, and approved by, the Town prior to commencement of construction.

C. The Developer/Contractor/Consultant shall be responsible for assuring that all work is performed in accordance with the approved plans and specifications. Any deviation from the approved plans and specifications shall be approved by the Town and VDH prior to performing such work.

D. Drilling fluid shall be sodium bentonite drilling clay commercially processed to meet or surpass the viscosity specifications in API "Standard 13-A for Drilling Fluid Materials", or approved equal.

E. Organic drilling muds shall not be used in any phase of drilling or construction. Lime shall not be used to thicken the drilling mud.

F. Drilling fluid mix water shall be from a potable source and initially Chlorinated to 50 mg/l free Chlorine concentration. Periodic addition will be required to maintain a 10 mg/l free Chlorine residual. All drilling fluids additives shall comply with industry standards and practices.

G. During drilling and well construction, a "Driller's Log" shall be prepared and submitted to the Town upon completion of the drilling.

H. Upon completion of the geophysical logging, recommendations shall be submitted to The Town for approval prior to the installation of the well casing and screens.

I. Grout of the surface casing shall be placed under pressure using an external tremie pipe in one continuous operation to a minimum depth of 100-feet.

J. Grouting operations shall be performed in the presence of the Town's Inspector and a VDH representative. Both agencies shall be notified a minimum of 48-hours in advance of the grouting operations.

K. Grout mixtures shall be approved by VDH and the Town prior to installation. Grout shall be firmly set (minimum of 72-hours) prior to proceeding with the well construction.

L. The well casing shall be stainless steel 316L. PVC well casing may be used with the prior approval of the Town and VDH as to material specifications and construction installation methods.

M. The screen shall be stainless steel 316L continuous slot wire wound screen, reinforced with longitudinal bars; the bars having a cross section that will form an opening between each adjacent coil of wire.

N. Prior to installation, the Consultant/Driller's recommended screen slot and gravel size along with supporting calculations shall be submitted to the Town for approval.

O. Prior to gravel packing, the hole shall be conditioned to ensure stability and to provide a clear filter cake. The gravel shall be disinfected by adding sufficient Chlorine to the placement fluid to produce a minimum Chlorine residual of 400 mg/l.

P. The well shall be developed in such a way as to remove the fines and sort the gravel pack. Records of the development steps and the chemicals used shall be submitted to the Town.

Q. A well plumbness and alignment, 48-hour pump test and recovery test shall be performed and the results documented and submitted to the Town.

R. Water samples shall be collected and analyzed for all parameters, required by VDH, including VOC's.

S. Final pump size and setting recommendations, along with test results and supporting documentation, shall be submitted to the Town for review and approval prior to installation.

T. The well shall be disinfected in accordance with VDH requirements.

U. The Developer shall obtain construction and operational permits from VDH and DEQ.

V. The Developer shall obtain all easements, approvals and regulatory permits.

W. The Developer shall acquire and provide 3-phase electrical service for the facility.

X. The water production facilities shall be equipped with a standby generator. Generator shall be rated for continuous duty and provide all power to operate the complete facility and systems.

Y. The water production facility shall be equipped with a Town compatible SCADA system.

Z. Shop drawings and operational, maintenance and repair manuals shall be provided to The Town, along with a one-year warranty on all facility components and workmanship.

AA. Record drawings shall be submitted and the facilities shall be dedicated as a public water supply prior to acceptance by the Town. All required easements shall be dedicated to the Town with recorded documents submitted to the Town.

BB. The facility shall be fenced.

APPENDIX A

SPECIAL PROVISIONS

Town of Kilmarnock Special Provisions to the
HRPDC Regional Construction Standards (6th Edition)
Appendix A

Item	Title	Page	Subsection	Modification
1	Products and Materials	200-18	V.5.10.E.1.a. Gate Valves	Delete the second paragraph and replace with the following: "Gate valves shall be manufactured by Mueller Company 2360 Series or Kennedy Valve Company Kenseal II, or approved equal.
2	Products and Materials	200-19	V.5.10.E.1.e. Valve Operators	Revise the first sentence to read as follows: "Buried valves shall have a two-inch square operating nut conforming to AWWA C509, and shall open counter clockwise."
3	Products and Materials	200-19	V.510.E.2.a. Ball Valves	Modify last sentence to the following: Valves shall be manufactured by the Ford Meter Box Company B11.
4	Products and Materials	200-23	V.5.10.H.7. Tapping Valves and Sleeves	Delete first sentence and replace with the following: 7. "Tapping sleeves shall be constructed of all stainless steel conforming to the following requirements:"
5	Products and Materials	200-24	V.5.10.I.3.c. Sleeves and Couplings	Add Ford Meter Box Company, Inc., Ultra-Flex FC2W and Mueller Company, AquaGrip as approved products.
6	Products and Materials	200-41	V.5.19.E.1.a. Gate Valves	Delete the second paragraph and replace with the following: Gate valves shall be manufactured by Mueller Company 2360 Series or Kennedy Valve Company Kenseal II, or approved equal."

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Item	Title	Page	Subsection	Modification
7	Products and Materials	200-42	V.2.19.E.2.a Ball Valves	Modify last sentence to the following: Valves shall be manufactured by the Ford Meter Box Company B11.
8	Products and Materials	200-44	V.5.19.G.7. Fire Hydrants	Add note 7 as follows: 7. "The upper standpipe shall be painted OSHA Yellow and the nozzle caps and dome shall be painted green."
9	Products and Materials	200-45	V.5.19.J . Water Meters	Add: Meter setters shall have cartridge style dual angle check valves.
10	Products and Materials	200-47	V.5.19.L.4. Tapping Valves and Sleeves	Delete first paragraph and replace with the following: 4. "Tapping sleeves shall be constructed of all stainless steel conforming to the following requirements:"
11	Products and Materials	200-48	V.5.19.M.1.f. Sleeves and Couplings	Add The Ford Meter Box Company, Inc., Ultra-Flex FC2W, Romac Alpha, and Mueller Company, AquaGrip approved products.
12	Products and Materials	200-48	V.5.19.M.2.c. Sleeves and Couplings	Add the following sentence: All brass fittings and couplings shall be manufactured by Ford Meter Box Company.

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Item	Title	Page	Subsection	Modification
13	Products and Materials	200-48	V.5.20.A. Miscellaneous Items	Add the following sentence: Tracer wire shall come to the surface at a minimum of every 200 feet.
14	Water Distribution	801-6	2.2.F. Tracer Wire	Revise the second sentence of paragraph to the following: "The wire shall terminate above ground at every valve box, tracer wire box, and air vent assembly, but shall come to the surface at a minimum of every 200 feet."
15	Water Distribution	801-8	II.2.7.A. Connections to Existing Mains	1. Add the following after the first sentence: "The Work Plan shall be detailed including valve operation, installation procedures, and testing processes. An anticipated timeline of the shutdown shall also be provided by the Contractor." 2. Add the following after the last sentence: "Work can be scheduled between 7 a.m. Monday to 4 p.m. Friday. No work shall be scheduled/performed after 4 p.m. Friday, on Saturday, Sunday or on holidays. It is preferred that Work be performed during normal business hours. However, avoiding customer shutdowns and high demand periods may require off hours Work."

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Item	Title	Page	Subsection	Modification
16	Water Distribution	801-19	II.2.8.D.5. Disinfection Preliminary Flushing	Option A: Delete 16-hours and replace with 24-hours. Option B: Delete in its entirety.
17	Sanitary Force Main Systems	803-6	2.2.F. Tracer Wire	Revise the second sentence of paragraph to the following: "The wire shall terminate above ground at every valve box, tracer wire box, and air vent assembly, but shall come to the surface at a minimum of every 200 feet."
18	Sanitary Force Main Systems	803-7	II.2.6.B. Connections to Existing Mains	1. Add the following after the first sentence: "The Work Plan shall be detailed including any pump station shutdowns, pump and hauls, valve operation, installation procedures and testing processes. An anticipated timeline of the shutdown shall also be provided by the Contractor." 2. Add the following after the last sentence: "Work can be scheduled between 7 a.m. Monday to 4 p.m. Friday. No work shall be scheduled/performed after 4 p.m. Friday, on Saturday, Sunday or on holidays. It is preferred that Work be performed during normal business hours.

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Item	Title	Page	Subsection	Modification
19	Sewer Line Cleaning	810-4	II.2.2.A.4. Cleaning Operations	Revise the first sentence to read as follows: "Existing flows shall not be interrupted for periods longer than necessary, but in no case shall back-ups into homes or sewer overflows be permitted."
20	Standard Details	SS_11	Sanitary Service Lateral Clean Out Frame and Cover	Revise Note 1 to the following: 1. Clean out frame & cover shall be Capital Foundry model # NPN-CW-18.
21	Standard Details	WD_06, WD_07, WD_08	Fire Hydrant Setting	Revise to add the following note: Weepholes shall be plugged when the fire hydrant is located in areas of high groundwater.