PART I

DESIGN STANDARDS AND PROCEDURES
FOR
WATER DISTRIBUTION AND SANITARY SEWER SYSTEMS
CHESTERFIELD COUNTY, VIRGINIA

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GENERAL

These design guidelines have been prepared to assist engineers preparing plans for water and sanitary sewer projects in Chesterfield County, Virginia. These guidelines are for use by experienced design professionals. Variations will be permitted based solely on sound engineering practice and will be reviewed and approved by the Department of Public Utilities on an individual basis. Such variations must be requested in writing along with sufficient documentation supporting the request.

Public sanitary sewers, private sewer 8" and larger (with manholes and service laterals), and public water mains shall be designed by a Professional Engineer licensed in accordance with the requirements of the Code of Virginia or a Professional Surveyor with a Class B license issued by the State of Virginia. Designs shall be in accordance with the Latest Edition of Waterworks Regulations and Sewerage Regulations, Virginia Department of Health, Commonwealth of Virginia and any other local, State or Federal agencies having jurisdiction. The engineer shall also comply with the requirements of the County's subdivision and utilities ordinances as they pertain to water and sewer systems. It is the responsibility of the Engineer to inform developers of the contents as set forth in the applicable local ordinances as it relates to the project under review and consideration by the Department of Public Utilities.

Prior to construction of public water and/or sanitary sewer facilities, construction drawings for the proposed facilities must be submitted for review to the Department of Public Utilities, Chesterfield County. The construction drawings must be in a form acceptable to the Department and be submitted in two copies. If deemed necessary by the Department, the developer or his agent shall submit an overall plan for the water and/or sanitary sewer systems for the proposed development. The plan must be submitted to the Department of Public Utilities for review and approval at least thirty (30) days prior to submission of any schematic, tentative subdivision, construction or site plan for the property. A detailed checklist of plan requirements can be found in Appendix 12 of this document.

It is suggested that, for complex projects and projects which may require special considerations, the engineer arrange a meeting with the Department of Public Utilities staff to discuss the approach to be taken to supply water and sanitary sewer service. All water and sanitary sewer systems must be located and sized properly to serve the entire service area in conformance with the County's approved Water and Wastewater Facilities Plan.

It should be noted that where it is determined that water or sanitary sewer lines are necessary to serve property beyond the subdivision or development in question, the developer will be required to design and construct his system, properly sized and at an appropriate location, to permit future extensions to be made at the limits of the subdivision or development in question. More specifically, sanitary sewer systems must be designed and constructed along rivers, creeks, and swales where adjacent property will be served by this system. The system must terminate, at all points in new development, to within one lot from the adjacent and/or

upstream properties to be served by the system in the future. Elevation of the sewer system must be designed such that future extensions are taken into consideration to allow service to all the area which naturally drains towards the system. Public water systems must be designed and constructed along major roads and/or through the development to facilitate for future extensions. In selecting routes for water and sanitary sewer extensions, the Department requires that the location must be such that it maximizes the potential for serving areas of existing and/or future developments.

The developer must enter into a contract with the Department before any work begins. A copy of the Utility Contractor's bid proposal as accepted by the developer is required to prepare the contract. The Unit Price Bid Proposals shall be based on the approved water and/or sanitary sewer plans. All work must be performed by a Class A licensed contractor and/or as deemed acceptable to the Department of Public Utilities. Where refunds may be involved, the developer is required to adhere in strict accordance with the current refund policy. A copy of the refund policy is available upon request. The Board of Supervisors must approve the contracts where refunds are involved prior to the beginning of construction. Pursuant to the definition, terms, and conditions as set forth in the Chesterfield County Code - Sections 18-1(a),(u) & (v), 18-51, 18-53, 18-54, 18-55, 18-55.1, and 18-56, all extensions of the public water and sewer systems shall apply and the ordinance be administered as follows:

Refunds will be made where –

1. The Department of Public Utilities has required that additional water or wastewater lines be installed to serve property beyond the developer's property; or
2. The developer is required to oversize the water or wastewater line being constructed to serve his development; or
3. An offsite extension (3,000' in length or less) is approved by the Department of Public Utilities and does not fall into any of the categories listed below.

Refunds will not be made where –

1. There is a tentative subdivision or schematic plan approved where the offsite water and wastewater line extends through and/or adjacent to this development to serve another development; or
2. A smaller development is the offspring of a larger development, where the entire tract was originally owned by one developer, not necessarily the same developer; or
3. The development is outside of the natural drainage area or wastewater service area where its' flows will discharge; or
4. The extension is within or adjacent to a road which separates the developer's property from the existing water or wastewater system.

Attached to these guidelines are the following appendices:

1. Developer's Checklist for Utilities Projects
2. Information Required for Utilities Contract
3. Contacting Property Owners (Sample Letter)
4. Engineer's Checklist for Water and Sewer Plans
5. Review Procedures for Water and/or Sewer Plans
6. Review Process for Water and Sewer Lines in Virginia Department of Transportation's Right-of-Way
7. Site Plan Requirements
8. Fire Sprinkler Systems Requirements
9. Standard Procedures for the County's Acceptance of Newly Constructed Pump Stations
10. Procedure for Installing Water Meters in Commercial and Industrial Developments
11. Procedures for Coordinating Proposed Water Line Designs with Existing Septic Tank and Drainfield Systems
12. Overall water/wastewater system plan.
13. Drawing Quality Control Specifications
14. Water Flow Test Submittal and Approval Procedures

The engineer should carefully review each of the appendices and follow the instructions and requirements stated therein.

CONTACTING PROPERTY OWNERS

Prior to performing any survey and design work on private property, the engineer/ surveyor shall notify all landowners that may be affected by the design or installation of the proposed utility line. Notification shall be made in the form of a letter to be sent to the property owner a minimum of ten (10) days before commencing work. Copies of such letters shall be provided to the Utilities Department along with the initial plan submittal. (See sample letter - APP 3-1)

CONSTRUCTION DRAWINGS

Construction drawings shall contain the information necessary, presented in a clear and legible manner, to construct the utility. Drawing quality shall conform to the specifications as reflected in Appendix 13.

The engineer shall coordinate the location of all proposed water and/or sanitary sewer lines within all existing and proposed road rights-of-way with regard to existing and proposed roads and drainage structures. In addition, coordination shall be made with other appropriate utility companies and agencies with regard to their existing easements, rights-of-way and facilities.

Where the possibility of conflicts with existing utilities exist, it shall be the Engineer's responsibility to secure accurate information on the horizontal and vertical location of such utilities through subsurface exploration.

Construction drawing requirements are summarized in Appendix 4, Engineer's Checklist for Water and Sewer Plans. The engineer must submit a copy of the checklist with a certification that the plans reflect all applicable items on the checklist. The plans will be reviewed and a review letter will be sent to the engineer with a copy to the developer. When the revisions are made, the engineer must resubmit the plans for final review. A letter of approval will be sent when all the County criteria are met.

Vertical datum for surveys shall be Mean Sea Level (USC & GS Datum).

Horizontal control shall be based on Virginia State Plane Coordinate Grid, South Zone, North American Datum of 1983 (NAD 83) by a minimum of two coordinate points. Traverse closure shall be at least 1:5000.

SANITARY SEWER LOCATION

All sanitary sewers located as described in the General Section and in existing or proposed streets shall be constructed along the center of the street. Exceptions to this specified location will be allowed only when it has been definitely shown that it is not practicable to adhere to the standard location. All sanitary sewers shall be laid on a straight line between manholes except that consideration will be given to laying sewers larger than 24-inches in diameter on a curve.

In a parallel installation sanitary sewer lines or manholes shall be at least 10 feet horizontally from any water main whenever possible. The distance shall be measured edge to edge between the affective structures.

When local conditions prevent a horizontal separation of 10 feet, a sanitary sewer may be closer to a water line provided that:

1. The bottom of the water main is at least 18 inches above the top of the sewer.

2. Where the vertical separation cannot be obtained, the sewer shall be constructed of ductile iron, (Class 52) and shall be pressure tested to assure watertightness prior to backfilling.

3. The sanitary sewer manhole shall be of watertight construction and be tested in place by vacuum testing.

In a crossing installation, sanitary sewers crossing water mains shall be laid to provide a separation of at least 18 inches between the bottom of the water main and the top of the sewer.

When conditions prevent a vertical separation of 18 inches, the following shall be used:

1. Sewers passing over or under water mains shall be in accordance with Item 2 above.

2. Water mains passing under sanitary sewers shall, in addition, be protected by providing:

   A. A vertical separation of at least 18 inches between the bottom of the sewer and the top of the water main.

   B. Adequate structural support for the sewers to prevent excessive deflection of the joints and settling on and breaking of the water mains.

   C. A section of water pipe centered at the point of crossing so that the joints will be equidistant and as far as possible from the sewer.

Where the sanitary sewer is installed parallel to a storm drainage structure, there shall be at least 10 feet horizontally, measured center to center, between them.

Design of sanitary sewer lines and laterals as it relates to sidewalks must be designed to accommodate at least a 10 foot horizontal separation between the County's public sewer mains. If sidewalks are designed within the public road right-of-way, the end of the sewer lateral must be designed 3 feet behind the house side of the sidewalk or to the right-of-way line, whichever is greater. If sidewalks are designed outside of the public right-of-way and are less than 5 feet from the right-of-way line, the end of the sewer lateral must be designed 3 feet behind the house side of the sidewalk. If the sidewalks are designed outside of the public right-of-way and are more than 5 feet from the right-of-way line, the sewer services must be designed within 1 foot outside of the right-of-way line.

Carrier pipe within bores for sanitary sewer installation shall be Ductile Iron (Class 52) and is to be used from manhole to manhole. C-900 PVC DR-18 pipe (Class 150) may be used as an option, provided there are no proposed or future house laterals connected directly into this pipe.

All sanitary sewer line crossings of railroads and, where required, roadways, and other major structures shall be encased in a casing pipe. Design of railroad crossings shall comply with the requirements of American Railway Engineering Association Specifications, Part 5 - Pipelines (latest revisions). The engineer shall be responsible for the preparation of the necessary application, at least 180 days in advance of construction or advertisement for bid, for submission by the County to the railroad or in a timely fashion as determined by the Department and/or the Engineer.

Ductile iron pipe (Class 52) shall be used when crossing storm sewer and other rigid underground conduits when the vertical separation is 18" or less.

The tops of all sewers entering or crossing streams shall be a sufficient depth below the natural bottom of the streambed to protect the sewer line. In general, one foot of suitable cover shall be provided where the stream is located in rock and three feet of suitable cover in other material. Less cover will be considered if the proposed sewer crossing is encased in concrete and/or ductile iron pipe is used and will not interfere with future improvements to the stream channel.

All sewer pipe within a 100 year backwater where cover is less than 3.0 feet shall be of non-float pipe. Other anti-flotation methods or devices will be considered on an individual basis.

Clay dams shall be utilized where the possibility exists that ground or surface water will follow the sewer trench, causing damage or undermining of pipe bedding.

In paved channels, the top of the sewer lines shall be placed at least 18" below the bottom of the channel pavement.

Sanitary sewers constructed in fill shall be of ductile iron pipe (Class 52) with manholes founded on original ground.

Sanitary sewers shall remain fully operational during the 100 year flood. Sewers and their appurtenances located along streams shall be protected against the normal range of high and low water conditions, including the 100 year flood. Sewers located along streams shall be located outside of the streambed and sufficiently removed therefrom to provide for future possible channel widening.

Sewers entering or crossing streams, estuaries, lakes, or reservoirs shall be constructed of watertight pipe. The pipe and joints shall be tested in place and shall exhibit zero infiltration. Sewers laid on piers across ravines or streams shall be allowed only when it can be demonstrated that not other practical alternative exists. Such sewers on piers shall be constructed in accordance with the requirements for sewers entering or crossing under streams. Construction methods and materials of construction shall be such that sewers will remain watertight and free from change in alignment or grade due to anticipated hydraulic and physical loads, erosion, and impact.

In cases where sanitary sewers are to be constructed on steep grades and velocities greater than 15 feet per second are indicated, solid wall PVC pipe or other abrasion resistant material shall be used.

In addition, sewers laid on a slope of 20 percent or greater shall be anchored securely with concrete anchors or other approved means. Suggested minimum anchorage is as follows but should be determined by the engineer:

1. Not over 36 feet center to center on grades 20 percent to 35 percent.

2. Not over 24 feet center to center on grades 35 percent to 50 percent.

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

DEPTH OF SANITARY SEWER LINES

All sewer lines within existing or proposed streets or areas subject to traffic shall be so constructed as to provide a minimum cover of 6' over the pipe. Greater depths shall be required to serve low properties, where street grades may be lowered in the future, where there is a possibility of further extension of the sewer line, or where clearance must be provided for other utilities. Clearance shall be provided for enlargement of undersized drainage structures.
Minimum cover for sewer lines in easements shall be 3.5 feet. Where cover over sanitary sewer lines is between 14 feet and 20 feet, and extra foot of stone shall be placed over the pipe. Where cover over sanitary sewer pipe will exceed 20 feet, ductile iron pipe (Class 52) shall be used.

SANITARY SEWER MANHOLES:

Manholes shall be constructed in accordance with Chesterfield County standards and details.

Manholes shall be located at the end of each line, at all changes in pipe size, alignment (except where laid on a curve where diameter is larger than 24"), grade and at sewer junctions. Maximum spacing between manholes on straight runs shall be 400 feet for sewers 15 inches or less and 500 feet for sewers 18 inches and larger.

Manholes subject to flooding shall be easily accessible and have watertight manhole covers. All manhole rims shall be 6 inches above the 100 year flood elevation, except where the rim would be more than 4 feet above the existing grade in which case watertight covers shall be used and manhole be set at a height 4 feet above final grade.

Drop manholes shall be used when the spring line elevation of the incoming sewer line exceeds the spring line elevation of the outgoing sewer line by 2' or more. Unvented sections of sewer shall not exceed 1,000 feet in length.

Sampling manholes shall be provided for all Significant Industrial Users (SIU) and any facilities discharging over 25,000 gal/day of non domestic wastewater, which includes industrial facilities, food processing, metal processing, hospitals, animal hospitals, photographic finishers, printing shops, etc.

Physical design of the sampling point must be appropriate for the type of wastewater to be sampled.

For further information, contact the Industrial Waste Pretreatment Section.

SERVICE CONNECTIONS

Service connections shall be provided in accordance with existing County ordinances, specifications and details. Plugged service connections are to be provided when required by the Department of Public Utilities for all lots and parcels within the new development. A minimum size of 6" diameter pipe is required for sewer lateral connections.

All service connections to the public sewer system shall be made to gravity sewer lines. No private connections shall be made to public force mains.

STRUCTURAL DESIGN

Structural requirements must be considered in the design of all sanitary sewers and appurtenances. This is a matter of detail design and is not subject to simple generalization. The following criteria should be considered by the design engineer:

1. Special Structures - Whenever possible sanitary sewer structures shall be built as shown in the standard details. Structures other than those shown in the standard details shall be considered special structures and shall be designed and detailed by the design engineer.

2. Pipe Foundation - In all cases the proper strength sewer pipe shall be specified for the proposed depth, width of trench and bedding condition. Soil condition should be considered with samples being obtained where necessary to verify pipe selection and foundation design.

HYDRAULIC DESIGN FOR SANITARY SEWERS

The quantity of sewage for design purpose shall be determined by the future requirements of the total drainage area tributary to the section of sewer under consideration.

Average quantities of sewage, including allowable infiltration, shall be computed as follows:

	Gallons per day per acre	Equivalent Persons/Acre
Residential		
Low		
R-25, R-40	500	5
Medium		
R-9, R-12, R-15	1,000	10
High		
RTH, RMF	2,500	25
Other		
Agriculture/ Undeveloped Land	1,000	10
Commercial		
Retail	2,000	20
Office	1,500	15
Industrial		
M-1 Light	2,000	20
M-2, M-3 Medium, Heavy	3,500	35

Where site specific determinations can be made, sewage flows may be determined by using the following design information:

Discharge Facility	Design Units	Flow gpd
Residential Units		
(a) Single Family Units includes Townhouses, Individual House Trailers, etc.	3.5 people/dwelling	350
(b) Apartments and Condominiums	4 people/3 bedroom apt.	350
	3 people/2 bedroom apt.	300
	2 people/1 bedroom apt.	200
Schools with showers and cafeteria	per person - Elementary	16
	per person - High School	25
Motels and Hotels at 65 gals/person (rooms only)	per room	130

Discharge Facility	Design Units	Flow gpd
Trailer Courts at 4 persons/trailer	per trailer	400
Restaurants	per seat	50
Service Stations	per vehicle serviced	10
Factories	per person per 8 hr. shift	25
Shopping Centers	per 1000 ft 2 of ultimate floor space	250
Hospitals	per bed	300

Nursing Homes	per bed	200
Homes for the Aged	per bed	100
Doctors Office in Medical Center	per 1000 ft 2	500
Laundromats, 9 to 12 machines	per machine	500
Theaters, Auditorium Type	per seat	5
Bowling Alleys	per lane	75
Office Buildings	per 1000 ft 2 of ultimate floor space	200

NOTE: Other classifications may be found in the Virginia Department of Health Regulations, latest edition.

Design flow shall be determined by using the peaking formula as follows: [For 0-20 mgd, $Q_d = 3.5\ Q_A^{0.807}$ and for 20-50 mgd, $Q_d = 2Q_A$]. The engineer should insure that the following design criteria are adhered to:

1. Sewers shall have a continuous slope, straight alignment and uniform pipe material between manholes.

2. At all junctions where a smaller diameter sewer discharges into a larger one, and at all locations where the line increases in size, the invert of the larger sewer shall be set so that the energy gradients of the sewers at the junction are at the same level. Generally, this condition will be met by placing the pipes at crown's level where possible, however, as a minimum, placing the 0.8 depth of flow in each sewer at the same elevation.

3. Sewers shall be designed to be free flowing with the hydraulic grade below the crown and with hydraulic slopes sufficient to provide an average velocity, when flowing full, of not less than 2.25 feet per second. Computations of velocity of flow shall be based on a value of "n" = 0.012 as used in the Kutter or Manning formula for velocity of flow.

3. In cases where the calculated depth of flow is less than pipe flowing full the velocity at actual depth of flow should be computed.

For sewage flow depth less than 1/4 full, allowance should be made for increased value of "n". In no case should velocities of less than 1.3 feet per second be permitted. Increased velocities shall be accomplished by steeper grades.

5. The following are minimum slopes in feet per hundred feet to be provided for pipes flowing 1/4 of full depth to full depth:

Pipe Size	8"	10"	12"	15"	18"	21"	24"	27"	30"	36"
Slope %	.40	.32	.24	.20	.16	.12	.10	.08	.07	.06

A minimum slope of 0.520 shall be maintained for terminal 8" lines not likely to be extended.

Minimum pipe size between manholes shall be 8".

6. In cases where sewers are to be constructed on steep grades for which high velocities are indicated, the maximum permissible velocity at average flow (before applying peak flow factor) should not exceed 15 feet per second. Suitable drop manholes shall be provided to break the steep slopes and to limit velocities to not more than 15 feet per second in the connecting sewer pipes between manholes.

Where drop manholes are impracticable for reduction of high velocity, the sewer shall be of solid wall PVC pipe or other abrasion resistant material.

7. Miscellaneous head losses at manholes, curves and junctions shall be estimated and allowed for as follows:

a. At manholes on straight runs allow head loss = 0.05 feet.
b. 90° turns made inside of manholes, where the radius of turn is less than 2 pipe diameters allow 0.50 $V^2/2g$. If the radius of turn is greater than 2 pipe diameters, allow 0.25 $V^2/2g$. In no case should the total allowance be less than 0.05 ft.
c. At transitions and interjections of sewers larger than 24" in diameter, allow 0.50 $V^2/2g$.

8. In general, the pipe diameter should be continually increasing with increase in tributary flow. Where steep ground slopes make possible the use of a reduced pipe size and substantial economy of construction costs is thereby indicated, the pipe size may be reduced but due hydraulic allowances shall be made to provide for head loss at entry, increased velocity and effect of velocity retardation at the lower end where the flow will be on flatter slopes. In no case, should pipe sizes be thus reduced more than one nominal size in diameter.

Hydraulic computations shall be submitted to the Department of Public Utilities for approval. Engineer shall submit with all sewer plans the information and calculations on sewer flow demands for the project. Upon receiving a written request from the developer and/or his agent and the information furnished by the developer's engineer, the Department will then provide the available sewer capacity. After evaluating this information on available capacities, the engineer shall then furnish his calculations supporting that these demands can be met and that the sizing of the proposed sewer mains are adequate.

SEWAGE PUMP STATIONS AND FORCE MAINS

Sewage pump stations will be used when it has been determined to be the only practical way to provide sanitary service based upon a finding that:

1. It is economically impractical to extend the gravity sewer and the use of a pump station will not adversely affect the County's ability to serve the area with a gravity sewer at a future time; and

2. The proposed design and plan for the pump station and connecting lines do not adversely affect the current financial status of the County utility system or the future ability of the County to install a gravity sewer; and

3. The proposed design of the pump station permits replacement of the pump station with a gravity sewer without significant capital outlay at a future time; and

4. The pump station will not overload the existing sewage facilities and will not otherwise negatively affect the County's ability to efficiently manage the sewer system.

The design of the sewage pumping facility shall be discussed with staff and the required design criteria determined. At a minimum the following data shall be provided:

1. Structural design and calculations, including reinforcing drawings where applicable, of the facility.

2. Hydraulic design for the equipment selected, including scaled drawings.

3. Electrical and mechanical drawings and specifications for the equipment selected.

4. Job Specifications to include but not limited to Appendix 9, "Standard Procedures for the County's Acceptance of Newly Constructed Pumping Stations".

Sanitary sewage force mains shall be ductile iron (Class 52) or approved equal. A higher class if the design parameters require a thicker pipe. For 12" and smaller, PVC C-900 or other approved water type pipe may be used. Force mains to be designed with a minimum flow velocity of 3.0 feet per second, a maximum flow velocity of 8.0 feet per second; and a Hazen-Williams "C" value of 120. Minimum size shall be 4 inches in diameter. A constant grade shall be used where feasible. Minimum ground cover shall be same as required for water lines or deeper where necessary to accommodate water services and/or future water lines, etc. Valves and air releases will be provided at appropriate locations.

Manholes receiving the discharge from force mains shall be designed in accordance with the County's standard details. In addition, special acid-resistant manholes and sewer pipe shall be provided downstream of the discharge point for a distance as determined by the engineer’s required hydrogen sulfide calculations or for 2,500 L.F., whichever is greater. On existing systems, all steps shall be removed and manholes shall receive an approved liner for the distance determined by the engineer’s calculations or 2,500 L.F., whichever is greater.

WATER PUMP STATIONS

Water pump stations shall be considered a special project and specific project standards and plans will be prepared by the Engineer and submitted to the County for review and approval. The project standards shall include but not limited to contents as set forth in Appendix 9.

WATER LINE LOCATION

Generally, water lines to be installed in proposed subdivision and local streets shall be located 2 feet off the edge of pavement where there is no curb and gutter and 4 feet in front of the face of curb (pavement side) where there is. However, within proposed curb and gutter streets, an alternate design should be considered if right-of-way is available and a design is feasible. Water lines to be installed along existing roads will generally be installed in easements where the road is likely to be widened in the future and in the right of way where the road will not be widened in the future.

Design of water mains and water meter boxes as it relates to sidewalks must be designed to accommodate at least a 4 foot horizontal separation between the County’s public water mains. If sidewalks are designed within the public road right-of-way, the street side of all water meter boxes must be designed 3 feet behind the house side of the sidewalk or to the right-of-way line, whichever is greater. If sidewalks are designed outside of the public right-of-way and are less than 5 feet from the right-of-way line, the street side of all water meter boxes must be designed 3 feet behind the house side of the sidewalk. If the sidewalks are designed outside of the public right-of-way and are more than 5 feet from the right-of-way line, the water services must be designed within 1 foot outside of the right-of-way line.

Where water lines are to be installed in roads expected to be widened in the future, they shall be located in easements unless the future road cross section is known and location of water line is designed to avoid future relocation.

Water lines shall be designed so that changes in alignment are made with bends with approved thrust blocks or approved mechanical joint restraint systems wherever applicable. All mechanical joint thrust restraint system calculations to be shown on plans with a detail sketch showing length of pipe and fittings to be restrained. See Part V for additional specifications and requirements. Where it is necessary to change alignment by deflecting successive lengths of pipe, the joint deflection shall be limited to the allowable deflection according to standard details) in Part II of this manual, which represents one-half the maximum allowable by most manufacturers. For PVC pipe, the deflection is made by curving the pipe, since there is no deflection capability in the joints. The bending radius shall be limited as per standard detail (s) in Part II of this manual.

Bending and joint deflection limits apply to vertical as well as horizontal curves. Engineer is to verify existing field conditions to develop soil classifications for calculated bearing pressures.

The engineer must design the system to ensure that the maximum deflection can be accomplished, however, fittings may be necessary and the engineer shall make this determination during design.

In subdivisions, water mains will be permitted in easements only when there is no other feasible alternative and prior approval is obtained from the Department of Public Utilities. Easements shall be wide enough to provide sufficient space for both installation and maintenance.

The engineer shall consider the location of existing and proposed sanitary sewer and storm drainage systems and all other underground structures and utilities that could affect the location and type of materials for the pipeline. The selected location should avoid conflicts and facilitate future maintenance.

Where the possibility of conflicts with existing utilities and/or other structures exist, it shall be the Engineer's responsibility to secure accurate information on the exact horizontal and vertical location of such utilities through subsurface exploration and reflect this exact information on the plans.

The engineer shall consider the requirement for separation of water and sanitary sewer facilities and shall use the same requirements stated in the **SANITARY SEWER LOCATION** section of these standards.

Water main crossings of railroads and where required, roadways shall be encased in a casing pipe. Design of railroad crossings shall comply with the requirements of American Railway Engineering Association Specifications, Part 5 - Pipelines (latest revisions). The engineer shall be responsible for the preparation of the necessary application, at least 180 days in advance of construction or advertisement for bid, for submission by the County to the railroad or in a timely fashion as determined by the Department and/or Engineer.

Water mains entering or crossing streams, shall be Ductile Iron Pipe minimum Class 52). The tops of these mains shall be a sufficient depth below the natural bottom of the streambed to protect the pipe. In general, 3.5 feet of suitable cover is required. The pipe and joints shall be designed, constructed, and protected against anticipated hydraulic and physical, longitudinal, vertical, horizontal loads, erosion and impact. Reasons for requesting less cover shall be given in writing to the County prior to plan submittal. Water mains constructed in fill shall be Ductile Iron Pipe (Class 52) with restrained joints.

Water mains constructed on piers will be permitted only when it can be demonstrated that no other practical alternative exists. The engineer shall submit a design for the piers, pier foundation and pipe that will demonstrate the structural integrity of the proposed system.

Above ground pipe shall be adequately supported, protected from damage from freezing, accessible for repair or replacement and above the 100 year flood elevation.

Subaqueous water main installations will be permitted only when it can be demonstrated that no other practical alternative exists. The pipe shall be of special construction having flexible watertight joints. Special attention shall be directed to foundation conditions for the pipe and to thrust resistance.

For both the above ground and subaqueous crossings the design shall provide:

> Valves at both ends of the crossing so that the section can be isolated for tests and repairs. The valves shall be easily accessible and not subject to flooding.

DEPTH OF WATER LINES

Standard Minimum cover will be 42 inches. All water lines shall be constructed to a depth that will provide protection against freezing and thawing, insure adequate cover over valves and other appurtenances and provide service. New installation of water lines adjacent to road ways shall have a minimum of 42 inches of cover from existing/proposed edge of pavement. Greater depths shall be required where street grades will possibly be lowered in the future. Clearance shall be provided for enlargement of undersized drainage structures. Any development which takes place over an existing water main shall be required to maintain the water main at a maximum depth of 10' below finished grade. Where the depth exceeds 10' the water main shall be raised to the standard minimum depth of 42".

WATER LINE APPURTENANCES

Valve manholes, air relief valves, fire hydrants, service lines and other appurtenances shall be constructed in accordance with Chesterfield County standards and details.

Hydrants in residential areas should be located at corners or in mid-block at lot lines as approved by the Fire Life Safety Division. Maximum hydrant spacing shall be in accordance with the latest fire code adopted by Chesterfield County. The developer is to make the necessary improvements

to satisfy fire flow demands as determined and required by Fire Life Safety Division. The developer or his agent must follow the procedures as outlined in Appendix 14.

Valves shall be located at not over 1,000 foot intervals and at all changes in pipe diameter. Valves shall also be provided at all pipe line intersections so as to provide shut off for repairs of limited sections without interruption of service to large areas and to facilitate testing. A minimum of two valves shall be provided at tees, three valves at crosses and shall-be located as close to the fitting as practical. All Valves are to be restrained to fittings by approved method.

When connecting to an existing water main, installing a tee as opposed to a tapping sleeve and valve is especially desirable when there are long distances between main line valves (greater than 1,000 feet) or even if the distance is less than 1,000 feet where it would be an advantage to add a main line valve for better system control. Therefore, it is important that each project be carefully evaluated by the developer's engineer with the Department of Public Utilities' assistance to determine if a main line valve is needed and/or cutting in a tee is practical, taking into consideration how many residences, businesses, hospitals, etc. may be without water.

Water mains shall be provided with air release valves and blowoffs at suitable locations to allow testing, chlorination and draining of the line. Fire hydrants, blowoffs or flushing hydrants shall be installed at dead- end mains.

STRUCTURAL DESIGN

Structural requirements must be considered in the design of all water mains and appurtenances. This is a matter of detail design and is not subject to simple generalization. The following criteria should be considered by the design engineer:

1. Special Structures - Structures shall be built as shown in the standard details, however, structures other than those shown in the standard details shall be considered special structures and shall be designed and detailed by the design engineer and submitted for review and approval to the Department of Public Utilities prior to plan submittal or brought to the Department's attention at the time of plan submittal.

2. Pipe Foundation - In all cases the proper strength water pipe shall be specified for the proposed depth, width of trench and bedding condition. Soil condition should be considered with samples being obtained where necessary to verify pipe selection and foundation design.

3. Thrust protection as shown on plans in the standard details shall consist of concrete thrust blocks against undisturbed earth. Approved mechanical joint restraint systems may be required for ductile iron and PVC C-900 pipe. Hydrant valves shall be installed with hydrant tees and hydrant protected from thrust by, approved mechanical joint restraints, and concrete thrust blocks.

4. Where valves are placed for future water line extensions, valves are to be restrained to the fitting and a minimum 20' length of pipe shall be installed past the valve except where calculations or local conditions indicate more pipe is required to provide adequate restraint. Dead-end lines shall be provided with a flushing hydrant or fire hydrant whichever is practical. Approved mechanical joint restraint systems are to be used as required to provide adequate retention of the pipe and valve when thrust blocks cannot be used.

HYDRAULIC DESIGN FOR WATER LINES

Water distribution systems shall be designed to provide adequate flow and pressure for both domestic supply and fire flow based on sound hydraulic analysis. Design shall be based on a maximum flow velocity at peak flows (excluding fire flow) of 5 feet per second and a Hazen-Williams "C" Value of 120. Engineer shall be required to comply with the procedures as outlined in Appendix 14.

The water distribution system and any extensions thereto shall be designed to supply the demands of all customers while maintaining 20 psi at maximum day plus fire flow or peak hour domestic, whichever is greater.

Design of the water system shall generally be such as to maintain 40 psi at maximum day demand. When 40 psi cannot be maintained, the engineer shall be responsible for coordinating with the Utilities Department to investigate alternatives in order to provide 40 psi. Designs providing less than 40 psi will be evaluated on an individual basis.

Also, the design of the water line should be such that a velocity of 2.5 f.p.s. can be maintained at blowoff devices (flushing hydrants) and at hydrants for proper flushing.

The following criteria shall be used in estimating average daily demands:

	Gallons per day per acre	Equivalent Persons/Acre
Residential		
Low		
R-25, R-40	500	5
Medium		
R-9, R-12, R-15	1,000	10
High		
RTH, RMF	2,500	25
Other		
Agriculture/ Undeveloped Land	1,000	10
Commercial		
Retail	2,000	20
Office	1,500	15
Industrial		
M-1 Light	2,000	20
M-2, M-3 Medium, Heavy	3,500	35

Where site specific determinations can be made, flows may be determined by using the following design information:

Discharge Facility	Design Units	Flow gpd
Residential Units		
(a) Single Family Units includes Townhouses, Individual House Trailers, etc.	3.5 people/dwelling	350
(b) Apartments and Condominiums	4 people/3 bedroom apt.	350
	3 people/2 bedroom apt.	300
	2 people/1 bedroom apt.	200
Schools with showers and cafeteria	per person - Elementary	16
	per person - High School	25
Motels and Hotels at 65 gals/person (rooms only)	per room	130
Trailer Courts at 4 persons/trailer	per trailer	350
Restaurants	per seat	50
Service Stations	per vehicle serviced	10
Factories	per person per 8 hr. shift	25
Shopping Centers	per 1000 ft^2 of ultimate floor space	250
Hospitals	per bed	300
Nursing Homes	per bed	200

Discharge Facility	Design Units	Flow gpd
Homes for the Aged	per bed	100
Doctors Office in Medical Center	per 1000 ft^2	500
Laundromats, 9 to 12 machines	per machine	500
Theaters, Auditorium Type	per seat	5
Bowling Alleys	per lane	75
Office Buildings	per 1000 ft^2 of ultimate floor space	200

NOTE: Other classifications may be found in the Virginia Department of Health Regulations, latest edition.

To determine maximum daily demands and peak hourly demands the following multipliers shall be used:

Maximum Daily Demand	=	1.8 times Average Daily Demand
Peak Hourly Demand	=	2.36 times Average Daily Demand

Fire flow requirements for non-residential areas shall be in accordance with the National Fire Protection Association Handbook (latest revisions) and the applicable sections of BOCA, and shall be coordinated with the Fire Life Safety Division Department. That portion of the Fire Sprinkler Systems to be maintained by the Department of Public Utilities shall be designed in accordance with the requirements as set forth in Appendix 8.

Minimum pipe size shall be 8", except that terminal water lines will be six (6) inches in diameter unless a larger diameter line is needed to meet the peak domestic demand and/or fire flow requirements. Dead-ends shall be eliminated by looping when feasible.

Services and meters shall be sized and locations designed in accordance with the Standard Details. Minimum service size shall be 3/4" pipe with 5/8" meter. Services shall be designed and reflected on the plans for both residential and commercial developments. A 1” County service line will be installed when the residential water service from the main to the meter is 60’ or greater; or the peak hour pressure at the meter is 40 psi or less; or the water service will be serving a “multi-purpose” residential fire sprinkler system as identified on plans, in which case it will also be fitted with a 1” water meter. When the peak hour pressure at the probable house site is less than 40 psi and depending on such variables as: house location, number of fixtures, number of finished floors, etc., a note must be added to the plans: “The builder may consider installing a larger plumbing line from the meter to the house and/or installing a booster pump to obtain a desired pressure”. When it is intended for a residential structure to be fitted with a multi-purpose fire sprinkler system, a note must be added to the plans: “If the combined domestic and fire flow demand for a residential, structure, as approved by the Fire Life Safety Division Department review staff, exceeds the rated capacity of a 1” meter, then the water service shall be installed in accordance with detail FIR-1B.”

Pressure reducing valves shall be installed on the customer side of the meter by builder or property owner, to be operated and maintained by the customer, when the service connection system pressure will be greater than 80 psi.

Blowoffs shall be provided at low points on mains 16-inches and larger. For 12-inch mains, blowoffs shall be provided at creek crossings.

Engineer should use the following guidelines, in regard to location of flush points, air release valves, blowoffs, etc. during the design of public water systems:

1. Access to flush points by contractors and especially to the County Operations and Maintenance Section is very important. Flush points serve no purpose if access to the flush points can not be obtained.

2. Engineer needs to make sure that appropriate notes i.e., flow (gpm) expected to be dispersed at points of flushing; etc. are put on the plans.

3. Emphasize (through appropriate notes) to contractor to maintain good erosion control and flushing procedures. Erosion control and environmental impact consideration must be taken into account whenever a flush point is chosen, therefore, certain controls may be needed at the time water line is installed.

4. Engineer needs to advise contractor to coordinate his work through the inspectors and the inspector coordinate with the County Operations and Maintenance Section regarding when to flush (time of day and season, etc.).

5. On most 16" or larger water lines, attempt to locate the flush points as near to the roadways or at a stream (keeping in mind adverse effects to downstream ponds, etc.).

6. Contractor is to perform flushing prior to acceptance of the new water line.

7. Minimize the number of blowoffs, and strategically place them so that proper flushing can be performed.

8. Minimizing number of air release valves, taking into consideration the depth that the water line is to be placed.

9. Standardize the design of a blowoff needed taking into account the size of blowoff, height of blowoff, positioning of blowoff, etc.

10. Look at easement considerations that would be needed during flushing process. Property owners and the County's Right of Way Section shall be solicited for advice during easement acquisition.

Wherever possible, two supply points shall be provided for subdivisions containing more than 25 lots.

All exposed water mains shall be adequately insulated as determined by the engineer.

APPENDIX 1

DEVELOPERS CHECKLIST FOR UTILITY PROJECTS

The following steps must be completed before the County will permit the Utilities Contractor to start construction:

_____ 1 - The developer may qualify for refunds where oversized lines are proposed. He should meet, as soon as possible, with the Department of Public Utilities to discuss his eligibility for refunds. One week prior to the meeting, the Developer shall submit a plat of the tract of land to be developed showing boundaries, title to the property and such other information required by the Department. Where refunds are involved, the developer must adhere to the current refund policy, copy of which is available upon request.

_____ 2 - The Department has reviewed the utilities plan. (Initial review of the plan will normally be completed within 2 to 3 weeks of receipt provided the engineer has submitted all required information needed to perform a proper review.

_____ 3 - The project plan has been approved by the appropriate agencies (i.e., County - erosion control, sewer, water, roads and drainage; Virginia Department of Transportation - roads and drainage; Virginia Department of Health and Virginia Department of Environmental Quality) and written verification has been furnished to the Department of Public Utilities, where applicable.

_____ 4 - The developer has sent a letter to the Development Section requesting the County to prepare a utilities contract. The letter needs to include the "Information Required For Utilities Contract" form and a copy of the "accepted" unit price bid proposal between the owner and the utilities contractor. Normally, the contract will be prepared within 2 days. The Board of Supervisors must approve contracts where refunds are involved. Two to three weeks should be allowed for this approval.

_____ 5 - Both copies of the utilities contract have been executed and returned to the County.

_____ 6 - All off-site and on-site easements, not included in a subdivision plat for the project, have been dedicated to the County. The Developer is to provide a check payable to the Clerk of the Circuit Court in the amount of the recordation costs when the executed easements are returned to the Right-of-Way Section. The Right-of-Way Section will calculate the charge and inform the Developer.

_____ 7 - The Utilities Contractor has obtained the highway permit, if required, and sent a copy of the permit to the Department of Public Utilities, Construction Section.

_____ 8 - For the onsite subdivision work, the erosion control measures have been installed and approved by the County Environmental Engineering Department. However, for the offsite utility work in conjunction with a subdivision, the field installation has been inspected by the Utility Inspector as approved by the County Environmental Engineering Department. Confirmation of approval should be obtained by the developer as early in the process to avoid any unnecessary delays in starting construction of the utilities.

_____ 9 - Prior to the installation of water mains, the Developer's engineer has submitted his certification that:

a. All pavement and shoulder areas within the right-of-way are graded to within 6″ of subgrade.

b. All ditches and slopes to 1 foot outside the right-of-way have been graded to final grade.

c. Markers for the sewer laterals are visible.

d. All necessary property pins have been installed.

APPENDIX 2

INFORMATION REQUIRED FOR UTILITIES CONTRACT
(PLEASE TYPE OR PRINT)

1. PROJECT NAME: _____

2. AGENT'S NAME: _____ PHONE ( ) _____
   ADDRESS: _____ ZIP _____

3. PROPERTY OWNER: _____ PHONE ( ) _____
   (See Item #6 – must be owner of property for which utilities are being extended to serve.)
   ADDRESS: _____ ZIP _____
   EMAIL ADDRESS: _____

   A. If Corporation, _____ will sign for a Corporation as _____. This Corporation was organized in the State of _____.
   B. If Partnership, _____ will sign for the partnership as its general partner.
      This partnership was organized in the State of _____.
   C. If a Limited Liability Corporation _____ will sign as managing member.
   D. If person signing the contract is <u>not</u> an officer of the corporation or partnership, a certified copy of the Corporate/Partnership Resolution authorizing that person to sign such documents <u>must</u> be attached to the County/Developer contract.

4. LEGAL DESCRIPTION (Lot and Block Number and GPIN as property exists:
   _____

5. MAGISTERIAL DISTRICT: _____

6. DEED BOOK _____ , PAGE _____ (must reflect #3 above)

7. UTILITIES CONTRACTOR'S NAME: _____

   Phone No: _____ Fax No: _____

   E-Mail Address: _____

   If the utilities work is subcontracted,

   General Contractor's Name: _____

   Phone Number: _____

   Subcontractor's Name: _____

   Phone Number: _____

8. LAND USE:

Residential:	Subdivision	_____	Townhouse/Condo	_____
	Apartment	_____	Other	_____
Commercial:	Office	_____	Retail	_____
Industrial:	Type	_____		

I certify that the above information is true and correct.

Signed

_____
Owner/Agent

_____
Date

Return to: Development Section
Department of Public Utilities
Post Office Box 608
Chesterfield, VA 23832-0009

APPENDIX 3

(SAMPLE LETTER)

(ENGINEER'S/SURVEYOR'S LETTERHEAD)

(Date)

(Property Owner's Name)
(Address)

Re: County Project # _____

Dear _____,

Our firm has been retained to design a water/sewer line to become a part of Chesterfield County's overall utility system. In conjunction with this, surveying is the first phase of work that must be completed.

Information obtained by this survey will allow our firm to recommend a location taking into consideration existing trees, shrubs, creeks, etc. Should you have any trees or topographic features you wish preserved, we would appreciate being advised so that we may consider these in our design.

After surveys and design are complete, you will be contacted should it become necessary to obtain easements for construction.

We propose to start survey work on or near your property within ten days to two weeks. Should you have any questions concerning either the survey or utility line, please contact this office at or the Department of Utilities at _____ to discuss this matter.

Your cooperation in this matter is greatly appreciated.

Sincerely,

_____

cc: Chesterfield County Department of Utilities
_____, Project Manager

APPENDIX 4

UTILITIES DEPARTMENT
ENGINEERS CHECKLIST FOR WATER AND SEWER PLANS

I. Title Page

A. _____ Project Name
B. _____ Engineer's or Class B Surveyor's Seal and Signature
C. _____ Vicinity Sketch (complete in detail) 1” = 2,000’ or less, with road names
D. _____ Table of Estimated Quantities (including breakdown of type of pipe).
E. _____ Title Block
F. _____ Tax Identification Numbers (formerly known as the Tax Map and Parcel Numbers)
G. _____ Magisterial District
H. _____ Name, Address, and Phone Number of Developer/Owner
I. _____ Legend of sanitary sewer and water lines, other utilities and structures existing and proposed ground and pavement profile. Profile information must be shown on profile sheet.
J. _____ Certification statement of the lot numbers, block letters/numbers and road names, etc.

II. General

A. _____ The utility plan includes an overall plan of the water and sewer layout, including any phasing of the development.
B. _____ A subdivision plat indexed to sheet numbers.
C. _____ Engineer and/or Surveyor has notified all offsite property owners prior to performing any work within offsite easements (copy of such notification is attached).

III. Standards

A. _____ Water and Sewer Notes (as a minimum, reference has been made to County Standard specifications and details).
B. _____ Vertical scale is 1" = 5' or 1" = 10'; and horizontal scale is 1" = 50' or as approved by the County. A "bar" scale is shown on each sheet.
C. _____ All water and sewer designs conform to the latest County, State and Federal regulations or standards.
D. _____ Plan and Profile sheets are on 24" x 36" paper, or as approved by the county.
E. _____ Scale drawings are accurate to within +/- 2% for vertical and horizontal scales.

IV. Plans

A. Utility Plans

1. _____ All water, sewer, road, and drainage structures are shown on each utility plan sheet, where applicable. May require larger scale to adequately obtain horizontal integrity.

2. All plans include:

a) _____ Existing water and/or sewer lines are properly labeled with project number, size material and with horizontal and vertical distances referenced on the plan.

b) _____ A bench mark is required on the site plan.

c) _____ Horizontal and vertical scale shown on each sheet (scale should be same on plan and profile).

d) _____ All existing easements are shown accurately and proposed water and sewer easements are shown on plans. The existing easements reflect accurate recordation information. Easements need to be shown on County property and plats must be sent directly to the Right of Way Section. Plats will not be recorded unless the property is sold.

e) _____ All existing and proposed storm sewer lines, gas, telephone, power, and other utility lines, which cross or run parallel to the sewer or water lines, are shown with exact horizontal and vertical separations given, where applicable. Subsurface exploration has been performed where potential conflicts exist, where applicable.

f) _____ Adjacent road and drainage projects are shown as required.

g) _____ Consideration has been given to areas where roads and drainage structures may be lowered in the future.

h) _____ Road names, state route numbers, and right-of-way widths are shown.

i) _____ Plan and profile are drawn in the same direction. Stations shall ascend from left to right, unless pre-approved by the county.

j) _____ Proposed water and/or sewer lines are shown with reference distances from right of way, boundary, buildings, other utility lines, etc.

k) _____ All property lines and property markers (stones, rods, pins, pipes, monuments, etc.) are shown.

1) _____ Location of existing houses, buildings, fences, wells and other structures are shown on plans. In lawn or kept areas, trees and shrubs in the easements are shown (size and type).

m) _____ All designs conform to the latest County and State erosion control and sedimentation rules, regulations, and ordinances. An erosion control and sedimentation plan must be approved by the County Environmental Engineering Department and included in the final approved set of utility plans.

n) _____ The engineer understands that he/she is responsible for coordinating the utility design with other engineers where their projects connect or are affected by other projects.

o) _____ Locations of special features (conc. encasement, rip-rap stabilization at creek crossings, clay dams, etc.).

p) _____ Detail drawings of all stream crossings and storm sewer outlets, with elevations of the stream bed and high (100 year flood elevation) and normal water elevations.

q) _____ Proper labeling of subdivision (lot, block, street names, subdivision boundaries, etc.).

r) _____ Adjacent property owner names) are shown on plans.

s) _____ All fill and cut areas are shown within the area of the existing and proposed sewer and/or water lines.

t) _____ Necessary easement plats onsite and/or offsite have been submitted for processing by the R/W Section. Plats concur with Exhibit A at the end of checklist.

u) _____ Pavement replacement detail, boring detail, etc. are shown on all plans.

v) _____ Location and dimensions of all water and sewer service connections are shown.

x) _____ Proposed and existing ground elevations are shown.

y) _____ Municipal, subdivision and/or drainage area boundaries are shown.

z) _____ North Arrow is reflected on all plan sheets.

aa)_____ Miss Utility notation is shown.

bb)_____ Engineer understands that any changes made to the road, drainage, water and/or sewer design will require a submittal to the Utilities Department for review and approval of the revised water and sewer plans reflecting those changes.

cc)_____ All revisions include an explanation either on the plans or by separate transmittal.

dd)_____ Plans have been submitted to State Health Department for review and approval where applicable. A copy of transmittal letter is attached to checklist.

ee)_____ If horizontal bore is required, bore location, length of bore, pit location (average 8' x 35') are shown and shown in relation to all existing and/or proposed utilities on plan and profile.

ff)_____ Alignment of utility in existing VDOT right of ways is consistent with County guidelines. A copy of a transmittal letter to Virginia Department of Transportation for their review is attached. Engineer Understands that a letter of approval from Virginia Department of Transportation is required prior to final utility plan approval.

gg)_____ Clay dams or other acceptable designs are shown at the appropriate locations to avoid water from creek and/or lake being diverted along pipe bedding.

hh)_____ Utility plans reflect those conditions as approved by the Planning Commission/Board of Supervisors.

ii)_____ Engineer has contacted Virginia Power to obtain exact location of power lines and received as-built information. Utility plans reflect this information accurately and is in accordance with the "Overhead High Voltage Line Safety Act".

3. Sanitary Sewer Plans

a) _____ All sanitary sewer plans are labeled with size, grade, length, direction of flow, and type & class of pipes (with backup calculations on the type & class pipe needed, where applicable).

b) _____ Manholes are labeled with top and invert elevations; coordinates; and locations, size and inverts of drop stacks when a vertical drop exceeds 2 feet.

c) _____ Deflection angles at all manholes or bearings of all lines are shown on the plans.

d) _____ All minimum finished floor elevations and basement elevations are to be shown on plans, where applicable.

e) _____ A sewerage drainage area map with hydraulic analysis is included in plans where sewer will serve property outside the limits of the development.

f) _____ The engineer has field verified the inverts of the existing manhole(s). Where invert elevations are different from the as-built plan, the engineer has verified his survey work and notified the Utilities Department of the discrepancy.

g) _____ All manholes are designed to an elevation above the 100 year flood plain elevation as set forth in the design standards, unless otherwise approved by the Utilities Department.

h) _____ Reference all existing manholes in easements.

i) _____ Ground coverage over sewer pipe meets minimum criteria.

j) _____ Engineer has put a notation that a backwater valve is to be used where the building with a finished floor elevation of the building is below the top elevation of the nearest upgrade manhole from the building connection.

k) _____ Where the sewer lines are in excess of 12' deep, the Engineer has identified where the sewer lateral must be installed in accordance with the standard details and the appropriate notes are reflected on the plans.

1) _____ A NOTE stating that the contractor must field verify the inverts of all existing manholes, gas lines, other utility lines prior to the start of construction.

m) _____ Greater than 0.4% minimum slope has been used whenever possible.

n) _____ Solid lines have been used for proposed sewers, short dashed lines for existing sewer and labeled future sewer or portions covered under other phases of construction.

o) _____ A minimum of ten (10) feet horizontal separation is maintained between sewer lines, sewer laterals and water meters or water blowoff devices (flushing hydrants) and between sewer line and storm drainage structures.

p) _____ All calculations have been checked for accuracy.

q) _____ All pipe between manholes are of like material and class.

r) _____ All temporary and/or permanent silt basins are shown and the sewer lines and manholes have been designed around these structures.

s) _____ All existing sewer laterals are shown on the plans, with station, length and depth, as depicted on the as-built plans.

t) _____ All sewer lines are designed with the entry into the manhole by the proposed sewer lines at an angle of 90° or greater to the downstream line, or if an exception has been granted, the engineer has increased the drop through the manhole to compensate for the reduced angle and has provided a blowup detail for the appropriate invert shaping that achieves the same results as a 90° or greater entry.

u) _____ The crowns of all sewer lines enter the manholes at crown's level or higher as specified in the design standards.

v) _____ Whenever connecting sewer lateral to an existing sewer line, Engineer has put on the plans the proper notation that "the contractor must use a mechanical hole cutter when tapping the existing sewer line and that an approved saddle shall be used" and the appropriate lots affected by this have been identified in the note.

w) _____ Where new manholes are proposed over existing lines, distance from the new manhole to the two existing manholes is shown; inverts of the manhole and each existing manhole are shown; slope of existing line from new manhole to upstream and downstream existing manholes is shown.

x) _____ Where future extensions are necessary, these lines are reflected on the plan.

y) _____ All manholes proposed within publicly maintained roads are to be located on center line of road.

z)_____ Sampling manholes are required for new facilities currently regulated by local or federal industrial waste pretreatment laws. Examples of these commercial facilities include restaurants, carwashes, auto repair shops, and Laundromats to name a few. Appropriate measures have been included in the design to allow for sampling of industrial waste. A sampling manhole shall be provided at the property line to facilitate random 24-hour composite sampling. In those cases where a private manhole on site can be utilized for this function, adequate provisions will be agreed upon to facilitate sampling. Provisions include ingress/egress to the private manhole, ability to sample, and adequate space to set a 24-hour composite sampler. Existing on site manholes, possibly inside buildings, will be approved on a case by case basis.

aa)_____ At all existing manholes, the engineer has provided the manhole number as reflected on the as-builts, and the County project number associated with the existing manhole.

bb)_____ The following data appears on all lots with minimum finished floor (sewer) designations and for those lots where gravity sanitary sewer service is questionable:

(1) The minimum finish floor (sewer) elevation;
(2) A note on the plans stating that the 6" sanitary sewer lateral for that lot is to be installed at 1% grade;
(3) The invert elevation at the end of the 6" lateral;
(4) The "building envelope" (at a minimum) and if possible, the building location (i.e. footprint);
(5) A "lot shot" elevation within the "building envelope"/ building footprint line; and
(6) Contours (labeled with elevations on each) of the lot.

4. Water Plans

a) _____ Plans show all fittings, fire hydrants, and valves including sizes. Each appurtenance are properly labeled.

b) _____ The location of fire hydrants will be coordinated with the Fire Life Safety Division by the Department of Public Utilities. Fire hydrant locations comply with design guidelines.

c) _____ All conflicts with storm sewers and other utility lines are shown with appropriate design changes shown.

d) _____ A minimum of eighteen (18) inches of vertical clearance has been designed and obtained at all crossings of other utilities, or as specified by other utility agencies, or otherwise approved by the Utilities Department.

e) _____ All water lines have a minimum of 3.5' of cover.

f) _____ Fire hydrants and air relief valves are shown on plans and profile.

g) _____ Hydrants or blow-off valves are designed at major low places in the line where possible and air release valves are designed at the high points.

h) _____ Blowoff devices (flushing hydrants) are designed at the end of all lines in cul-de-sacs. Location of hydrants comply with guidelines outlined in design standards.

i) _____ All water services are shown in accordance with the design standards.

j) _____ Plans show all connections to the existing subdivision mains, etc.

k) _____ Engineer has designed water system in accordance with available pressures and has provided fire flow and pressure calculations, in accordance with Appendix 14.

l) _____ Line location is shown 4' from face of curb or 2' off pavement where there is ditch.

m) _____ Pipe sizes noted on plans.

n) _____ Ditch lines are shown on the plan and depth of ditch(s) are shown on the profile at the fire hydrant locations and service lines, where necessary.

o) _____ Water line stubs for future extensions are designed to be installed beyond the edge of pavement.

p) _____ Location of water meter boxes are shown outside of non-vehicular traveled areas. Where it is not possible to locate the boxes out of the traveled areas. Where it is not possible to locate the boxes out of the driveways, and/or vehicular traveled area, a cast iron box is specified.

q) _____ For water line tie-ins, the engineer has shown the valve to be used for cut off during the tie-in. Where tapping the main line vs. cuttings in a tee is applicable, the engineer has evaluated which method will be used as outlined in the County's Design Standards.

r) _____ Knockdown meter box shall not be located within any travel areas.

s) _____ Water line profiles are shown.

Date: _____

Engineering Firm: _____

Engineer's Name: _____
(Print Name)

_____
CERTIFICATION

CHESTERFIELD COUNTY

CHESTERFIELD COUNTY

DEPARTMENT OF UTILITIES

RIGHT OF WAY OFFICE

P. O. BOX 608, CHESTERFIELD, VA 23832-9998

PLAT CHECKLIST

DATE	JOB NO.
COUNTY PROJECT NO.	
RE:	

TO: _____

_____

_____

THE ATTACHED PLAT(S) REQUIRE REVISIONS FOR THE FOLLOWING REASONS:

- ☐ CURRENT OWNER(S) NAMES
- ☐ DEED/WILL BOOK AND PAGE NUMBERS
- ☐ PARCEL IDENTIFICATION NUMBER (15 DIGITS)
- ☐ PARCEL STREET ADDRESS
- ☐ SUBDIVISION NAME, SECTION, BLOCK, LOT, AND PLAT BOOK AND PAGE NUMBERS
- ☐ DEED/PLAT BOOK AND PAGE NUMBERS ON EXISTING EASEMENTS
- ☐ ADJACENT PROPERTY OWNERS, WITH SUBDIVISION NAME, SECTION, BLOCK, LOT AND PLAT BOOK AND PAGE NUMBERS (IF APPLICABLE)
- ☐ ROAD WIDTHS, ROAD NAMES, ROUTE NUMBERS DEED/PLAT BOOK AND PAGE NUMBERS
- ☐ TYPE OF EASEMENT
- ☐ METES AND BOUNDS OF VARIABLE WIDTH EASEMENTS AND ALL PARCELS TO BE CONVEYED BASED ON THE VIRGINIA STATE PLANE COORDINATE SYSTEM, SOUTH ZONE NAD83 (CENTERLINE DATA IS ACCEPTABLE FOR STANDARD WIDTH EASEMENTS)
- ☐ CURVE DATA AND CHORD BEARING AND DISTANCE
- ☐ 2 COORDINATE POINTS ON EACH EASEMENT OR PARCEL TO BE CONVEYED
- ☐ TIE TO PROPERTY CORNERS AND AN EXISTING PHYSICAL INTERSECTION
- ☐ PROJECT NUMBER
- ☐ SITE PLAN/CASE NUMBER
- ☐ NORTH ARROW (NAD83 NOTED)
- ☐ MAGISTERIAL DISTRICT, COUNTY, STATE
- ☐ SIGNED SURVEYOR'S/ENGINEER'S SEAL
- ☐ DATE/REVISED DATES
- ☐ STANDARD ENGINEER'S SCALE AND BAR GRAPH (1" = 10', 20', 30', 40', 50', 60', 100', 200') (METRIC 1:100, 200, 250, 300, 400, 500)
- ☐ SIZE (BETWEEN 8 ½" x 11" AND 18" X 24")
- ☐ TITLE
- ☐ SEE PLAT

COMMENTS: _____

_____

_____

_____

PLEASE MAKE THE INDICATED REVISIONS AND SUBMIT THE REVISED PLATS TO THIS OFFICE FOR PROCESSING.

FROM: _____

TITLE: _____

PHONE: _____

Revised 1/2010

APPENDIX 5

REVIEW PROCEDURE FOR WATER AND/OR SEWER PLANS
(Developer Projects)

Prior to construction of public water and/or sewer facilities and issuance of any building permits, water and/or sewer plans must be submitted to and approved by the Department of Public Utilities.

A. It is required for water and sewer projects, that the engineer arrange a meeting with the Department of Public Utilities, Chesterfield Courthouse, Chesterfield, Virginia 23832, (804) 751-4440, to discuss the approach to be taken to supply water and sewer service. All water and sewer systems must be sized properly and the location designed to provide sewer and water availability to the entire service area. An overall water and sewer plan shall be submitted for development.

B. The water and sewer plans must be designed by a Professional Engineer in Civil Engineering or Professional Surveyor with a Class B license who is registered by the State of Virginia. The plans must conform to the County's latest overall water and sewer master plan and the Engineers Checklist for Water and Sewer Plans (see Appendix 4).

C. Prior to approving the water and/or sewer plans, the Environmental Engineering Department must approve the erosion control plan for the water and/or sanitary sewer installations.

D. The engineer shall coordinate the location of all proposed water and/or sewer lines within all existing and proposed road rights-of-way with regard to existing and proposed roads and drainage structures. In addition, coordination shall be made with other appropriate utility companies and agencies, i.e., Virginia Power, C&P, gas companies, railroad rights-of-way, VDOT, State Health Department, etc. with regard to their existing easements, rights-of-way, and facilities.

E. The engineer must submit a copy of the checklist with his/her certification that the plans reflect all applicable items on the checklist. The plans will be reviewed and a review letter will be sent to the engineer with a copy to the developer. When the revisions are made, the engineer must resubmit the plans for final review. A letter of approval will be sent when all the County criteria are met. Four sets of additional plans shall be sent once all the approvals are granted for construction purposes.

F. Prior to the beginning of construction, all water and/or sewer easements outside the boundaries of the new subdivision and/or within a complex not recorded by a subdivision plat, must be dedicated to the County. The developer is to provide a check payable to the Clerk of the Circuit Court in the amount of the recordation costs when the executed easements are returned to the Chesterfield County's Right-of-Way Section. The Right-of-Way Section will calculate the charge and inform the developer. When a VDOT permit is required to install the water and/or sewer line, the engineer needs to follow the "Review Process for Water and Sewer Lines in VDOT's Right-of-Way" (see Appendix 6). A letter from VDOT accepting the location of the water and sewer lines in the right-of-way and design of the pavement replacement is required prior to approval of the water and sewer plans. The developer is responsible to have a copy of the highway permit sent to the Department of Public Utilities prior to the start of construction within the VDOT highway.

G. The developer must enter into a Contract with the Department. A copy of the accepted bid proposal and a completed copy of "Information for Utilities Contract form" are required to prepare the Contract. The unit price bid proposals shall be based on the approved water and sewer plans and all work must be performed by an acceptable licensed utilities contractor. Where County refunds are in the contract, the developer is required to adhere in strict accordance with the current policies and ordinance. The Board of Supervisors must approve the contracts where refunds are involved, prior to the contractor beginning construction. The developer needs to allow sufficient time (2-3 weeks) for the contracts with refunds to be approved by the Board of Supervisors.

H. Before the utilities contractor can start work, a road grade certification must be furnished by the engineer. It shall include his verification that the entire proposed road rights-of-way where water lines are proposed have been graded as required in Appendix 1. Also, prior to the release of any on-site work, County Environmental Engineering Department must approve the erosion control devices for the subdivision.

I. Upon meeting all the above criteria, plans will be turned over to the Construction Section for the issuance of notice to proceed. The contractor must give the Inspection Section at least 48 hours notice before construction may begin. At such time, a pre-construction meeting may be required and if so, shall be arranged by the contractor and the Inspection Section. Notification shall be given to the Principal Engineer at 748-1576.

APPENDIX 6

REVIEW PROCESS FOR WATER AND SEWER LINES IN VIRGINIA DEPARTMENT OF TRANSPORTATION'S RIGHT-OF-WAY

1. Horizontal location of proposed water and/or sewer lines within the existing VDOT right-of-way will be reviewed and approved by VDOT. In addition, the pavement replacement detail must be approved by VDOT.

2. The Engineer and/or his agent will be required, with VDOT's assistance, to determine the type of existing pavement. **In order to determine the type of existing pavement, VDOT shall require corings to be taken every 1,000 feet** +/-.

3. The Engineer will be required to submit to the VDOT the applicable sheets of the proposed water and/or sewer plans which reflect the proposed lines in relation to the existing right-of-way plus show and identify the type of pavement that exists along with any sample pavement corings.

4. VDOT and the County will discuss any pavement replacement requirements that do not conform to the "Description of Water and Sewer Lines in the Right-of-Way" last dated or any requested shift in the alignment.

5. Prior to the water and/or sewer plans being approved by the Department of Public Utilities, VDOT will send a written response (with a copy being sent to the Utilities Department) to the Engineer within 15 days with their comments and/or approval of the water and/or sewer line (s) location and pavement replacement detail.

6. Prior to the release of water and sewer work, County's Environmental Engineering Department shall approve the erosion control measures proposed within State Right of Way.

APPENDIX 7

SITE PLAN REQUIREMENTS
FOR WATER AND/OR SEWER MAIN LINE EXTENSIONS

1. The location of the existing sewer main and water lines must be shown on the site plan.

2. The exact location of the existing sewer (lateral) connection and/or water service and box must be shown, making reference to the length, depth and station location of the sewer lateral and the relationship of the water and sewer services and appurtenances with the existing, proposed and future buildings, etc. Also, show size of existing water meter where applicable.

3. Existing and proposed water and sewer line easements must be shown on the site plan and Engineer needs to make sure there are no buildings or other permanent structures encroaching onto easements. Also, if there are any other type of structures and/or activities proposed i.e., storm sewers, retaining walls, grading, curb and gutter, concrete paving, obstacles (garbage pads, light posts, and other utility lines) etc., the Engineer shall make site design changes and take appropriate measures to protect the existing water and/or sewer line and its' appurtenances.

4. Existing plumbing from building to connection and/or water meter must be shown. Proposed plumbing from building to sewer connection and/or new water meter must also be shown.

5. When the site plan reflects the installation of a new sewer connection, the appropriate notes outlining the Utilities Department's requirements for installing a connection must be shown on the plan. The point where the utilities contractor stops his work and the plumber begins needs to be clearly denoted on the plan.

6. Site plan needs to clearly reflect the proposed "Fill" and "Cut" areas. Engineer is to analyze how it will affect the existing and/or proposed water and/or sewers and submit his evaluation and recommendation with the site plan in writing for review and approval by the Department's Review and Design Section.

7. Adjustment of water and sewer appurtenances will require notes, i.e., notifying the Inspection Section at 748-1576 to inspect any adjustments, that an acceptable licensed Utilities Contractor perform all utility work, etc.

8. Engineer must be aware of where proposed and future water and/or sewer extensions are needed and show this information on the plans and reflect sufficient (minimum of 16' permanent and 10' construction for water lines and/or 16' permanent and 20' construction for sewer lines) easement width for future water and/or sewer extensions. A separate easement plat needs to be submitted to the Department of Public Utilities and an agreement will be prepared by the Right of Way Section for developer to obtain necessary signatures. All onsite and offsite water and/or sewer easement(s) for future improvements where septic tanks and/or wells are being used, and offsite utility easements where proposed extensions are needed to serve the site must be recorded prior to the release of the building permit. Normally, the site plan will not be approved until the offsite easement is dedicated.

9. Where additional Road R/W and/or widening is proposed, the site plan needs to reflect the extension of the existing sewer (lateral) connection and/or existing water service and meter box just beyond new R/W line.

10. A water meter sizing form must be submitted to the Department of Public Utilities for commercial properties connecting to public water where existing and/or new services are proposed. Applicant must complete all spaces on the sizing form prior to submitting it to the Department's New Construction Section.

11. If the existing water meter size needs to be decreased or removed due to change in water demand, a letter from the Developer is required authorizing the County to either replace the existing meter with a smaller meter or remove the meter at Developer's expense.

12. For all new building additions with proposed water and sewer facilities, the engineer needs to submit a "Water Meter Sizing Form" for the addition as well as the existing building to determine if the existing water meter size is sufficient for new water usage. At that point the Developer should be aware that additional water and sewer connection fees are required.

13. Engineer shall provide all calculations necessary to support the sizing of the proposed water improvements that provide both fire and domestic demands being placed on the site.

    Determination of existing water line pressures will require engineer's coordination with appropriate staff in the Department of Utilities. Such coordination requires written request being sent to the Department. Fire flow requirements and approvals are the engineer's responsibility to coordinate with appropriate staff in Fire Life Safety Division. Also, see Appendix 14 for procedures to follow.

14. Engineer shall note the IFC requirements on the site plan.

15. If an underground fire line is proposed, engineer must show the proposed water line tie-in and the proposed location of the double-check assembly.

16. Schematic Plans will be reviewed by the Department's Utilities Planning Section. As a minimum, all plans must reflect the following information:

    1. Vicinity map - scale 1: 2000';

    2. Tax Identification Number(s) (formerly known as the Tax Map and Parcel Numbers);

    3. Development name

    4. Conceptual layout of water and sewer;

    5. Existing easement, including deed book and page number;

    6. Proposed easements.

SITE PLAN CHECKLIST
(NOTE: Below is an excerpt from the approved Chesterfield County Site Plan Checklist, however Engineer must submit plans based on THE LATEST Site Plan Checklist.)

PROJECT _____

TAX ID# __ __ __-__ __ __-__ __ __-__ __ __ __ **DATE** _____
(Formally known as the Tax Map & Parcel Numbers)

UTILITIES

1. _____ Sheet index and materials list provided.

2. _____ Legend of sanitary sewer and water lines, other utilities and structures existing and proposed ground and pavement profile. Profile information must be shown on profile sheet.

3. _____ The utility plan includes an overall plan of the water and sewer layout, including any phasing of the development.

4. _____ Engineer and/or Surveyor has notified all off-site property owners where water and sewer easements are existing (copy of such notification is attached).

5. _____ Water and Sewer Notes (as a minimum, reference has been made to County Standards, Specifications and details).

6. _____ Vertical scale is 1" = 5' or 1" = 10' ; and horizontal scale is 1" = 50' or as approved by the County.

7. _____ All water and sewer designs conform to the latest County, State and Federal regulations or standards.

8. _____ If irrigation and/or fire suppression is required, show how the water is to be obtained.

9. _____ All water, sewer, road and drainage structures are shown on one plan sheet, where applicable. May require larger scale to adequately obtain horizontal integrity.

10. _____ Existing water and/or sewer lines are properly labeled with size, type material and County project number and with horizontal and vertical distances referenced on the plan.

11. _____ A bench mark is required on the site plan.

12. _____ All existing easements are shown accurately and proposed utility easements are shown on plans. The existing easements reflect accurate recordation information.

13._____ All existing and proposed storm sewer lines, gas, telephone, power, and other utility lines, which cross or run parallel to the sewer or water lines, are shown with exact horizontal and vertical separations given, where applicable. Subsurface exploration has been performed where potential conflicts exist, where applicable.

14._____ Adjacent road and drainage projects are shown as required.

15._____ Consideration has been given to areas where roads and drainage structures may be lowered in the future.

16._____ Plan and profile are drawn in the same direction. Stations shall ascend from left to right.

17._____ Proposed utilities lines are shown with reference distances from right of way, boundary, buildings, other utility lines, etc.

18._____ Locations of existing houses, buildings, fences, wells and other structures as shown on the plans.

19._____ Locations of special features (conc. Encasement, rip-rap stabilization at creek crossings, clay dams, etc.).

20._____ All fill and cut areas are shown for sewer and water.

21._____ Location and size of all water and sewer connections.

22._____ Miss Utility notation is shown.

23._____ All revisions shall include an explanation either on the plans or by separate transmittal.

24._____ All sanitary sewer plans are labeled with size, grade, length, direction of flow, and type and class of pipes (with backup calculations on the type and class pipe needed, where applicable).

25._____ Manholes shall be labeled with top and invert elevations; coordinates; and location, size and inverts of drop stacks when a vertical drop exceeds two (2) feet.

26._____ Deflection angles at all manholes or bearings of all lines are shown the plans.

27._____ A sewerage drainage area map with hydraulic analysis is included in plans, if applicable.

28._____ The engineer has field verified the inverts of the existing manhole(s). If the invert is different from the as-built plan, the engineer will verify his survey work and notify the Utilities Department of the discrepancy.

29. _____ All manholes are designed to an elevation above the 100 year flood plain elevation as set forth in the design standards, unless otherwise approved by the Utilities Department.

30. _____ Ground coverage over sewer pipe meets minimum criteria.

31. _____ Engineer has put a notation that a backwater valve is to be used where the building with a finished floor elevation of the building is below the top elevation of the nearest upgrade manhole from the building connection.

32. _____ Where the sewer lines are in excess of 12' deep, the Engineer has identified where the sewer lateral must be installed in accordance with the standard details and the appropriate notes are reflected on the plans.

33. _____ Maintain greater than the 0.4% minimum slope whenever possible.

34. _____ Solid lines have been used for proposed sewers, short dashed lines for existing sewer and label future sewer or portions covered under other phases of construction.

35. _____ A minimum of ten (10) feet horizontal separation is maintained between sewer lines and water lines, sewer laterals and water meters or water blowoff devices (flushing hydrants) and between sewer line and storm drainage structures, unlessotherwise approved by the Utilities Department.

36. _____ All silt basins and BMP's are shown and the sewer lines and manholes have been designed around these structures, unless otherwise approved by the Utilities Department.

37. _____ All existing sewer laterals are shown on the plans, with station, length and depth, as depicted on the as built plans.

38. _____ All sewer lines are designed with the entry into the manhole by the proposed sewer lines at an angle of 90° or greater to the downstream line, or if an exception has been granted, the engineer has increased the drop through the manhole to compensate for the reduced angle and has provided an blowup detail for the appropriate invert shaping that achieves the same results as a 90° or greater entry.

39. _____ The crowns of all sewer lines enter the manholes at crown's level or higher as specified in the design standards.

40. _____ Where new manholes are proposed over existing lines, distance from the new manhole to the two existing manholes is shown; inverts of the manhole and each existing manhole are shown; slope of existing line from the new manhole to upstream and downstream existing manholes is shown.

41._____ All manholes proposed within areas where vehicles travel are to be located either on center line of the road or center of the traveling lane.

42._____ Sampling manholes are required for new facilities currently regulated by local or federal industrial waster pretreatment laws. Appropriate measures have been included in the design to allow for sampling of industrial waste. A sampling manhole shall be provided at the property line to facilitate random 24-hour composite sampling. In those cases where a private manhole on site can be utilized for this function, adequate provisions will be agreed upon to facilitate sampling. Provisions include ingress/egress to the private manhole, ability to sample, and adequate space to set a 24-hour composite sampler. Existing on site manholes, possibly inside buildings, will be approved on a case by case basis.

43._____ At all existing manholes, the engineer has provided the manhole number as reflected on the as-builts, and the County project number associated with the existing manhole.

44._____ Plans show all fittings, fire hydrants, and valves including sizes. Each appurtenance is properly labeled.

45._____ A minimum of eighteen (18) inches of vertical clearance has been designed and obtained at all crossings of other utilities, or as specified by other utility agencies, or otherwise approved by the Utilities Department.

46._____ All water lines have a minimum of 3.5' of cover.

47._____ Fire hydrants and air relief valves are shown on plans and profile.

48._____ Hydrants or blow-off valves are designed at major low places in the line where possible and air release valves are designed at the high points.

49._____ All water services are shown in accordance with the design standards.

50._____ Engineer has designed the water system in accordance with available pressures and has provided fire flow and pressure calculations in accordance with Appendix 14.

51._____ Pipe sizes noted on the plans.

52._____ Ditch lines are shown on the plan and depth of ditch(s) are shown on the profile at the fire hydrant locations and services lines, where necessary.

53. _____ Water line stubs for future extensions are designed to be installed beyond the edge of pavement.

54. _____ Location of water meter boxes are shown outside of non-vehicular traveled areas. Where it is not possible to locate the boxes out of the driveways, and/or vehicular traveled area, a cast iron box is specified.

55. _____ For water line tie-ins, the engineer has shown the valve to be used for cut off during the tie-in. Where tapping the main line vs. Cutting in a tee is applicable, the engineer has evaluated which method will be used as outlined in the County's Design Standards.

56. _____ Necessary easement plats on-site and/or off-site have been submitted for processing by the right of way section. Plats conform to the requirements reflected on Exhibit A in Appendix 4.

57. _____ The engineer understands that any changes made to the road, drainage, water and/or sewer design will require a submittal to the Utilities Department for review and approval of the revised water and sewer plans reflecting those changes.

58. _____ If the waterline is greater than sixteen inches in diameter and/or the sewer serves over 400 people, plans need to be submitted to the Virginia Department of Health for review and approval. A copy of the transmittal letter must be attached to the engineer's checklist when the checklist is submitted.

59. _____ If horizontal bore is required, bore location, length of bore, pit location (average 8' x 35') are shown and shown in relation to all existing and/or proposed utilities on the plan and profile.

60. _____ Utility plans reflect those conditions as approved by the Planning Commission/Board of Supervisors.

61. _____ Engineer has contacted Virginia Power and received as-built information. Utility plans reflect this information accurately and is in accordance with the "Overhead High Voltage Line Safety Act."

62. _____ A NOTE stating that the contractor must field verify the inverts of all existing manholes, gas lines, other utility lines prior to the start of construction.

63. _____ All pipe between manholes are of like material and class.

64. _____ Knockdown meter box shall not be located within any travel areas.

65. _____ Water line profiles are shown.

SITE UTILIZATION SURVEY FORM

CHESTERFIELD COUNTY
INDUSTRIAL WASTE PRETREATMENT PROGRAM
DEPARTMENT OF UTILITIES
P.O. BOX 608
CHESTERFIELD COUNTY, VIRGINIA 23832-9998

BUSINESS NAME: _____ **ACCOUNT NUMBER:** _____

SERVICE ADDRESS: _____ **SIC CODE #** _____
(Standard Industrial Classification)

MAILING ADDRESS: _____ **SIC CODE TITLE/DESCRIPTION/GROUP:**

(City/ County) _____ (State) _____ _____

PHONE NUMBER: ( ) _____

CERTIFICATION STATEMENT
I CERTIFY THAT THE INFORMATION PROVIDED IS TRUE AND REPRESENTS, TO THE BEST OF MY KNOWLEDGE, THE INFORMATION REQUESTED. I ALSO ACKNOWLEDGE THAT I AM THE MOST QUALIFIED PERSON ON SITE TO ASSESS THE OPERATIONS OF THIS BUSINESS.

SIGNATURE	TITLE	COMPANY NAME	DATE

PRINT or TYPE NAME

QUESTIONS	YES Y	NO Y
Does the facility utilize Chesterfield County's Sanitary Sewer System? **If YES, please answer the following:** Average Estimated Daily Wastewater Discharged _____ Gallons/CCF per day (You may write in the CCF total from your most recent water bill in lieu of gallons per day) Total Number of Employees _____	___	___
Are hauled waste services utilized at any time of the year? **If yes, please check all that apply:** Septic Tank _____ Grease Trap _____ Grit Trap _____ Oil/Water Separator ____ Other: (describe) _____	___	___
Is this facility located in a strip mall or other multi-unit building?	___	___
Does your business discharge, or have the potential to discharge, a waste product to the sewer system *OTHER THAN* normal sanitary wastewater?	___	___

5. Provide a brief description of the business(es) at this address. Also, list any operations or processes which may be associated with this address.

_____

_____

_____

_____

6. Please list all chemicals and raw materials that are used/stored at the site: **(Attach a list if necessary)**

Name of Chemical/Raw Material	Quantity Stored Onsite	Common Use for Chemical at Site

7. Please check all that apply to the site.

	Aluminum Forming		Glass Manufacturing		Petroleum Refining
	Asbestos Manufacturing		Industrial Launderer		Pesticide Manufacturing
	Battery Manufacturing		Ink Formulating		Pesticide Formulating & Packaging
	Builder•s Paper and Board Mills		Inorganic Chemicals		Pesticide Applying, Storage, Distribution, & Selling
	Carbon Black Manufacturing		Iron & Steel		Pharmaceuticals
	Centralized Waste Treatment		Leather Tanning & Finishing		Photographic Processes
	Coal Mining		Machinery Manufacturing & Rebuilding		Porcelain Enameling
	Coastal Oil & Gas		Metal Finishing		Pulp, Paper & Paperboard
	Coil Coating		Metal Molding & Casting		Rubber Manufacturing
	Can Making		Nonferrous Metals Forming		Soap & Detergent Manufacturing
	Copper Forming		Nonferrous Metals Manufacturing		Steam Electric
	Electrical & Electronic Components		Onshore/Stripper Oil and Gas		Timber Products
	Electroplating		Organic Chemicals, Plastics & Synthetic Fibers		Textiles
	Ferroalloy Manufacturing		Paint Formulating		Vehicle Washing
	Fertilizer Manufacturing		Paving and Roofing		
NATURE OF BUSINESS					
	Manufacturing/Processing		Warehouse/Wholesale Distribution		Packaging/Repackaging
	Service Related		Offices Only		Retail

DEPARTMENT OF UTILITIES

CHESTERFIELD COUNTY, VIRGINIA

PROCEDURE FOR ESTIMATING CUSTOMER WATER DEMAND

Owner’s Engineer or authorized agent shall:

1. Determine the number and type of water fixtures needed and list on the "Sizing Water Service Lines and Meters" form where applicable (Attachment A).

2. Determine the combined fixture value: Multiply the fixture values times the number of fixtures to obtain the Total Fixture Value for each type of fixture. Add all Total Fixture Values and place the answer on the Combined Fixture Value Total Line.

3. Substantiate all other demands with data furnished by the owner's engineer and/or his agent. If it is necessary to have a fixed demand and/or an irrigation demand, owner's engineer and/or his agent must complete Part B of the sizing form.

   Caution: The person completing Part B of this form needs to include all water demands necessary for the buildings and/or its' intended use. For conversion from Combined Fixture Value to gpm, refer to Figures 4.2 and 4.3 of the AWWA Manual of Water Supply Practices No. M 22, latest revision.

4. Upon completion of this form, send to the following address:

   Chesterfield County Department of Utilities
   Development Section
   P.O. Box 608
   Chesterfield, Virginia 23832-0009

County shall determine:

1. If you install water saving flush valve water closets, the County's virtual meter policy may apply.

2. County will size the service based on the information provided by the Owner’s Engineer or authorized agent.

SIZING WATER SERVICE LINES AND METERS
DEPARTMENT OF UTILITIES CHESTERFIELD COUNTY, VIRGINIA

Business Name:	Address of Building:	
Development Name:	Project Number	Type of Use _____ Map I.D. No. _____

I certify that the information on this form is true and correct.
Applicant Name (Print) _____ Phone # _____
(Signature) _____ (Local Phone # Desired)

****

PART A Fixture	Fixture Value 60 psi		No. of Fixtures		Total Fixture Value
Bathtub	8	X	_____	=	_____
Bedpan Washers	10	X	_____	=	_____
Bidet	2	X	_____	=	_____
Dental Unit	2	X	_____	=	_____
Drinking Fountain – Public	2	X	_____	=	_____
Kitchen Sink	2.2	X	_____	=	_____
Lavatory	1.5	X	_____	=	_____
Showerhead (Shower Only)	2.5	X	_____	=	_____
Service Sink	4	X	_____	=	_____
Toilet - Flush Valve	35	X	_____	=	_____
- Tank Type	4	X	_____	=	_____
Urinal - Pedestal Flush Valve	35	X	_____	=	_____
- Wall Flush Valve	16	X	_____	=	_____
Wash Sink (Each Set of Faucets)	4	X	_____	=	_____
Dishwasher	2	X	_____	=	_____
Washing Machine	6	X	_____	=	_____
Hose (50 ft Wash Down) - ½ in.	5	X	_____	=	_____
- ⅝ in.	9	X	_____	=	_____
- ¾ in.	12	X	_____	=	_____
Combined Fixture Value Total					_____

****

PART B	Line		
	1. Domestic Demand (Verification by County Staff - See Conversion Table)	=	_____gpm
	2. Fixed Demand (To include all demands except for domestic & irrigation)	=	_____gpm
	3. Irrigation Demand (From Data Supplied by Site Engineer)	=	_____gpm
	4. Total Demand	=	_____gpm
	5. Meter Size based on Total Demand (Verification by Co. Staff - Use Water Meter Sizing Table – Attachment B of Development Section Procedure #344)	=	==========

****

COUNTY USE ONLY

Actual Meter Size _____ Virtual Meter Size _____
Sized By _____ Date _____ Public Sewer Ready Yes____ No____
Treatment Plant _____

PROCEDURES FOR INSTALLING 6 INCH LATERALS

TO EXISTING SANITARY SEWER LINES

When it is necessary to tap the main sewer line and install a 6 inch sewer connection, the following guideline shall be adhered to:

1. The work shall be done by an approved utilities contractor specializing in the installation of public water and sewer lines. Upon request, the County will furnish a list of known utilities contractors acceptable to the County to perform such work.

2. If a water line is to be crossed, the tap must be made on Monday - Thursday.

3. The contractor shall notify the Utilities Department's Chief Inspector (768-7354) 48 hours prior to beginning construction.

4. When tapping the sewer line, a mechanical hole cutter and an approved saddle must be used. The tap must be made so that the 6 inch connection will enter the main line on a slope no greater than 45 degrees. No connection shall be cut into the top of a sewer line.

5. When tapping into a manhole, bring the 6 inch connection in above the shelf, but no higher than two feet above the lowest invert. A channel to carry the flow from the connection must be built inside the manhole.

6. The 6 inch connection is to be constructed only to the property line and/or the edge of the easement in which the main sewer line lies, or as directed by the inspector.

7. The contractor is responsible for damages to any existing utilities and shall have in his possession and/or furnish evidence upon request of having sufficient insurance to cover any damages that may occur.

8. Work in the State Right of Way:

   a. The VDOT must grant permission to install a sewer lateral within their right of way. The utilities contractor is responsible for making application to Virginia Department of Transportation for permission to install a 6 inch connection within their right of way and for providing the Chief Inspector a copy of the permit before commencing work.

   b. Use the necessary signs and barricades to divert traffic.

   c. One-way traffic must be maintained at all times.

d. The trench must be backfilled with 21A stone, and compacted as required.

e. Pavement should be replaced within 24 hours. All paving is to be done in accordance with State Highway Department specifications.

f. On streets subject to school bus traffic, work should be done only between 9:00 A.M. and 3:00 P.M.

PRIOR TO CONNECTING SEWER LINES FROM A HOME OR BUSINESS TO THE 6 INCH CONNECTION, A SEWER CONNECTION FEE MUST BE PAID AND ALL THE ABOVE REQUIREMENTS MUST BE MET. BUILDING INSPECTOR'S OFFICE MUST BE NOTIFIED FOR INSPECTION.

Any deviations from these guidelines must be approved by the Chesterfield County Utilities Department.

APPENDIX 8

FIRE SPRINKLER SYSTEM REQUIREMENTS

Commercial/Industrial

All fire sprinkler system services may be un-metered and shall be equipped with an approved backflow preventer to assure protection of the public water supply from contamination. Backflow prevention devices will be installed in an approved vault as near to the property line as possible. The Utilities Department maintenance responsibility will end immediately preceding the inlet gate valve of the assembly.

1. The Department of Public Utilities will perform plan review of the proposed water line extension up to the first OS&Y gate valve located on the inlet side of the backflow preventer and also the plan review of the backflow assembly itself to assure the proper device is installed per regulations. For pipe runs greater than 100 L.F.(from main to the vault) a gate valve shall be installed at the main at the tee. In all cases, the Engineer shall provide details illustrating what type of anchoring will be used on the inlet side of the assembly, so that the OS&Y valve (inlet side) of the backflow preventer will not blow off when the device is removed.

2. The Fire Life Safety Division will review from the OS&Y gate valve located on the inlet side of the backflow preventer up to and including the building. The Fire Life Safety Division will also review the vault for compliance. A separate plan submission is required for Fire Life Safety Division approval. In addition, the submittal to the Fire Life Safety Division shall include underground pipe size, length, location, weight, materials, point of connection to County main, vault details, and what type of restraining devices (thrust blocks, retainer glands, etc.) will be installed.

3. An auxiliary fire permit issued by the Building Inspector's Office, along with four (4) sets of plans, is required for the work from the vault to the building and shall be applied for by the installing contractor from the Building Inspector's office and plans submitted to and reviewed by the Fire Life Safety Division.

4. The Fire Life Safety Division will review the location of the vault for the backflow preventer at such time a utilities plan is submitted to the Department of Public Utilities.

5. The vault shall be located at or as near to the property line as possible and out of the main flow of traffic.

6. The vault shall be designed and constructed in accordance with Utilities Department Specifications Standard Details.

The location will be reviewed by both the Department of Public Utilities (Review and Design Section) and Fire Life Safety Division for optimum placement. The review of the site plan is not a detailed review of the water and sewer design when it involves the relocation and/or extension of the public system. However, the site plan (the applicable sheets of the site plan) must reflect the approved water and sewer design and show the exact location of the existing facilities. Therefore, it is important that the Engineer submit utilities plans directly to the Department of Public Utilities at the same time or as near that time to avoid any unnecessary delays in the approval of the site plan and release of the building permit.

Installation of backflow preventer assemblies other than at the property line shall be approved by the Fire Life Safety Division. In these instances a gate valve will be installed at the property line and/or edge of water line easement to designate the point at which Utilities Department responsibility ends.

Under any circumstances where a Siamese connection is required, it will be installed on the outlet side of the backflow preventer assembly.

Upon making application for water service, applicants who wish to separate his fire line service must have this reflected on the site plan and the Utility plan (Engineer is required to submit for review and approval a separate utility plan to the Utilities Department's Review and Design Section) indicating the size line needed for the fire demand and the size water meter and service line for the domestic use. The installation of 2" and smaller fire line and water meter service line and box must comply with the applicable details in the Standard Details Section. The applicant must indicate clearly on the water meter sizing form his desire to separate the fire service, otherwise, the water meter and appurtenances will be installed without regard to fire service and applicant will be subject to additional expense to correct the situation.

Where the applicant can not accomplish combining the fire/domestic services in the manner described above and/or a separate fire line is needed where there already exists a water meter service, all work must be performed by a licensed utilities contractor approved by the Department of Public Utilities.

Residential

This section is intended for use exclusively to meet the requirements for NFPA 13D – *Standard for the Installation of Sprinkler Systems in One & Two-Family Dwellings and Manufactured Homes.*

Water services for all other residential fire sprinkler systems are handled in accordance with the Commercial/Industrial section of this requirement.

1. Each lot intended for a single family residence will be supplied through a maximum of a one-inch (1″) water service and a maximum of a one-inch (1″) water meter.

2. Companion meters used for outside irrigation will not be allowed to be connected to the water service line for a meter serving a residence equipped with a sprinkler system.

3. The fire sprinkler system design engineer shall use the same water pressure data that was used for the design of the public water system for that residential development.

4. The Fire Life Safety Division will be the sole approving authority for the design of all residential sprinkler systems and they must approve the type of system (multi-purpose or separated) to be installed.

5. If a residential unit is equipped with a multi-purpose system, the Fire Life Safety Division will notify the Utilities Department – New Construction Supervisor in writing, to tag the water service account as such and also state this on the meter application. When the water meter is installed, a water resistant tag will be attached to the lock ring on the meter yoke stating “Fire sprinkler system supply.”

6. If a residential unit is equipped with a separate sprinkler system, the Fire Life Safety Division will notify the Utilities Department – Cross Connection Coordinator in writing and advise us of the type of system installed and the location. This type of installation will require an approved backflow prevention device to be installed and maintained in accordance with the Utilities Department Cross Connection Control and Backflow Prevention Program.

7. The cost associated with retrofitting the water service to accommodate a separated fire sprinkler system will be the responsibility of the builder.

8. To eliminate the potential for water theft the Utilities Department highly recommends the installation of a flow switch with an audible alarm to be mandatory on all separated residential sprinkler systems. The flow switch shall be installed downstream of the backflow device.

APPENDIX 9

STANDARD PROCEDURES
for
The Acceptance of Newly Constructed
PUMPING STATIONS

I. Pre-Construction Phase

A. A pre-construction meeting is set up by Inspection for both County and Developer projects.

1. This meeting will include the Engineer, the Inspector, Contractor, and the Owner.

2. The Contractor will furnish to the Inspector a detailed construction schedule.

3. Discuss preparation of operations and Maintenance Manual and subsequent application from Water Control Board for Certificate of Operation.

4. Minutes will be furnished by the Engineer.

B. A Notice to Proceed is issued by Design Section to the Contractor.

II. Construction Phase

A. Daily, thorough inspection of construction carried out by the Inspector.

1. The Inspector will be responsible for daily reports addressing project status and construction problems which may evolve.

2. In the case that the project is not progressing on schedule, the Inspector is to send a written notification to the Owner, with a copy to the Contractor, the Design Section, and the Engineer addressing this problem.

B. Monthly meetings will be set up by the Inspector which will include the Engineer, the Contractor, and the Inspector with the minutes supplied by the Engineer.

C. Once the construction is complete, we will require a letter of completion from the Owner/Owner's Agent insuring that all work has been completed, which will include Virginia Power work, water services, C&P work, telemetering, etc. This letter will include the Building Inspectors Office Approval. This letter will also request a start up inspection ten days in advance. This letter is to be sent to the inspector.

III. Start Up Inspection

A. Inspection sets up a start up inspection by sending a written notification to the Engineer, the Contractor, the Operation and Maintenance Section, the Design Section, and the owner where applicable.

B. An extensive inspection is carried out by the Design Section, Operations and Maintenance, Inspection, and the Engineer.

1. All equipment is to be operated.

2. All other facilities per plans and contract documents are inspected.

3. The Inspector develops the punch list by using the attached checklist.

C. Inspection will write a letter addressing all deficiencies and send it to the Owner/Owner's Agent with a copy to the Contractor, the Engineer, the Operations and Maintenance Section, and the Design Section. This letter will also request a time frame for repairs.

1. This letter will come from the Chief Inspector and the Inspector.

2. The Owner/Owner's Agent must submit in writing, to the Inspector, a time frame and a specific date that repairs will be finished, with a copy of the letter sent to Operations and Maintenance, the Design Section, the Engineer and the Contractor.

3. The Contractor shall notify the Inspector 24 hours prior to making any repairs or additions regarding the punch list.

4. The Owner/Owner's Agent is required to respond, in writing, to the Inspector certifying the completion of the punch list with a copy sent to the Engineer.

5. The Owner/Owner's Agent shall request in writing from the Inspector a Pre-Final Inspection within ten days after completion of the punch list.

IV. Interim - Start Up - Pre-Final

A. The Inspector is responsible for keeping lines of communication open between Inspection and all parties. He is to keep the job progressing.

B. Through out this period no service connections will be allowed. The County will not be held responsible for the cost of the associated utilities, or operation and maintenance of the facility.

V. Pre-Final Inspection

A. Inspection sets up a Pre-Final inspection by sending a written notification to the Engineer, the Contractor, the Design Section, Operations and Maintenance and the Owner/Owner's Agent.

B. Re-inspecting the Station

1. All equipment is to be operated.

2. All punch list items must be complete.

VI. If Station Deficiencies are still noted repeat procedures detailed in Start Up Inspection

VII. If Station Passes Pre-Final Inspection

A. A letter will be required from the Engineer indicating that the project has reached a stage of substantial completion. In this letter a statement that all requirements for the facility have been fulfilled will be included.

B. The Engineer must submit three copies of the Operations and Maintenance Manual to the Operations and Maintenance Section, and send a sufficient number of copies to the Virginia Department of Health and the State Water Control Board.

C. The Engineer is responsible to obtain the Certificate for Operation prior to putting the station into operation, with a copy of the Certificate being sent to Inspection, Operations and Maintenance, the Owner/Owner's Agent and the Contractor.

1. The Engineer sends a letter to the Virginia Department of Health stating that the Pumping Station has been built in accordance with the approved plans and specifications.

2. The Virginia Department of Health will issue the Certificate for operation for a water pumping station, and the Department of Environmental Quality will issue the Certificate for Operation for a sewage pumping station.

D. The Inspector is required to notify the Design Section in writing that the Station is acceptable.

E. Upon receipt of the completion statement, the Design Section will issue a letter to the Owner/Owner's Agent stating the acceptance of the Station.

F. Connections will be allowed to the Station at this point in time.

G. The Operational Costs (power, telephone, etc.) are assumed by the County at this time.

H. Equipment warranties and yearly acceptance begin at this time.

I. The contractor is responsible for furnishing evidence of sufficient bonding during the warranty period.

J. Daily Operations and Maintenance begin at this time at the County's cost.

K. Procedure for handling equipment failures that are covered by warranty are carried out if necessary.

1. Operation and Maintenance contacts the Inspector in writing.

2. The Inspector notifies the Owner/Owner's Agent in writing indicating the degree of the problem and when the repairs need to be completed.

3. The Owner/Owner's Agent will make the necessary repairs and will send a letter to the Design Section indicating that the necessary repairs are complete with a copy sent to the Engineer, the Inspector and the Operations Maintenance Section.

VIII. Final Inspection

A. The Inspector sets up a Final Inspection by sending a written notification to the Engineer, the Contractor, the Operation and Maintenance Section, the Design Section, and the Owner/Owner's Agent This inspection will take place during the final month of the warranty period.

B. All remaining equipment problems should be resolved. The punch list created by Operation and Maintenance through out the year should be used as the checklist.

C. After the Station passes the Final Inspection

1. The Design Section will send a written statement stating that the County accepts full responsibility of the station to the Owner/Owner's Agent with a copy to the Engineer, the Inspector and the Operations and Maintenance Section.

2. Operation and Maintenance Section assumes full responsibility for the station.

IX. General

A. Full open communication between Design, Inspection, Engineer and Operation and Maintenance is mandatory.

B. All correspondence, being written, verbal, or by telephone, etc., must be appropriately documented by all parties.

C. The Senior Utility Engineer is responsible for making sure all inspection duties are carried out properly.

APPENDIX 10
PROCEDURE FOR INSTALLING WATER METERS IN COMMERCIAL AND INDUSTRIAL DEVELOPMENTS

1. All commercial and industrial developments (Shopping Centers, Sites, etc.) will be treated the same as residential development where New Water Lines are being installed.

2. Developer or his agent will be required to complete the water meter sizing forms and submit them to the Utilities Department's Review and Design Section at the same time plans are submitted for review.

3. A map clearly depicting location of buildings, etc., must be submitted by the Developer or his agent. Same information must be shown on the water plans.

4. Engineer is required to incorporate with his plans a detail of the method to installing meters.

5. All appropriate notes, details, etc. are to be shown on plan.

6. Contract between the developer and contractor shall include the installation of the water meter services and boxes.

7. Developer shall be responsible for informing all builders that the water and sewer connections fees must be paid prior to the County forces setting water meters.

8. Connection fees shall be as stated in ordinance.

9. Engineer and contractor shall refer to the County Standard Detail Drawings and the latest revised "Approved List of Manufacturers, Materials and Specifications" for approved method for designing and constructing the water meter assemblies.

EXCEPTIONS:

On projects where utility contractors are involved in any new construction, the contractor shall perform all service taps and install services, including taps on existing lines. Where no utility contractor is assigned to project, county shall perform all service taps 2" and smaller on existing waterlines. Contractors shall perform all taps larger than 2".

APPENDIX 11

PROCEDURES FOR COORDINATING PROPOSED WATER LINE DESIGNS WITH EXISTING SEPTIC TANK AND DRAINFIELD SYSTEMS

A. Investigation during preliminary design

1. Coordination by the County's and/or Developer's Design Engineer should be initiated through the Utilities Department reviewer, and once the local Health Department has assigned appropriate staff to handle the request, then the Engineer is to work directly with their staff.

2. Design Engineer is to contact the local Health Department and work closely with their staff to determine location of existing septic tank and drainfield lines; condition of septic tank and drainfield systems; etc.

   If repairs are determined to be needed, the local Health Department needs to issue a repair permit.

3. Design Engineer is to obtain information, advice, etc. from local Health Department regarding the alteration of existing system, i.e., design criteria; and to find out if it is even possible to alter system.

B. Design Engineer shall identify areas where conflicts will occur or may likely occur.

C. Design of the proposed water line must be done to avoid conflicts, or where it is not practical to do so, the septic tank and drainfield system shall be altered or redesigned to avoid proposed water line.

D. In cases where alterations of the drainfield systems are likely to occur, the Design Engineer shall have bid proposal reflect a bid item to include such work.

E. The alteration work must be done prior to start of water line in the area of the conflict and this reflected in the bid documents.

F. The Utilities Construction Section's inspector shall work closely with the local Health Department to ensure that the contractor obtains appropriate inspections.

Appendix 12

Overall Water/Wastewater System Plan Requirements

Checklist for overall water/wastewater system plan submission requirements.

I. General plan requirements for both water and wastewater systems:

A. _____ The location of all existing water and wastewater lines with the size and reference distance identified. Also, the nearest appurtenance such as a manhole or valve are shown.

B. _____ The accurate locations of all existing utility easements. The easements denote the proper width and permanent/ temporary status.

C. _____ Existing and proposed storm sewer, gas or other lines (which may cause a conflict with proposed water and wastewater lines at the time of installation) are shown.

D. _____ All existing and proposed roadways with the name, state route number, and right-of-way widths are shown.

E. _____ Adjacent property owners' names are shown.

F. _____ Proposed, existing, and original ground elevations are shown at 5 foot vertical contour intervals, and includes permanent or established benchmarks within the area.

G. _____ All plans have a north directional arrow, oriented towards the top of the sheet.

II. Wastewater System: Plan includes the following design information:

A. _____ The routing and size of all proposed wastewater lines.

B. _____ All proposed/future connection points and the associated easements for all adjacent properties.

C. _____ A detailed hydraulic analysis for the proposed system, including the overall service area for all trunks and/or sub-trunks, are included with the plans. Also, all of the appropriate land use densities for each area are shown. The analysis covers any upstream/ adjacent properties and, as deemed necessary, any portions of the downstream system.

III. Water System: Plan includes the following design information:

A. _____ The proposed size and routing of all water lines.

B. _____ The location of stubs and easements(if necessary) for future service to adjacent properties.

C. _____ The location of the closest existing valve from the proposed tie.

D. _____ Development densities for each area within the proposed development.

APPENDIX 13
DRAWING QUALITY CONTROL SPECIFICATIONS

I. General

1.01 All plans submitted to the Utility Department for review shall conform to the minimum legibility and quality control requirements of this Section. Any drawing submitted for review which substantially does not meet this specification will not be accepted for review.

1.02 All plans shall conform to the requirements of other Sections of the specifications as to size, form and content.

II. Documents on Paper

2.01 General Description

A. Plans submitted to the Utility Department shall be direct prints by the Diazo or similar process, in blueline or blackline, on paper equal to the products of the Azon Co. Photocopies or telefacsimile reproductions are not acceptable for plan review, but may be submitted for information or preliminary review purposes.

2.02 Legibility

A. The contrast of the printed material shall be high, with blank areas being as white as possible, and all information being as dark as practicable, while remaining clear and distinct.

B. Shading, especially that done by filling in with a pencil or the use of the darker shading film, shall not be used on the drawings where it will occlude any other information, such as on the plan views of paved areas. Areas to be set off may be accomplished by stippling (maximum density 21 dots per linear inch, minimum 10 dots per linear inch); or by hatching or cross-hatching with maximum line width of 0.30 mm (#00 pen) and minimum line spacing of 1/10" where this method does not obscure other information.

C. Line work shall be consistent and sharply defined, with the best results usually obtained from ink on polyester film. The minimum line width shall be 0.30 mm (#00 pen), with the majority of the work in the wider pen sizes.

D. Lettering (text) shall be consistent and clear, with a minimum height of 0.100" (10 pt.) and minimum line width of 0.35 mm (#0 pen). The larger type shall have correspondingly wider line widths. The preferred font shall be sans serif engineering (LEROY) in vertical or 67½° slant, all capitals.

E. All information must be contained within the borders of each sheet, particularly on the plan and profile sheets.

F. No photographs, or prints or reproductions of photographs, shall be a part of any drawing. Specifically, aerial photography may not be used in the plan views or at any other location.

III. Documents on Electronic Media

3.01 General Description

A. Drawings submitted on electronic media must conform to all the requirements of this Section, and with the following requirements.

3.02 Compatibility

A. Document must be completely compatible with Chesterfield Utility Department software.

B. Documents created on compatible software should be received in their standard file formats - for example, AutoCAD documents should be received in .DWG format. The Engineer needs to be aware of discrepancies due to different versions of the software; the Utility Department must be able to work with the media received and send out revisions the Engineer can utilize.

C. All correspondence is to be received in Microsoft Word format or in standard ASCII format.

D. All CAD documents to be received must be in standard AutoDesk - AutoCAD.DWG Release format compatible to the Utilities Department. These documents must be free of any third party software restrictions. Restrictions must be purged off the files before sending to the Utilities Department.

APPENDIX 14

WATER FLOW TEST SUBMITTAL AND APPROVAL PROCEDURES

The following procedures must be adhered to by the developer or his agent to insure and verify that public water is available to meet the fire flows and domestic demands as required to serve an existing and/or proposed development:

I. **Start Point**

The developer's engineer must request a hydraulic modeled flow test at the start of design for their project. This "start point" request must be submitted in writing (faxes are accepted) and must include the following information:

A. A sketch, map, or section of plan sheet that clearly shows the location of the proposed tie-in point(s) or the hydrant(s) nearest to the proposed tie-in point(s) where the start point test(s) are to be run.

B. A fax number to return the results to the engineer.

II. **Site Plan Process**

Once the engineer has the "start point" results and completes their design of the project, results of hand written or modeled flow calculations supporting their design must be submitted directly to the Utilities Department for review and approval. These results shall include the following information as shown on Standard Detail DES-5:

A. Static pressures at all on-site hydrants and the sprinkler system connection (the hydrant, tee, reducer, or other fitting nearest to the public side of the double check assembly).

B. Verification that the required ISO total flow requirements can be supported by the on-site hydrants. The ISO calculation sheet must be included in the submittal. The ISO total flow requirements must be divided between the on-site hydrants and the test run simultaneously. The ISO calculation sheet will indicate the required flow and the number of hydrants required for the site.

1. If the number of hydrants on the site plan matches the number of hydrants indicated as needed on the ISO calculation sheet, each hydrant is first tested at 1500 gpm and then the flow test is run by dividing the ISO required flow evenly among the new hydrants and running the hydrants simultaneously.

2. If the number of hydrants on the site plan exceeds the number of hydrants indicated as needed on the ISO calculation sheet (this may occur due to spacing or other considerations), then an additional test must be performed prior to performing the ISO test. Each hydrant on the site plan must be tested at 1500 gpm each individually and the residual pressure for each hydrant recorded. The ISO test is then performed by flowing a number of hydrants equal to the amount indicated as needed on the ISO calculation sheet, and by dividing the ISO required flow evenly among the ISO required hydrants and run simultaneously. The hydrants to be flowed in this test is determined by using the hydrants with the lowest residual pressures in the individual test. The remaining hydrants will not be used in the simultaneous test.

C. A mailing address and fax number for the engineer.

The flow test information must be submitted in the form of a sketch and table and may be done by hand as long as they are legible (see format as shown on DES-5). Hydraulic model printouts are unacceptable for review.

Once the results are submitted in the proper format, the submittal will be reviewed by County staff. Should there be any discrepancy, the engineer shall be contacted and the discrepancy resolved. If any of the aforementioned standards cannot be met, the Fire Life Safety Division shall be contacted. The engineer is required to modify the project to accommodate the standard and submit revised flow test results, unless an exception is approved by the Chesterfield County Fire Life Safety Division. Any significant changes in the site plan layout required by the Utilities Department site plan review staff or by the Fire Life Safety Division will require that revised flow test results be submitted for review.

Once the project flows are approved, the "start point" curve and cover letter is to be included on the plans (see Standard Detail DES-6). This data/information must be put on the Utility plan sheet or Overall Utility plan sheet along with the ISO calculation sheet. If the static pressures are such that an individual PRV or booster pump (greater than 80 or less than 40 psi, respectively) is needed, this information will be indicated on the cover page of the response letter to the engineer.

III. **Residential Subdivision Construction Plan Process**

Once the engineer has the "start point" results and completes their design of the project, results of hand written or modeled flow calculations supporting their design must be submitted directly to the Utilities Department for review and approval. These results shall include the following information as shown on Standard Detail DES-4:

A. Static pressures at all proposed hydrants.

B. Verification that the proposed hydrants meet flow test requirements of 1000 gpm at 20 psi residual for each hydrant. Hydrants are to be tested individually.

C. A mailing address and fax number for the engineer.

The flow test information must be submitted in the form of a sketch and table and may be done by hand as long as they are legible (see format as shown on DES-4). Hydraulic model printouts are unacceptable for review.

Once the results are submitted in the proper format, the submittal will be reviewed by County staff. Should there be any discrepancy, the engineer shall be contacted and the discrepancy resolved. If any of the aforementioned standards cannot be met, the Fire Life Safety Division shall be contacted. The engineer is required to modify the project to accommodate the standard and submit revised flow test results, unless an exception is approved by the Chesterfield County Fire Life Safety Division. Any significant changes in the site plan layout required by the Utilities Department site plan review staff or by the Fire Life Safety Division will require that revised flow test results be submitted for review.

If the static pressures are such that individual PRV’s or booster pumps (greater than 80 or less than 40 psi, respectively) are needed, this information will be indicated on the cover page of the response letter to the engineer.

IV. **Tentative Subdivision Process**

For Tentative Subdivision plans, the rules for Residential Subdivision Construction Plans (III) apply with the following exceptions:

A. For tentatives where the entire development is shown, the engineer must submit a flow test for the entire subdivision. If the subdivision is to be phased, a water phasing plan must be submitted that demonstrates the ability of each phase to achieve the required fire flows independently of any future phases.

B. For tentatives where only part of the entire development is shown, the engineer must submit a flow test for the entire development and for the individual tentative. A water phasing plan must also be submitted that demonstrates the ability of each phase to achieve the required fire flows independently of any future phases. An overall development water/wastewater master plan may be required depending on the complexity of the development.

C. All tentatives must show individual fire hydrants in a layout approved by the Fire Life Safety Division and flows are to be tested for each hydrant. Tentatives should also take particular high and low elevations into account for static pressure tests and for fire flow tests.

V. Overall Development Water/Wastewater Master Plan Process

For Overall Master plans, the rules for Residential Subdivision Construction Plans (III) apply with the following exception:

A. The overall plan must demonstrate the ability of the proposed system to achieve the required fire flows. In lieu of individual fire hydrants, tees, reducers, ends of lines, and selected high and low points should be calculated for static pressure and fire flows.