

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

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December 2017

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# TOWN OF SMITHFIELD

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## **SECTION 1. WATER DISTRIBUTION AND SANITARY SEWER SYSTEMS:**

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

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

All site and subdivision plans shall be sealed by a Professional Engineer or Land Surveyor licensed in the Commonwealth of Virginia. Plan submittals shall be accompanied by the “Water and Sanitary Sewer System Design Checklist” provided in Appendix D. Any plans submitted without a Professional seal or a completed checklist will be returned without review.

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

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

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

DEQ:

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

VDH:

- All water mains 16-inches and larger.
- All transmission mains.
- All water production facilities (including wells).
- All master metered projects which have on-site, private water distribution piping larger than 8-inches in diameter or serving more than 14 residential connections.

HRSD:

- All gravity sanitary sewer projects with a 40,000 gpd or greater Average Design Flow or, 100 or more connections regardless of phasing.
- Any project proposing a direct connection to HRSD mains.
- Any project proposing work in proximity to existing HRSD mains.
- Any project discharging Industrial Waste.

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

- 1.3 **VERTICAL AND HORIZONTAL SURVEY DATUM CONTROL:** Vertical and horizontal survey datum control shall be based upon, the Town of Smithfield, Virginia 2003 Geodetic Control Network, Horizontal NAD 83 (1996), Vertical NAVD 88. A minimum of one permanent bench mark that meets the requirements of the Subdivision Ordinance of Smithfield, Virginia shall be established for each project.
- 1.4 **CONTRACTOR LICENSING:** Contractor registration shall be in accordance with Title 2.2 Chapter 43 of the Code of Virginia. The Contractor responsible for installing the water and sanitary sewer facilities will be required to provide their State Contractor's License number.

## **SECTION 2. SYSTEM DESIGN:**

### **2.1 WATER DISTRIBUTION PRESSURE:**

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

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

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

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

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

### **2.4 COVER:** Water distribution systems and sanitary force mains shall have a minimum of 36 inches and a maximum of 42 inches, measured from the top of the pipe to the established finished grade above the pipe, unless otherwise approved by the Town. Water service lines shall have a minimum of 18 inches and a maximum of 2 feet of cover. During design, site

layout of other infrastructure (i.e. storm sewer, gravity sanitary sewer, etc) shall be considered in minimizing the need to have deep pressure mains.

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

The Town of Smithfield shall not accept nor be responsible for repairing, maintaining, or locating any portion of the water or sanitary systems prior to dedication of the appropriate corresponding utility easement(s) relating to the said development. Existing water and sanitary systems within the said development currently not within an easement shall also have appropriate easements dedicated prior to acceptance of new development water and sanitary systems. The Town reserves the right to require existing easements to comply with current easement width criteria for development projects (i.e. increase existing easement width from 10-feet to 20-feet).

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

Water and sanitary sewer easements are exclusive, and shall be designated on the plans and plat as "Town of Smithfield Utility Easement," with the width specified, unless otherwise authorized by the Town.

The following note shall be added to all plats containing Town of Smithfield Utility Easements:

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

Any existing Town of Smithfield easement requiring abandonment or extinguishment will

require approval by the Town of Smithfield. Appropriate materials (plat, deed, exhibits, etc) including fees shall be submitted by the Developer/Engineer for presentation to the Town.

- 2.6 **DEAD ENDS AND HIGH POINTS:** Dead ends shall be minimized by looping of all water lines where possible. Where dead-end lines occur, they shall be provided with a below grade flushing hydrant. The flushing device shall not be directly connected to any sanitary sewer. Approved manual air release devices shall be installed at all system high points. **All devices shall be inspected by the Town prior to backfilling.** Consideration shall be given to providing a suitable means of conveying flush water to an adequate outfall channel, thus precluding potential erosion problems.
- 2.7 **EXTENSION PROVISIONS:** Provisions shall be made for logical future water and sanitary sewer extensions. Future water main and sanitary force main extensions shall be provided with a gate valve and a minimum of a full joint of pipe beyond the gate valve. This pipe shall be properly restrained, plugged, blocked, pressure tested, and disinfected (water mains only) along with the rest of the piping system. After passing inspection, the gate valve shall be closed. A temporary blow-off assembly shall be installed at the end of all extensions. Gravity sanitary sewer extensions from manholes shall be provided with a 2-foot stub of pipe properly plugged to prevent infiltration. When the gravity sewer is extended, the 2-foot stub shall be removed, and replaced with a full joint of pipe.
- 2.8 **HYDRAULIC ANALYSIS:** A hydraulic analysis is required for all water system design projects requiring an extension of the water distribution system, and/or installation of new fire hydrants and/or as required by the Town. The hydraulic analysis shall be used to verify flow demands and pressure availability for the proposed project and to justify pipe sizes. The analysis shall also demonstrate the effect the proposed project will have on the existing distribution system. The hydraulic analysis shall include as a minimum the following:
- A. Under peak hour demands (excluding fire demands), the water distribution system shall maintain pressures above 40-psi.
  - B. Under maximum day plus fire demands plus applicable irrigation demands, the water system shall maintain pressures above 20-psi.
  - C. Water system layouts shall be designed to minimize dead ends. Looping water lines is a standard practice to eliminate dead ends.
  - D. Velocity in any pipe line (excluding fire hydrant six-inch runs) shall not exceed 5 fps under any condition.
  - E. Head losses in any pipe line (excluding fire hydrant six-inch runs) shall not exceed 20 psi per 1,000 feet of pipe line.
  - F. Provide a separate hydraulic analysis for each phase of the project to confirm adequate system design.
  - G. The water model calculations must be sealed, signed and dated by a Licensed Professional

Engineer, currently licensed by the Commonwealth of Virginia.

- H. The hydraulic analysis shall be neatly organized and bound. Provide a summary describing the project, the basis of the calculation procedures performed, name and version of the software. The analysis shall be provided in printed form as well as electronic form. The electronic copy shall include the input data for inclusion in the Town system model.
- I. Provide a node map that includes pipe numbers, reservoirs, pumps, junction numbers, contours to check elevations, locations of fire hydrants, and lot locations.
- J. Provide in the model, irrigation demands that might be applied to this development. If no irrigation demands are included in the model, then provide justification of how the irrigation will not be allowed for this project. If irrigation demands are included for this development, then describe how the irrigation demands were developed and what mechanisms will be in place to control them. An example of justification might include the homeowner covenant documentation prohibiting outdoor irrigation of all kinds or allowing irrigation under specific circumstances that support the irrigation demand calculations. Provide a written discussion of irrigation demands with the analysis.
- K. Provide a software generated date/time stamp on all water model pages.
- L. Provide in the hydraulic analysis the following:
  1. Fire hydrant flow tests for which the model is based and a description of input assumptions such as reservoir data and pump data that simulates the flow test.
  2. Listing of all inputs for all pipes, nodes, pumps, reservoirs, etc, used in the model.
  3. Include Average Day Demand Analysis.
  4. Include Maximum Day Demand Analysis.
  5. Include Maximum Day Demand + Fire Flow + any applicable irrigation demands. The water system must maintain 20-psi at all nodes.
  6. Include Peak Hour + any proposed irrigation demands. The pressures in the system must be maintained above 40-psi at all nodes.
  7. Include a Global Fire Flow Analysis.
  8. No pipe velocities shall exceed 5 fps, under any condition
  9. No pipe head losses in any pipeline shall exceed 25-feet per 1,000-feet of pipe.
  10. Provide separate hydraulic analysis for each phase of the project to confirm adequate system pressures and flows during phase development. Apply the fire flow within the phased area.

11. Pipe reports must include the following information at a minimum:

- a. Pipe number
- b. Starting Node number and Ending Node number
- c. Status
- d. Pipe diameter (inches)
- e. Pipe length (feet)
- f. C-Factor (C-Factor of 130 is the maximum allowed)
- g. Discharge (gpm)
- h. Velocity (fps)
- i. Head losses (ft)
- j. Minor losses (ft)

12. Junction reports must include the following information at a minimum:

- a. Junction number
- b. Elevation (ft)
- c. Demand (gpm)
- d. Description (description for calculating demand)
- e. Calculated demand (gpm)
- f. Pressure Head (ft)
- g. Residual pressures at all nodes (psi)
- h. Hydraulic Grade Line (ft)

13. Reservoir report must include the following information at a minimum:

- a. Label
- b. Elevation (ft)
- c. Hydraulic Grade Line (ft)

- d. Inflow (gpm)
- e. Outflow (gpm)

14. Pump report must include the following information at a minimum:

- a. Label
- b. Status
- c. Elevation (ft)
- d. All input information
- e. Intake pump grade (ft)
- f. Discharge pump grade (ft)
- g. Discharge (gpm)
- h. Pump head (ft)

2.9 **WATER AND SANITARY SEWER SYSTEM DATA SHEETS:**

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

1. Date: Provide the date the Water Data Sheet was completed. If revisions are necessary, add each revision date.
2. Provide the following information under General Information:
  - a. Provide the project name.
  - b. Provide the project address: Provide the address if available or a description of the location of the project.
  - c. Developer: Provide the firm name of the responsible party for the development.
  - d. Submitted By: Provide the name of the firm submitting this project for review.
  - e. Contact Person: Provide the name of the contact person the Town may contact to address questions concerning the application.
  - f. Address: Provide the address of the contact person.



4. Provide the Fire Hydrant(s) Flow Information as follows:
  - a. Provide the actual fire hydrant flow test information and attach a copy to the hydraulic analysis. Information to be provided is the fire hydrant number or address, static pressure (psi), residual pressure (psi), pitot pressure (psi), residual flow (gpm) and the estimated flow at 20-psi and the date the fire hydrant flow test was performed.
  - b. Provide the fire flow volume required for this project as stipulated in Section 2.11. Deviations from the Town of Smithfield required fire flow volumes must be approved in writing by the Smithfield Fire Department and the supporting documentation attached.
  - c. Hydraulic Analysis: Provide the volume (gpm) of the total fire flow plus maximum day demand plus any applicable irrigation demands and the minimum pressure in psi.
  - d. Number of Existing Fire Hydrants: Provide the number of existing fire hydrants used to support this project.
  - e. Number of Proposed Fire Hydrants: Provide the number of proposed fire hydrants to be added to support this project.
  - f. This sheet will be sent by the Town of Smithfield to the Smithfield Fire Department for their approval. The Fire Department approval will be required as a component to the Town approval of this Water Data Sheet.
  
5. Provide the Water Distribution Information as follows:
  - a. Water Distribution Piping: Provide the diameter (inches), length (feet) and pipe materials (DI, PVC, etc) for the water distribution system piping for this project. The length of pipe must correspond to the pipe within proposed Town easements or pipe within public right-of-ways. If multiple phases or sections of a project are anticipated, include only the piping proposed on the phased site plan.
  - b. Water Meter Assemblies: Provide the size (inches) and the number of each meter size for the water distribution system submitted. Developer or Owner must purchase meters. Water meter sizing for commercial developments shall be calculated using the International Plumbing Code as adopted and amended by the Uniform Statewide Building Code (latest edition) for fixture counts and flow values and AWWA Manual - M22 for water meter size based on the calculated flow rates. Provide a copy of the water meter sizing calculations with this analysis. Also provide calculations for justification of irrigation meters if a separate irrigation meter is proposed. Detector Check Valve water meters shall be listed individually. If multiple phases or sections of a project are anticipated, include only those water meters proposed on the phased site plan.

- c. The use of multiple meters in lieu of a single, larger meter, is prohibited unless as authorized by the Town of Smithfield.
- d. Submit calculations which verify the existing or proposed water service line velocities do not exceed 5 feet per second based on the peak hour demand.
- e. Casing Pipe: Provide the casing pipe diameter (inches) and length (feet).

## WATER DATA SHEET

Date: \_\_\_\_\_ Revised: \_\_\_\_\_

**I. GENERAL INFORMATION:**

- a. Project Name: \_\_\_\_\_
- b. Project Address: \_\_\_\_\_
- c. Developer: \_\_\_\_\_
- d. Submitted By: \_\_\_\_\_
- e. Contact Person: \_\_\_\_\_
- f. Address: \_\_\_\_\_  
\_\_\_\_\_
- g. Phone: \_\_\_\_\_ Fax: \_\_\_\_\_ Email: \_\_\_\_\_

**II. DESIGN INFORMATION:**

- a. Source of Water: \_\_\_\_\_

b. Flow Information:

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

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

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

**WATER DATA SHEET (continued)**

Date: \_\_\_\_\_ Revised: \_\_\_\_\_

Project Name: \_\_\_\_\_

Project Address: \_\_\_\_\_

**III. FIRE FLOW INFORMATION:**

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

Date Performed: \_\_\_\_\_ Nozzle Size: 2-1/2 inch

Hyd. No. \_\_\_\_\_ Static \_\_\_\_\_ psi Residual \_\_\_\_\_ psi

Hyd. No. \_\_\_\_\_ Pitot \_\_\_\_\_ psi Flow \_\_\_\_\_ gpm

Hyd. No. \_\_\_\_\_ Pitot \_\_\_\_\_ psi Flow \_\_\_\_\_ gpm

Hyd. No. \_\_\_\_\_ Pitot \_\_\_\_\_ psi Flow \_\_\_\_\_ gpm

Total Residual Flow \_\_\_\_\_ gpm

Calculated Flow @ 20 psi \_\_\_\_\_ gpm

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

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

d. Hydraulic Analysis: Fire Flow + Maximum Day Demand + any applicable irrigation demands:  
\_\_\_\_\_ gpm @ \_\_\_\_\_ psi. > 20 psi (Node \_\_\_\_\_ )  
*(Attach a hydraulic analysis that supports the above flow and pressure results)*

e. Number of Existing fire hydrants: \_\_\_\_\_

f. Number of Proposed fire hydrants: \_\_\_\_\_

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

**Fire Department Approval (Town use only):**

Approved by: \_\_\_\_\_

Date: \_\_\_\_\_

## WATER DATA SHEET (continued)

### IV. WATER DISTRIBUTION INFORMATION:

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

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

- b. Water Meter Assemblies:

Water Meter Size (Inches)	Quantity

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

Casing Pipe:

Diameter \_\_\_\_\_ (Inches), Length \_\_\_\_\_ (Feet)

Diameter \_\_\_\_\_ (Inches), Length \_\_\_\_\_ (Feet)

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

1. Date: Provide the date the Sanitary Sewer System Data Sheet was completed. If revisions are necessary, add each revision date.
2. Provide the following information under General Information:
  - a. Provide the project name.
  - b. Provide the project address: Provide the address if available or a description of the location of the project.
  - c. Developer: Provide the firm name of the responsible party for the development.
  - d. Submitted By: Provide the name of the firm submitting this project for review.
  - e. Contact Name: Provide the name of the contact person the Town may contact to address questions concerning the application.
  - f. Address: Provide the address of the contact person.
  - g. Provide the phone and fax numbers and the e-mail address of the contact person for this application.
3. Provide the following information requested under Design Information as follows:
  - a. Sanitary Sewer System: Provide the name of the collection basin or receiving lift station or pump station.
  - b. Design Population: Provide the breakdown of the proposed development such as 100-single-family homes and/or 10,000-gross square feet Office Building, etc. This item and flow duration shall reflect the type of development listed in Table 2.1- Flow Demands. Provide the total peak flow in accordance with Section 2.10, paragraphs E and F.
  - c. Sanitary Sewer System Piping: Provide the diameter (inches), length (feet) and pipe materials (DI, PVC, HDPE, etc.) for the sanitary sewer gravity and force main system piping for the development. The length of pipe must correspond to the pipe within proposed Town easements or pipe in public right-of-ways. If multiple phases or sections of a project are anticipated, include only the piping proposed on the phased site plan.
  - d. Sanitary Sewer Manholes: Provide number of standard manholes, number of 60-inch diameter manholes, and their respective average depths.
  - e. Casing Pipe: Provide the casing pipe diameter (inches) and length (feet).

**SANITARY SEWER SYSTEM DATA SHEET**

Date: \_\_\_\_\_ Revised: \_\_\_\_\_

**I. GENERAL INFORMATION:**

- a. Project Name: \_\_\_\_\_
- b. Project Address: \_\_\_\_\_
- c. Developer: \_\_\_\_\_
- d. Submitted By: \_\_\_\_\_
- e. Contact Person: \_\_\_\_\_
- f. Address: \_\_\_\_\_
- g. Phone: \_\_\_\_\_ Fax: \_\_\_\_\_ Email: \_\_\_\_\_

**II. DESIGN INFORMATION:**

A. Sanitary Sewer System: \_\_\_\_\_

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

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

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

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

D. Sanitary Sewer Manholes:

Standard Manholes: \_\_\_\_\_, Average Depth: \_\_\_\_\_

60-inch Manholes: \_\_\_\_\_, Average Depth: \_\_\_\_\_

E. Casing Pipe:

Diameter \_\_\_\_\_(inches), Length: \_\_\_\_\_ (feet)

2.10 **FLOW DEMANDS AND DESIGN CONSIDERATIONS:** Design basis for new developments shall be based on the following flow criteria:

- A. Maximum Day Water Demand - maximum day demand is defined as 1.7 times average day demand.
- B. Peak Hour Water Demand - peak hour demand is defined as 4.0 times average day demand.
- C. Average Day Water Demand - average day demand is defined by Table 2.1 based on the number of units, flow rate and flow duration for each development type for master planning purposes and residential developments. For site specific site projects, the demand shall be calculated based on the International Plumbing Code (IPC) for fixture counts and flow values. The IPC flow value, which is a peaked demand, shall be divided by a factor of 4 for the Average Day Demand.
- D. Water meter sizing for commercial site plans shall be calculated using the International Plumbing Code as adopted and amended by the Uniform Statewide Building Code (latest edition) for fixture counts and flow values and the AWWA Manual – M22 for water meter size based on the calculated flow rates. Meter sizing shall be based on not exceeding 80% meter capacity unless approved otherwise by the Town. Provide a copy of the water meter sizing calculations with this form. Submit calculations which verify the existing or proposed water service line velocities do not exceed 5 feet per second based on the peak hour demand.
- E. Peak Sewer Flow - lateral and sub-main sewers.
  - 1. Lateral - a sewer that has no other common sewers discharging into it.
  - 2. Sub-main - a sewer that receives flow from one or more lateral sewers.
  - 3. Minimum Peak Design Flow should be 400-percent of the average design flow.
- F. Peak Sewer Flow - main trunk and interceptor sewers.
  - 1. Main or Trunk - a sewer that receives sewage from one of more sub-main sewers.
  - 2. Interceptor - a sewer that receives sewage flow from a number of gravity mains, trunk sewers, sewage force mains, etc.
  - 3. Minimum Peak Design Flow should be 250-percent of the average design flow.
- G. General -In general, sanitary sewer systems should be designed for the estimated ultimate tributary population with an upper limit consisting of the 50-year population growth projection, except when considering parts of the system that can be readily increased in capacity. Consideration shall be given to land use plans and to the other planning

documents and to the maximum anticipated capacity of institutions, industrial parks, apartment development, etc.

H. Sanitary Sewer Design Considerations: All sanitary sewer systems shall be designed with the following considerations:

1. Peak hourly sewage flows
2. Additional maximum sewage or waste flow from industrial plant
3. Ground water infiltration
4. Topography of area
5. Depth of excavation
6. Slope of sewer lines and laterals
7. Pumping requirements
8. Downstream system capacity

**Table 2.1**

<b>Type of Development</b>	<b>Contributing Design Units</b>	<b>Flow or Demand (GPD/Unit)</b>	<b>Flow or Demand Duration (hours)</b>	<b>Sewer Flow Peaking Factor</b>	<b>Water Flow Peaking Factor</b>
Dwellings	Per Unit	310	24	2.5	(6)
Trailer Courts, Apartments, Condos, Townhomes & Timeshares	Per Unit	310	24	2.5	(6)
Schools	Per Person	10	8	3	(6)
Boarding Schools	Per Person	75	16	3	(6)
Hotels & Motels	Per Room	130	24	3	(6)
Restaurants (including fast food)	Per Seat	30	16	3	(6)
Service Stations	Per Gross SF	0.4	16	3	(6)
Shopping Centers	Per Gross SF	0.2	12	3	(6)
Hospitals	Per Bed	300	24	3	(6)
Nursing Home/Assisted Living	Per Bed	160	24	3	(6)
Doctor's Office in Medical Center	Per Gross SF	0.25	12	3	(6)
Laundromats	Per Machine	500	16	3	(6)
Community Colleges	Per Student and Faculty	10	12	3	(6)
Theaters (auditorium type)	Per seat	2.5	12	3	(6)
Picnic Areas	Per Person	5	12	3	(6)
Camps, Resort day & Night with Limited Plumbing	Per Site	50	24	3	(6)
Luxury Camps With Flush Toilets	Per Site.	100	24	3	(6)

**Table 2.1 (Cont'd)**

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

**Sanitary Sewer Flow Projection Notes:**

- (1) The stated flow per day per unit is provided as a guide and should only be used if known data for similar heavy or light industrial facilities is not available.
- (2) For undeveloped property zoned other than residential, average daily flows may be projected at a rate of 1,000 gpd per acre. Consideration should be given to designated wetlands and Chesapeake Bay Preservation Act Resource Protection Areas (CBPA RPA) which should be excluded from the gross acreage. A peaking factor of 3 shall be used.
- (3) For undeveloped property zoned residential, average daily flows may be projected at a rate of 310 gpd per unit based on the zoning density. A peaking factor of 2.5 shall be used.
- (4) Flow duration should be taken into account for design of onsite infrastructure and when discharging into publically owned force mains, but need not be considered for downstream publically owned gravity collection systems. Additionally, the SCAT Regulations require a peaking factor of 4 be applied to the average daily flow when designing laterals and sub-mains. For example, in designing an on-site sanitary sewer lateral or an on-site private pump station for a shopping center that has a gross square footage of 7,500 SF, the flow duration should be applied as follows:

$$7,500 \text{ SF} \times 0.20 \text{ gpd/SF} = 1,500 \text{ gpd}$$

$$1,500 \text{ gpd} / (12 \text{ hour duration} \times 60 \text{ min/hr}) = 2.08 \text{ gpm}$$

$$2.08 \text{ gpm} \times 4 \text{ (peak factor per SCAT regulations)} = 8.32 \text{ gpm}$$

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

**Table 2.1 (Cont'd)**

- (6) Water Demand Peaking Factors shall be as defined in Section 2.10 for Average Day, Maximum Day ( 1.7 x Average Day) and Peak hour Demands (4 x Average Day).
- (7) For all undeveloped property, water demands shall be based on the number of residential units and/or commercial square footage anticipated for the development either by current zoning or where limited by Proffers. Peaking factors shall be as defined in Section 2.10.

2.11 **FIRE FLOW REQUIREMENTS:** Fire flow demands are specified by the Smithfield Fire Department and are based on the designated zoning, use, and specific type of construction. The zoning categories are:

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

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

**FIRE FLOW DEMANDS**

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

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

Manufactured joint restraints shall be supplied by the same manufacturer as the pipe material and shall be subjected to the same submittal and compliance requirements as the approved pipe. The minimum restrained lengths shall be in accordance with the Joint Restraint Table found in the Smithfield standard details (Detail JR.1). Fire hydrant assemblies shall be restrained at least one full joint of pipe in each direction on the mainline.

2.13 **CONNECTION TO EXISTING WATER AND SANITARY SEWER SYSTEMS:**

All connections to existing water systems to include saddles, service lines, tapping sleeves and valves and direct taps, and connections to existing sanitary sewer systems to include saddles, laterals, manhole connections, force main connections, etc., shall be scheduled with the Town of Smithfield. **The connections shall be made only in the presence of the Town of Smithfield.** Connections to existing manholes shall be made by core-drilling the manhole and connecting the pipe using a KOR-N-SEAL boot, or equal. Existing manholes shall be vacuum tested upon completion of the new connection. Connections to sewer laterals shall be made to the standpipe, unless approved otherwise by the Town.

**Fernco couplings, or similar products, shall not be permitted on Smithfield water mains, sanitary sewer mains, force mains, laterals or standpipes. Must use Surguard fitting, or approved by Town.**

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

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

Sewer Size (inches)	Minimum Slope (Feet per 100 Feet)
8	0.40
10	0.28
12	0.22
15	0.15
18	0.12
21	0.10
24	0.08
27	0.067
30	0.058
36	0.046

- 2.15 **MAXIMUM VELOCITY**: Generally, the maximum permissible velocity in gravity sewers shall not exceed fifteen (15) feet per second. Where velocities greater than fifteen (15) feet per second are expected, special provisions shall be made to protect against internal erosion by high velocity. The pipe shall conform to appropriate ASTM or AWWA specifications which provide protection against internal erosion. Drop manholes shall be provided to break steep slopes to limit the velocities in connecting sewer pipes between manholes. Where drop manholes are impractical, the sewer main shall be ductile iron or other abrasion resistant material. Sanitary sewer on 20% slope or greater shall be anchored with concrete anchors in accordance with Section 21.05.03 of the SCAT Regulations. Suggested minimum anchorage is as follows:
- A. Not over 36-feet center to center on grades 20 percent and up to 30 percent.
  - B. Not over 24-feet center to center on grades 30 percent and up to 50 percent.
  - C. Not over 16-feet center to center on grades 50 percent and over.
- 2.16 **JUNCTIONS**: At all junctions where a smaller sewer joins a larger one, the invert of the larger sewer shall be lowered to maintain the same energy gradient. This may be accomplished by one of the following methods:
- A. Positioning the 0.8 depth point of both sewers at the same elevation, or
  - B. Positioning the crown of both sewers at the same elevation.
- 2.17 **MANHOLES**: Manholes shall be designed to include the following:
- A. Manholes shall be installed at the end of each line of eight (8) inch diameter or greater; at all changes in grade, size, or alignment; at all intersections; and at distances not greater than 400-feet.
  - B. Manholes for sewers up to 24-inches in diameter shall not be less than 48-inch inside diameter.
  - C. Manholes for sewers larger than 24-inches in diameter shall not be less than 60-inch inside diameter.
  - D. Manholes 10 feet and over in depth shall be 60-inch diameter. No sewer manholes over 13 feet in depth will be allowed in the Town.
  - E. Manhole top elevations shall be above the 100-year Flood Elevation or shall be sealed watertight frame and cover with approved casting or inserts. Ventilation of gravity sewer systems shall be provided where continuous watertight sections greater than 1,000-feet in length are incurred.
  - F. Stubs out of manholes for future development shall not exceed 2-feet in length, unless

approved otherwise by Smithfield.

- G. Minimum elevation difference across manhole from inlet to outlet shall be 0.1 feet.
- H. Epoxy manhole coatings shall be provided where lift station force mains or low pressure lines with five (5) or more residential grinder pumps connect to a manhole. A minimum of three (3) manholes and 1200 feet downstream of these force main connections shall be coated. Plans shall clearly designate the manholes requiring coating, the coating manufacturer and minimum Type A coating as defined in the HRPDC standards. Smithfield reserves the right to require additional manholes for epoxy coating where deemed necessary.
- I. Sanitary Sewer laterals shall not connect to the mainline within 5-feet of a manhole. Laterals upstream and within 5-feet of the manhole shall connect directly into the manhole where necessary.
- J. Interior drop connections shall be constructed when the vertical difference between the invert of the outlet pipe and the invert of the inlet pipe is 24-inches or greater. Where drop connections are required, manholes shall be a minimum of 60-inch. Inside drop system by Reliner, or equal, shall be used. Where the difference in elevation between the incoming sewer and the manhole invert is less than 24-inches, the invert shall be filleted to prevent solids deposition.

2.18 **MINIMUM SIZES:** No public sanitary sewer shall be less than 8-inches in diameter, except collector lines serving six (6) connections or fewer on cul-de-sacs. Additionally, sidewalk collector lines may be 6-inches in diameter provided that engineering calculations and justifications indicate that such size is adequate, and the collector line terminates with a manhole. The minimum size for a single lateral connection is 6-inches inside diameter. Smithfield reserves the right to specify the size of any sanitary sewer main or lateral.

2.19 **DEPTH OF SEWERS:** All sewers shall be constructed in such a manner that a minimum of 3-feet of cover is maintained between the top of the pipe and the finished grade elevation. Where conditions dictate that the cover be less than 3-feet, ductile iron pipe will be required, and the installation shall be approved by Smithfield. For depths of sewer exceeding 10-feet, ductile iron pipe shall be used. No sewer over 13 feet in depth will be allowed.

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

- 2.21 **PIPE CROSSING SEPARATION:** Pipe separation at crossings between water, sanitary sewer, storm, gas, or other pipe systems shall be 18-inches unless approved by Smithfield. Where Smithfield allows less than 18-inches separation, the pipe crossing shall comply with HRPDC Standard Detail WS\_09. Reference the HRPDC Regional Construction Standards, Section 805, for additional requirements regarding separation of water mains and sewers.
- 2.22 **PROXIMITY TO BEST MANAGEMENT PRACTICES (BMP'S)** : Unless authorized by Smithfield, water and sanitary sewer mains, appurtenances and easements shall not be placed within a BMP, stormwater structure, or associated embankment. BMP's or stormwater structures shall not be constructed within existing water or sanitary sewer easements.
- 2.23 **PLAN CLARITY:** Water and sanitary sewer force main appurtenances such as valves, fittings, air release valves, etc., shall be shown in both plan and profile views. Plan of development shall be clear and concise. It is necessary to call the appurtenances out in only one location, with stationing and offset annotated, as long as they are depicted graphically in both. Water and sanitary sewer pipe material (PVC or DIP) shall be clearly identified on the plan and/or profile. Plan and profiles shall be developed at a maximum scale of 1"=40' horizontal and 1"=4' vertical. Plan and profile horizontal scales shall be the same with the vertical profile scale a tenth of the horizontal scale.

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

Smithfield and/or HRPDC references to the applicable standard details (i.e. Typical Water Meter Installation, W13.0) shall be provided on the plan, either individually labeled or tabularized. Standard details shall not be provided on the plan unless modified. If modified, the engineer shall clearly identify those modifications on the detail.

- 2.24 **GREASE TRAPS:** Grease traps are required for all restaurants or other commercial establishments expected to discharge FOG (fats, oils, and grease) to the wastewater collection system. Grease trap design shall comply with the International Plumbing Code and the Smithfield FOG Ordinance. Provide a tee with a 4-inch vertical standpipe and a cast iron clean-out frame and cover to be used as a sampling station for the proposed grease traps. This sampling station should be located within 5-feet from the grease trap on the effluent side.
- 2.25 **GRINDER PUMPS:** Grinder Pump Procedures shall be considered on a case by case basis.

2.26 **GENERAL SYSTEM DESIGN CONSIDERATIONS:**

- A. Buried ductile iron pipe and fittings shall have mechanical or push-on joints. Above ground ductile iron pipe and fittings shall have flange joints or restrained joint mechanical joints as appropriate and approved by the Town. For flange piping, use of multi-gaskets and spacers are prohibited.
- B. Where PVC pipe less than 4-inches in diameter is specified to be used in Right-Of-Ways and where subjected to surface (vehicular) loads, schedule 80 pipe shall be required. On water service lines, PVC schedule 80 pipe may only be used in lieu of copper pipe where the installation exceeds 80-linear feet.
- C. Valves shall be installed on all temporary dead-end pressure pipelines, on small branching mains as close as possible to the larger main, and on loop networks. Valves shall also be placed on water mains so that a break or failure will not affect more than 800-linear feet of main. Valves shall be located at the tee for all intersecting water mains and sanitary sewer force mains. Provide at intersecting mains one valve per the number of connecting waterlines (i.e. provide four (4) valves for an intersecting cross fitting). For pipes 2" and smaller, Municepex pipe is required.
- D. Air release valve assemblies shall be constructed at all high points along pressure pipelines. Where practical, high points shall be eliminated by slight adjustments to the pressure pipeline profile. Locations of manual air release valves shall be shown on the construction plan and profile drawings.
- E. Blow-off assemblies shall be constructed at all dead end points along the water mains. Locations for the Blow-off assemblies shall be shown on the construction plan and profile drawings.
- F. Fire Hydrant Locations: Fire hydrants shall be installed in the public right-of-way or in a Smithfield easement. Fire hydrants shall be located in non-traffic areas (i.e., in an island or behind a curb). Fire hydrants shall be installed at an intersection whenever possible. Fire hydrants installed at an intersection shall be located at the curb's point of curvature. All other fire hydrants shall be located in-line with a property line perpendicular to the right-of-way line, whenever possible. In townhouses, condominiums, apartments, commercial and industrial areas, fire hydrants shall be located in a raised island (grass or concrete) when not at an intersection. Each fire hydrant location shall be approved by the Town and the Smithfield Fire Department. In addition, fire hydrants shall be located on the following:
  - 1. On highways divided by a median strip, hydrants shall be located on each side of the right-of-way as per the fire hydrant spacing requirements.
  - 2. On cul-de-sacs the distance between the last fire hydrant and the end of the cul-de-sac shall not be more than one-half (1/2) distance specified in the fire hydrant spacing.
  - 3. Smithfield, in consultation with the Fire Chief, may require that additional fire hydrants be provided on the site at specified locations in order to ensure adequate fire

suppression capabilities and to allow the system to be flushed periodically of accumulated sediments.

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

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

H. Sanitary sewer cleanouts shall be placed at the property line or right of way line by the contractor, builder or homeowner. Sanitary sewer cleanouts shall not be installed in driveways, sidewalks, or bike paths except when approved by Smithfield, and will require the frame and cover for heavy loads (HRPDC Regional Construction Standards Detail SS\_12). The Engineer shall evaluate this requirement where subdivision lots and/or sites have minimal roadway frontage and cleanout locations will be likely located within driveways, whether or not shown on the plan. In this instance, SS\_12 cleanouts shall be clearly specified on the plan. Smithfield reserves the right to require SS\_12 cleanouts be provided at its direction. No cleanout shall have an invert elevation greater than 4.5 feet below grade.

2.27 **WATER METER**: Water meters shall be Neptune model T-10, Tru/Flo Compound, or Protectus III Fire Service meters as manufactured by the Schlumberger Water Division, or as approved by the Town of Smithfield, and shall register in gallons. Water meters shall be purchased by the Builder or Developer per Town specification with installation witnessed by the Town. Meter type/model shall be approved by the Town prior to Builder or Developer purchasing the water meter. All 1 1/2-inch and larger meters shall be compound type unless otherwise approved by the Town.

Neptune Meters shall be E-Coder R900i with radio read.

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

1. Water meter box installation shall maintain a minimum 18-inch horizontal edge-to-edge clearance from driveways and/or drive paths, sidewalks or bike paths, unless approved otherwise by the Town.
2. Water meter relocations shall require a new tap when landscaping or other physical features require relocation of the existing service more than 5-feet.
3. Water service lines shall be perpendicular to the main, except in cul-de-sacs.

2.28 **DETECTOR CHECK VALVE**: A detector check valve with a backflow prevention device located downstream is required at the following locations:

- A. Master meters for entire water systems (Neptune Protectus III).
- B. Fire services or automatic sprinkler services.
- C. Locations of backflow prevention devices shall be approved and inspected by the Town.

The detector meter shall be 5/8-inch x 3/4-inch.

2.29 **BACKFLOW PREVENTION DEVICES:** Backflow prevention devices shall be installed as required by the Town of Smithfield's Cross Connection and Backflow Prevention Program. The installer's responsibility is to make proper installation of approved backflow prevention devices, in accordance with the manufacturer's installation instructions, the Uniform Statewide Building Code, and any additional instructions offered by the Town. Approved backflow prevention devices and assemblies are those that meet AWWA standards, and are approved by ASSE and the USC-FCCC (University of Southern California Foundation for Cross Connection Control and Hydraulic Research). Flow orientation, access, and installation of backflow preventers shall be provided in accordance with USC-FCCC guidelines and as specified by the installation instructions of the approved manufacturer. NOTE: USC approval is specific to orientation, horizontal or vertical, device model number and size. Approvals are continuously verified and can be rescinded. Thermal expansion and/or water hammer downstream of the assembly can cause excessive pressure. To avoid possible damage to the system and assembly, the installer will use water hammer arresters, surge protectors, relief valves and expansion tanks as appropriate. Only testable devices that meet or exceed current and future hazards to the Town's distribution system shall be approved and accepted by the Town's Backflow Prevention Manager. Approved method or type of construction shall be included. Backflow prevention assemblies must not be installed in locations subject to flooding such as underground vaults. Protection of backflow preventers shall meet current code requirements and outdoor enclosures for backflow preventers shall comply with ASSE 1060. Refer to the Town of Smithfield's Cross Connection and Backflow Prevention Program Weblink at <http://www.smithfieldva.gov/departments/planning,-engineering,-&-public-works/cross-connection-and-backflow-prevention-program/> for further information.

2.30 **CONTROL VALVES (2 inches in Diameter and Larger):** Control valves (2" and larger) shall be hydraulically operated, pilot-controlled diaphragm-type globe valve. All control valves shall be constructed in an above ground structure meeting the requirements of t. The main valve shall have a single removable seat and a resilient disc. The stem shall be guided at both ends by a bearing in the valve core and an integral bearing in the valve seat. No external packing glands are permitted and there shall be no pistons operating the main valve or any pilot controls. The pilot control shall be a direct-acting, adjustable, spring loaded, normal open, diaphragm valve, designed to permit flow when controlled pressure is less than spring setting. The control valve shall be class 125 bronze fittings manufactured in accordance with ANSI B16.1, ASTM A48, B61, and B62, adjustable from 30 to 300 psi. Valves shall have an internal and external epoxy coating in accordance with AWWA C550-latest revision. Valves shall be furnished with a Delrin stem in both normally open and normally closed configurations. Valves shall also include position indicator devices. Valves shall have remote control and SCADA (Supervisory Control and Data Acquisition) features as required by the Town. This valve shall be Cla-Val or approved equal. Control valve

functions include one or more of the following:

- A. **Check Valve:** Check valves shall be no-slam operation, drip tight shut off and shall have adjustable dual speed controls.
- B. **Pressure Reducing:** Pressure reducing valves shall provide sensitive and accurate pressure control, shall provide easy adjustment and maintenance, shall be tamper resistant, and shall include a fully supported frictionless diaphragm.
- C. **Combination Pressure Reducing and Pressure Sustaining Valves:** Combination pressure reducing and pressure sustaining valves shall have accurate response to slight pressure changes, a check feature, shall be completely automatic operation, drip tight, positive seating; and, shall have fully hydraulic operation
- D. **Solenoid Actuated Valve:** Solenoid actuated valve shall have quick acting solenoid actuation, and shall provide for ease for installation and maintenance.
- E. **Rate of Flow Control Valves:** Rate of flow control valves shall accurately limit flow rate, shall have automatic operation, shall include orifice plate and holder, and shall have a check valve feature and allow for ease of adjustment.
- F. **Altitude Valve:** Altitude valves shall include accurate repeatable level control, drip tight positive shut-off, reliable hydraulic operation, easy adjustable controls, complete automatic operation, and shall be either double acting or single flow as required by the Town.

2.31 **PROCEDURES WHEN CUTTING INTO OR REPAIRING WATER MAINS:** When an existing main is opened, either by accident or design, the excavation will likely be wet and may be contaminated from nearby sewers. Liberal quantities of hypochlorite applied to open trench areas will lessen the danger from such contamination. Tablets are preferred because they dissolve slowly and continue to release hypochlorite as water is pumped from the excavation.

- A. Once the trench has been dewatered and repairs begin, all pipe, couplings, sleeves, and associated appurtenances shall be swabbed or sprayed with a five percent hypochlorite solution before they are installed. No. 57 stone should be applied to the bottom of the open trench to provide adequate footing for repair crews. Upon completion of repairs, flushing from hydrants or other means shall take place toward the work location from both directions if possible. Flushing shall take place immediately after repairs are completed and continue until all discolored water and air is eliminated.
  - 1. Where practical, in addition to the procedures above, a section of main in which the break can be isolated without interrupting service to customers, the section shall be flushed with a 300 mg/L chlorine solution with a contact time of 15 minutes. This shall be accomplished by placing hypochlorite granules into the upstream end of where the repair is taking place. After the repair is completed, the upstream valve shall be opened only long enough to fill the main. Once the 15 minute contact time has taken place, the main shall be thoroughly flushed until all discolored water and

air is removed and the chlorine residual is less than 2 mg/L. Flushing shall take place in such a way as to prevent discolored and heavily chlorinated water from being pushed out into the system.

2.32 **CONSTRUCTING WATER AND SANITARY SEWER PIPELINES IN FILL AREAS:**

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

The water or sanitary force main pipe lines installed in fill areas shall be restrained joint ductile iron pipe extending at least 40-feet on either side of the fill into native ground. Gravity sanitary sewer lines installed in fill areas shall be restrained joint ductile iron pipe extending to the nearest manholes on either end of the fill which are located in native ground.

2.33 **SUBSURFACE UTILITY LOCATING:** Test holes shall be performed and information incorporated in the design for all existing pipe crossings where conflicts with proposed utilities may occur. This shall include physically locating all proposed connections to existing Town of Smithfield water and sanitary force main systems. As part of the site plan process, the developer/engineer shall provide test hole data sheets to the Town which substantiate the horizontal and vertical location of each crossing/connection.

2.34 **TEMPORARY CONSTRUCTION METERS:** Temporary construction meters shall be installed in accordance with Smithfield Detail W-1.

2.35 **MASTER UTILITY PLAN DEVELOPMENT:** Where required by the Town of Smithfield, Master Utility Plans with associated hydraulic modeling and calculations shall be submitted prior to site plan submittal. Generally, Master Utility Plans shall be submitted for large scale developments, projects being developed in phases, and developments requiring multiple water and or sewer pump station facilities. Town of Smithfield general guidelines for development of Master Utility Plans are included in Appendix E.

2.36 **GEOTHERMAL WELLS:** All proposed geothermal wells shall be shown on a site plan. The site plan shall be reviewed and approved by the Town of Smithfield.

1. The site plan shall contain the following:

- a. Wells shall be issued the appropriate State Health Department and Town of Smithfield permits prior to construction.
- b. A Town of Smithfield certified well driller shall be employed to drill all wells.
- c. Geothermal wells shall not be located within the limits of a stormwater management

- facility or other areas subject to frequent surface water intrusion.
- d. Well construction shall conform to the State Health Department, waterworks regulations and private well regulations.
  - e. Drilling fluid mix water shall be from a potable water source. Drilling fluids shall be sodium bentonite clay.
  - f. ReInjection of water or any other substances back into the groundwater system for heat pumps or any reason shall be prohibited.
  - g. Provide a typical Geothermal well detail on the plans including:
    - i. Diameter of the wells
    - ii. Depth of wells
    - iii. Full depth grout
    - iv. Closed loop system
    - v. Number of wells
    - vi. Location of wells and well field
2. Proposed Geothermal Wells, within 1500 feet radius of a public water well or if determined by the Town of Smithfield to be a potential influence to a public well, shall also provide the following:
- a. The Applicant must confirm that Upper Potomac aquifer is below the bottom of the proposed depth of the geothermal well, or is non-existent in the vicinity of the proposed geothermal well field.
  - b. The only fluids allowed in the piping/well system shall be potable water and food grade antifreeze additives.
  - c. Provide methods of constructing the geothermal wells including mud pits and measures to control drilling fluids/mud.
  - d. Contact information of the person responsible for inspecting the full depth grout installation. The person shall provide to the Town of Smithfield a Certification Letter that states they witnessed and can certify all wells were inspected during the grouting process. The certifying person shall have one of the following qualifications:
    - i. Professional Engineer licensed in Virginia
    - ii. Certified Professional Geologist
    - iii. Third party Town of Smithfield certified well driller
  - e. Grout shall be pumped through the tremie pipe until grout appears at the surface. Grout shall be placed in one continuous operation.
  - f. Well grouting shall be completed prior to removal of the drill rig.

### **SECTION 3. SITE WORK, DRAINAGE, STREETS:**

- 3.1 **GENERAL:** Design shall be by a professional engineer licensed in accordance with the requirements of the Code of Virginia. The Town prior to commencement of construction shall approve all plans, plats and specifications in writing.

The Contractor shall be responsible for traffic control during the course of the work and shall provide certified flagmen, signs, etc., as necessary to meet requirements of VDOT and/or the Town of Smithfield. At least one (1) lane of traffic shall be maintained on existing residential streets at all times.

Tree trunks, branches, and exposed roots damaged during equipment operation or construction shall be pruned as directed by a certified arborist or the Town of Smithfield.

The Contractor shall construct and maintain all necessary silt devices sufficient to prevent soil from being eroded from the site into any adjacent system, ditch or watercourses. Any material that is eroded shall be promptly removed. The Contractor shall comply with the current requirements of the "Virginia Erosion and Sediment Control Handbook".

All excavated materials shall be stockpiled so as not to interfere with existing drainage. Stockpiles shall have as a minimum silt fence installed around its perimeter.

The Contractor shall be responsible for removing and replacing with matching materials any pavement, driveways, walks, curbs, etc., that must be cut or that are damaged during construction. Cuts in pavements shall be straight-line saw cut. Cuts in curbs and walks shall be saw cut at an existing joint. Repair as per Section 3.3.7 of these standards

Plans, profiles and specifications shall include provisions for excavation and backfill, dewatering, sheeting and bracing, maintenance of traffic and protection of the public, protection of existing utilities and structures, trench widths and preparation, materials, material testing, details of pipe laying and construction of pipe lines and appurtenances and other items as may be applicable to the project and all in accordance with good engineering practice. Plans (Scale 1"=30' or larger) shall include profiles, details and topographic information such as existing and proposed zoning, lot numbers, street pavement, sidewalks, driveways, curb and gutter, storm drains, utilities, trees, shrubbery, property lines, street names and house numbers (where available) and appropriate elevations. Plans shall also include a vicinity map, map and deed book references for adjacent property and existing easements, and typical sections of streets, roads and ditches. Plans shall not be larger than 24"x36". Plans shall include typical sections for streets and ditches.

Datum shall be Town of Smithfield, Virginia 2003 Geodetic Control Network, Horizontal NAD 83 (1996), and Vertical NAVD 88. Plans shall show referenced benchmark and a minimum of two (2) benchmarks established for the project. The developer shall establish permanent benchmarks in subdivisions. The number and locations are to be determined by the Town's representative and developer. The benchmark elevation is to be certified by a licensed land surveyor or a professional engineer.

3.2 **DRAINAGE DESIGN**: Drainage shall be designed in general by the criteria established in the current VDOT Drainage Manual. Design and construction shall also meet the applicable requirements of the Town of Smithfield "Chesapeake Bay Preservation Area Ordinance"; and stormwater management and erosion and sediment control requirements of the Commonwealth of Virginia Soil and Water Conservation Board. Refer to the current "Virginia Erosion and Sediment Control Handbook" and "Virginia Stormwater Management Handbook". No "wet" drainage systems are to be allowed in the Town of Smithfield.

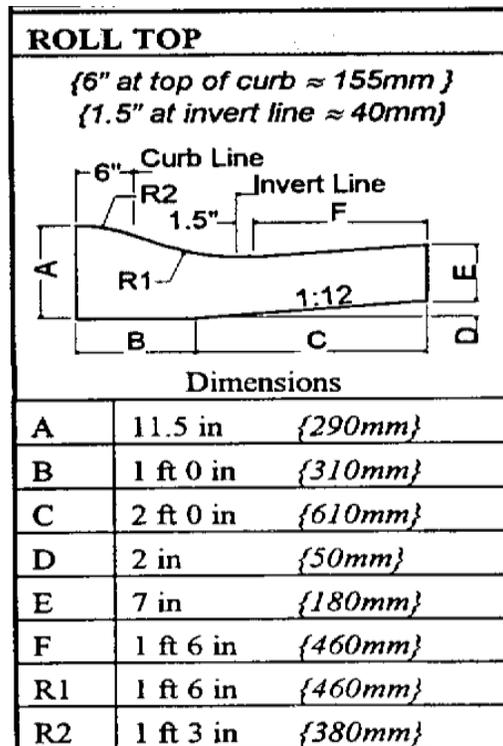
Drainage shall be designed by the criteria established in the Virginia Department of Highways Drainage Manual and in coordination with the following guidelines:

- (1) Peak runoff shall be computed by the rational method with the intensity taken from the intensity-duration curve for Norfolk, Virginia.
- (2) Where the drainage basin exceeds 200 acres or when a retention design is involved, hydrographic or other approved methods are to be used for design purposes.
- (3) Runoff coefficients shall be based on a weighted coefficient for the composite area.
- (4) Inlet capacities and pavement spread calculations shall be designed in accordance with the current VDOT Drainage Manual. These capacities shall be designed for a storm having a minimum 10-year recurrence frequency. Inlets shall be spaced to eliminate pavement spreads in excess of ten feet (10') on the typical street section calculated on a 10-year recurrence frequency.
- (5) Pipe Capacities:
  - (a) Hydraulic grade line calculations are required which take into account structure and bend losses, etc. Pipe joints must be designed to withstand pressures proposed. System must be designed to prevent flooding during the design event.
  - (b) Hydraulic grade line calculations must reflect the same design event in the downstream or receiving facility.
- (6) Off-site drainage improvements will be required to prevent the proposed development from having any significant detrimental effect on the downstream facilities or natural channels.

3.3 **DRAINAGE MATERIALS AND STANDARDS:** Materials and standards shall be in accordance with the current Virginia Department of Transportation (VDOT) "Road and Bridge Specifications" and "Road and Bridge Standards", unless otherwise stated.

- (1) Temporary drainage during construction shall be provided by the Contractor to relieve areas that may cause damage to roadways, etc. or as directed by the Town.
- (2) Concrete shall be Class "A3" Air Entrained (3,000-psi. minimum) for general concrete and Class "A4" Air Entrained (4,000 psi minimum for pre-cast units).
- (3) All storm sewer pipes in Town Right-of-Way shall be concrete tongue and groove. Pipes not subject to traffic loading may be non-reinforced pipe. Pipes subject to traffic loading shall be reinforced concrete pipe, Class III minimum. H.D.P.E. (High Density Polyethylene Pipe Smooth Bore) may be substituted in lieu of concrete pipe in all locations in which this pipe will meet or exceed the current VDOT Standards and Specifications, and the approval of the Town. Corrugated metal pipe will not be permitted. Any concrete pipe that has an end section that is broken, chipped, or has been saw cut during installation will be required to be epoxy grouted as per approval of the Town engineer and / or their representative.
- (4) Pre-cast structures are acceptable. These drainage structures shall meet all current VDOT Standards and Specifications. Drop Inlet T-DI-1 shall be furnished with square "Alternate Top" where wheel loading is not a factor.
- (5) Riprap shall be provided at endwalls and flared end sections or as otherwise specified by the Town.
- (6) All new and, where required, existing downstream, storm sewer pipes and structures shall be cleaned of debris and eroded material upon completion of construction.
- (7) No open cut of a public roadway shall be allowed except with written permission from the Town, accompanied with all necessary sureties. This repair shall be equal to or greater than VDOT MP-70 Figure 1(pages 34-35) or as approved by the Town.
- (8) Relocation of any utilities shall be at the Contractor's expense and completed with site work.

- (9) Before digging the Contractor shall call "MISS UTILITY" of Tidewater at 1-800-552-7001 for location of existing utilities. Prior to construction or excavation, the Contractor shall assume the responsibility of locating any underground utilities (public or private) that may exist and cross through the area of construction. Utility companies shall be notified 72 hours in advance of any excavation in the proximity of their utilities. The Contractor shall be responsible for repairing, at his expense, any existing utilities damaged during construction. The above referenced statement shall be noted on all construction plans. At their expense, the contractor shall be responsible for repairing any existing utilities or infrastructure within the right of way of the Town during construction. This repair shall meet the approval of the Town.
- (10) In lieu of CG-6 curb, roll-top curb is to be utilized where applicable by Virginia Department of Transportation's (VDOT) current standards and specifications or as directed by the Town's representative.



3.4 **PAVEMENT DESIGN CRITERIA**: Pavement design shall be performed by a Professional Engineer/Land Surveyor licensed to perform this type of work. Soil sampling shall be performed as per the current VDOT Pavement Design Guide. Samples should be taken a minimum of 10' below the finish grade of the proposed street. The Engineer shall submit to the Town for review test logs, pavement design and bore location map. The following information shall be submitted to the Town with the pavement design:

- (1) **Soil Analysis** - Ten-foot (10') deep boring logs of sufficient quantity to determine the soil profile, related to elevations. The borings shall reflect ground water elevations; description of materials and blow counts on the samplers. Borings shall indicate normal water table elevation, and projected seasonable high water table elevation. Maximum spacing of test shall be 500 foot (250' radius of coverage per test) and as per the current VDOT Pavement Design Guide. No less than 2 tests are to be provided. All soil tests are to be performed by a certified Testing Laboratory licensed to perform this type of work. Soil Analysis of subgrade material shall include:
  - (a) Gradation (Sieve and Hydrometer Analysis)
  - (b) Atterberg Limits.
  - (c) Moisture density relationships and curves.
  - (d) Maximum dry weight.
  - (e) Optimum moisture content.
  - (f) Specific gravity.
  - (g) Swell.
  - (h) California Bearing Ratio in accordance with Virginia Test Method (VTM-8), with soaked and unsoaked test results required. Samples shall be taken at the proposed street subgrade elevation.

- (2) **Traffic Volumes** - On proposed new streets the following minimum 24-hour trip generation information shall be used or the current “I.T.E. Trip Generation Manual”, whichever is greater:

<u>Development</u>	<u>Trip Generation Rate</u>	<u>%Heavy Trucks</u>	<u>7<sup>th</sup> Edition ITE Rate</u>
Single Family Residential	10/ dwelling unit	5	9.57
Townhouse Residential	6/ dwelling unit	5	5.86
Apartment Residential	6/ dwelling unit	5	6.72
Elementary and Intermediate Schools	0.8/ student	5	1.29/student elem. 1.62/student int.
High School	1.4/ student	5	HS 1.71/student
Industrial	52/ AC	12	6.97/KSF
Shopping Centers	600/ AC	5	42.94/KGLSF

Where proposed streets intersect the boundary of the subdivision providing access to adjoining undeveloped property, the design traffic shall be based on the number of acres and the total number of units expected to contribute traffic to the street.

3.5 **PAVEMENT DESIGN**: The pavement shall be designed per the current “VDOT Pavement Design Guide for Subdivision and Secondary Roads in Virginia”.

- (a) Flexible Pavement. Flexible pavement design shall be in accordance with Section 315 of the current “VDOT Road and Bridge Specification Manual” and the current “VDOT Pavement Design Guide for Subdivision and Secondary Roads in Virginia”.

Off site or private property:

- Minimum subgrade CBR of 15. If native soil has CBR < 15, install minimum 6-inch select borrow base.

- 6-inch minimum compacted subgrade.
  - Minimum flexible pavement section:
    - Asphalt Surface Course: 2-inch
    - Aggregate Base: 6-inch
    - Compacted Subgrade: 6-inch
- (b) Full Depth Asphalt. Full depth asphalt pavement design criteria shall conform to the provisions of the Asphalt Institute Manual and/or any applicable sections of the current “VDOT Pavement Design Guide for Subdivision and Secondary Roads in Virginia”. Minimum section shall be:
- 1-1/2-inch surface.
  - 10-1/2-inch base.
  - 6-inch compacted subgrade.
- (c) Soil Cement Base. The use of a design that utilizes soil cement shall meet Section 307 of the current “VDOT Road and Bridge Specifications Manual”.
- (d) Lime Stabilized Base. The use of a design that utilizes lime-stabilized base shall meet Section 306 of the current “VDOT Road and Bridge Specifications Manual”.
- (e) Aggregate Base. The use of a design that utilizes aggregate base shall meet Section 309 of the current “VDOT Road and Bridge Specifications Manual”.

3.6 **PAVEMENT MATERIALS AND STANDARDS:** Materials and standards shall be in accordance with the current edition of the HRPDC Construction Standards, unless otherwise stated.

3.7 **PAVED PRIVATE ENTRANCE:**

- (1) Applicants to whom permits are issued shall at all times indemnify and save harmless the Town of Smithfield, Virginia from responsibility for, damage to, or liability arising from the exercise of the privileges granted in such permit either during construction or at any time in the future.
- (2) A permit may be denied any applicant, and all permits issued by the Town of Smithfield may be revoked, whenever in the opinion of the Town Manager, the safety, or use of maintenance of the highway, so requires.
- (3) The permittee agrees that if the work authorized by this permit, including

any work necessary to restore shoulders, ditches and drainage structures to their original condition, is not completed by the applicant to the satisfaction of the Town, the Town of Smithfield will do whatever is necessary to restore the area within the right of way to its original condition, and the permittee will pay to the Town the actual cost of completing the work.

- (4) The absence of a Town representative does not in any way relieve the permittee of responsibility to perform the work in accordance with the provisions of this permit.
- (5) No trees are to be cut or trimmed within the right of way.
- (6) The entrance is to be constructed so as not to impair drainage within the right of way, with any and all drainpipe being supplied by the permittee.
- (7) All precautions will be taken for the protection of traffic, such as flagmen, signs, barricades, lights, etc. as necessary.
- (8) **Note:** The paved area (the area between the edge of the pavement/back of curb and the right of way line) shall consist of one of the following treatments in accordance with the current Virginia Department of Transportation specifications and/or approval by the Towns' Engineer:
  - a. Asphalt Entrance: The base course shall be crushed stone, Type I, No. 21A, 21B or 22, minimum 8" in depth compacted to 95% density at optimum moisture. The surface course shall consist of a prime with RC-250 at the rate of 0.3 gal. per sq. yd. and an application of bituminous concrete Type SM-2A at a rate of 220 lbs./sq. yd. geometrical design of the entrance, if piped, should be the same as the attached PE-1. If it is a curb and gutter roadway section, minimum 2 – foot flares should be installed at the curb line.
  - b. Concrete Entrance: The paved area shall consist of Class A3 concrete 7" thick (minimum), current Virginia Department of Transportation Road and Bridge standards, Sections 201 and 203. Geometrical design of the entrance, if piped, should be the same as attached PE-1. Allowance will be given on 20 – foot radial section of PE-1 with minimum 3 – foot flares. If it is a curb and gutter roadway section; minimum 2 – foot flares should be installed at the curb line.

**Please contact Mr. Wayne Griffin, Town of Smithfield Engineer, at 365-4200 prior at any installations of entrances.**

## SECTION 4. PROJECT CLOSE-OUT:

4.1 **RECORD DRAWINGS:** Record drawings are required at the completion of all water, sanitary sewer, and storm sewer system projects constructed for, or dedicated to, the Town of Smithfield and shall include the following:

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

Water mains along roadways shall be dimensioned from the edge of pavement to the main every 50-feet. The Town of Smithfield reserves the right to require additional dimensioning on the record drawings for areas of long distances between fittings.

B. Development Projects:

1. Final Inspection Requirements:
  - a. No final inspection will be scheduled until all property pins are installed, flagged, and staked, installation of all other utilities serving the development (to include Virginia Power, Telephone, Gas, Cable, and others) is complete, and record drawings are submitted. Record drawings shall be submitted in accordance with Section 4.1.A and delivered fifteen (15) days prior to scheduling the final inspection.
  - b. A letter shall be provided by the Developer/Owner confirming that all utilities (i.e. electric, gas, cable, telephone and others) have been installed. The letter shall include the cost associated with the installation of the water, sanitary sewer, and storm sewer system, both on-site and off-site.

- c. A copy of the recorded plat and/or related documentation shall be submitted to the Town of Smithfield. Easement dedication shall comply with Section 2.5.
- d. The Developer/Owner will provide a signed letter by the Engineer or Surveyor of record stating that the construction work was completed according to the approved plans and specifications. This statement will be based upon inspections of the construction, during and after construction.
- e. Contractor shall provide personnel responsible for exercising all valves in the presence of the Town during the final inspection walkthrough.

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

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

4.3 **DEDICATION (DEVELOPMENT PROJECTS):** Following verification of the record drawings and completion of the punch list, the developer/owner will formally dedicate the water distribution, sanitary sewer, and storm sewer system, easements, and/or property to the Town of Smithfield. Such dedication will be acknowledged in writing by the Town.

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

4.4 **WATER METER ALLOWANCE:** No water meter will be installed in any subdivision or development prior to substantial completion of water, sanitary sewer, and storm sewer systems. Substantial completion includes completion of all required tests, except CCTV, and verification from an acceptable laboratory that the water is bacteria free. The Town of Smithfield will not accept any utility until final completion requirements of Section 4.1 have been met.

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

Option 1:

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

Option 2:

Submit cash deposit or a letter of credit (the “deposited funds”) to the Town that can be used to complete deficiencies not corrected by Developer/Contractor. Entire deposited funds or unused portion will be returned to Developer/Contractor once the Town accepts the utilities. When requested by Developer, the Town will identify deficiencies in pre-final punch list. If not corrected immediately, a plan for correction must be submitted to the Town within 30 days of receipt of notice of deficiencies. All deficiencies identified must be completed within 60 days of receipt of Notice of Deficiency. If not, the Town will use deposited funds to correct deficiencies. The Town will assess an administrative fee of 25% over costs for managing correction of deficiency. Deposited funds will be \$500 per meter multiplied by the total number of meters approved for the site plan and is to be made at the time of substantial completion. There is a \$12,000 minimum deposit.

**SECTION 5. WATER FACILITIES AND PUMPING STATIONS:**

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

Water production facilities shall be designed and constructed in accordance with the latest Town constructed facility in regards to operation, controls, SCADA (Supervisory Control and Data Acquisition), layout, construction materials, equipment, disinfection and other related appurtenances and the latest Town Standards and Specifications for Groundwater Wells and Water Production Facilities. The size of storage and production facilities shall be based on the needs of the development and as approved by the Town. Water storage facilities shall consist of disinfection, peak demand and fire flow storage unless otherwise approved by the Town.

5.2 **WASTEWATER PUMPING STATIONS:** Pumping Stations shall meet all applicable requirements of the Department of Environmental Quality (DEQ), and shall be submitted to the Town of Smithfield for review and approval. Pumping Stations shall be designed in accordance with the DEQ SCAT Regulations, and the Town of Smithfield Design Standards. The size of the pumping station shall be based on the needs of the development and the Town.

5.3 **OPERATIONS, MAINTENANCE AND REPAIR MANUALS:** Operation, maintenance and repair manuals shall be provided for all individual pieces of equipment and electrical systems. Provide four (4) copies of each manual bound in hardback binders or an approved equivalent. One (1) complete manual shall be provided to the Town for approval prior to system or equipment tests being performed. All revisions or comments from the system and equipment testing shall be incorporated into the final four (4) copies to be submitted to the Town prior to project completion. The manual shall include the following information:

- A. On the exterior of the manual denote the following “OPERATION, MAINTENANCE AND REPAIR MANUAL”, the name of the project, location of the building, and the name of the Contractor.
- B. The manual shall include the name, addresses, and telephone numbers of each subcontractor installing the equipment and systems and the name, address and phone numbers for the local representatives for each item of equipment and each system.
- C. The manual shall include a table of contents, with tab sheets placed before instructions covering the subject.
- D. The manual shall include, but not be limited to the following:
  - 1. A system layout showing circuits, devices, and controls

2. As-built wiring diagrams with the data to explain detailed operation, maintenance and repair for each component or system.
3. A control sequence describing the start up, operation and shutdown.
4. Detailed instructions on the function of each piece of equipment or system to include the start up, operation, repair and shutdown procedures.
5. Provide a detailed parts list for each piece of equipment or system including names, addresses and phone numbers of suppliers.
6. The manual shall be complete in all respects for all equipment, control, accessories and systems.
7. The manual shall be clearly and concisely written and shall be specifically prepared for makes, models and types of equipment and systems furnished.
8. General literature shall be modified or highlighted for the specific piece of equipment or system furnished.

**SECTION 6. GENERAL NOTES:**

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

**TOWN OF SMITHEFIELD GENERAL NOTES FOR WATER DISTRIBUTION AND SANITARY SEWER SYSTEMS:**

- A. All components of the water distribution and sanitary sewer system shall be installed and tested in accordance with the latest edition of the Town of Smithfield Design Standards for Water Distribution and Sanitary Sewer Systems, the HRPDC Regional Construction Standards (Sixth Edition dated June 2016), the Virginia Department of Health Waterworks Regulations, and the Department of Environmental Quality Sewage Collection and Treatment Regulations. The Contractor shall use only new materials, parts, and products on all projects. All materials shall be stored so as to assure the preservation of their quality and fitness for the work. A copy of the Town of Smithfield Design Standards and HRPDC Regional Construction Standards must be kept on-site by the contractor during time of installing, testing, and conveying facilities to the Town.
- B. The Contractor/Developer shall acquire a Certificate to Construct Water and Sanitary Sewer Facilities prior to commencement of construction of any water or sanitary sewer facilities.
- C. A preconstruction meeting shall be held between the Town, the Developer, the Contractor including relevant subcontractor(s), and the Project Engineer prior to issuance of a Town of Smithfield Certificate to Construct. It shall be the responsibility of the Contractor to schedule this meeting with the Town and coordinate with the other attendees.
- D. The Developer's representative shall submit shop drawings for all materials and receive Town approval prior to commencement of construction. All materials ordered and installed prior to the Town's review and acceptance will be at the Contractor's/Developer's risk.
- E. Pipe lines and services shall be installed after grading to within 6-inches of final grade and prior to placement of base material.
- F. All water mains shall be fully flushed, pressure tested, and disinfected and satisfactory bacteriological samples obtained, in accordance with the Town of Smithfield Design Standards. Flushing of water mains shall be scheduled with the Town Inspector a minimum 3 business days prior to the flushing. Contractor shall provide the required duration and volume to the Inspector. Flushing will be scheduled Tuesday through Thursday, unless authorized otherwise by the Town, and will be on a first come-first serve basis.

- G. Routine periodic inspections during construction will be provided by the Town. These inspections do not relieve the Developer/Contractor/Owner from his obligation and responsibility for constructing a water distribution and sanitary sewer system in strict accordance with the Town of Smithfield Design Standards and HRPDC Regional Construction Standards.
- H. Any field modifications or changes to the approved plans shall be verified and checked by the Engineer of Record and approved by the Town prior to any field modifications or changes. All approved changes and field modifications shall be accurately indicated on the record drawings.
- I. All lots shall be provided with water service and sanitary sewer connections. The connections shall be extended from the main to the property line or easement line, and shall terminate with a yoke in a meter box, or at the clean out, set at final finished grade. Meters for all lots (units) shall be paid for by the Developer or builder and installed by the Town.
- J. Any required easements, permits and approvals shall be acquired by the Developer prior to commencement of water main and/or sanitary sewer construction.
- K. The Contractor shall comply with all applicable laws, ordinances, rules, regulations and orders of any public body having jurisdiction. The Contractor shall erect and maintain, as required by the conditions and progress of the work, all necessary safeguards for safety and protection. The Contractor shall also notify "Miss Utility" at 1-800-552-7001 or 811 prior to performing any underground excavation.
- L. Water meter box installation shall maintain a minimum 18-inch horizontal edge-to-edge clearance from driveways and/or drive paths, sidewalks, bike paths, curbing and adjacent water meter boxes.
- M. Only Town of Smithfield personnel are authorized to operate valves on existing Town water mains and sanitary force mains. Once a system has been hydraulically energized, the Town will be responsible for operating the valves. The Contractor shall contact the town of Smithfield Public Works at 757-365-4200 if there is an emergency or need to open/close a valve.
- N. Any existing unused well(s) shall be abandoned in accordance with State Private Well Regulations and Town of Smithfield Code.
- O. Bedding of Town utilities shall be in accordance with HRPDC Detail EW\_01, Type III for rigid pipe and Type IV for PVC pipe.
- P. No trees, shrubs, structures, fences, irrigation mains, invisible pet fences or other obstacles shall be placed within an easement which would render the easement inaccessible by equipment. Shrubs shall be a minimum of 5 feet, and trees a minimum of 10 feet, from the center of water and sanitary sewer pipelines.

- Q. Joint restraint shall be provided in accordance with minimum requirements of Town of Smithfield Detail W-2, unless shown otherwise on the plans. All pressure pipelines shall have joint restraint. Fire hydrants shall be restrained at least one full joint of pipe in each direction on the mainline.
- R. Proposed water and sanitary sewer systems shall maintain a minimum horizontal separation of 5-feet from other utilities and structures, including but not limited to storm sewers, street lights, etc. Water and sanitary sewer facilities shall have a minimum 10-foot horizontal edge-to-edge separation.
- S. Any proposed backflow prevention device and/or grease trap must be inspected by the Town of Smithfield Backflow Prevention Manager/FOG Inspector (757- 365-3327/ 757- 365-4272).
- T. The Contractor/Developer shall acquire a Certificate to Construct Water and Sanitary Sewer Facilities prior to commencement of construction of any water or sanitary sewer facilities. Plumbing inside of proposed buildings must be inspected by the Town's Backflow Prevention Manager (757-365-3327), for potential cross connections. Any cross connections must be protected by the appropriate backflow prevention device(s).
- U. Easements denoted as "Town of Smithfield Utility Easements" are for the exclusive use of the Town and the property owner. Other utility service providers desiring to use these easements with the exception of perpendicular utility crossings must obtain authorization for access and use from the Town and the property owner. Additionally, the Town shall not be held responsible for any damage to improvements within this easement, from any cause.
- V. The Town of Smithfield shall not be held responsible for any pavement settlement due to pipe bedding, backfilling, backfill materials or compaction for water or sanitary sewer facilities for this project.
- W. Fire hydrants to be installed within existing or proposed VDOT right-of-ways shall be located in accordance with VDOT Requirements.
- X. Privately owned utilities, (e.g., water and sewer lines and private fire service mains), shown on this plan are regulated by the Virginia Uniform Statewide Building Code, and enforced by the Isle of Wight County Permits Division. These privately owned utilities must comply fully with the International Plumbing Code, the National Fire Protection Association Standard 24, and the Virginia Statewide Fire Prevention Code. Contractors working from this site plan are cautioned not to install or conceal privately owned site utilities without first obtaining the required permits and inspections.
- Y. Sanitary sewer laterals shall not connect to the mainline within 5-feet of a manhole. Laterals upstream and within 5-feet of the manhole shall connect directly into the manhole where necessary.

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

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

**TOWN OF SMITHFIELD GENERAL NOTES FOR WATER  
PRODUCTION FACILITIES: (Revised March 2008):**

- A. All well facilities shall be designed by a Commonwealth of Virginia Licensed Professional Engineer (Consultant), and the design, construction and installation shall be in accordance with the following:
  - 1. Commonwealth of Virginia Department of Health (VDH) Waterworks Regulations.
  - 2. Town of Smithfield Design Standards.
  - 3. Approvals of the Town and VDH shall be obtained prior to commencement of construction.
- B. Construction plans shall be submitted through the Town for review and approval. The Developer/Contractor/Consultant shall supply minimum three (3) sets of construction plans and specifications detailing all phases of the well and water production construction including testing, materials, shop drawing submittals, painting and installation. These shall be submitted to, and approved by, the Town.
- C. The Developer/Contractor/Consultant shall be responsible for assuring that all work is performed in accordance with the approved plans and specifications. Any deviation from the approved plans and specifications shall be approved by the Town and VDH prior to performing such work.
- D. Drilling fluid shall be sodium bentonite drilling clay commercially processed to meet or surpass the viscosity specifications in API “Standard 13-A for Drilling Fluid Materials”, or approved equal.
- E. Organic drilling muds shall not be used in any phase of drilling or construction. Lime shall not be used to thicken the drilling mud.
- F. Drilling fluid mix water shall be from a potable source and initially Chlorinated to 50 mg/l free Chlorine concentration. Periodic addition will be required to maintain a 10 mg/l free Chlorine residual. All drilling fluids additives shall comply with industry

standards and practices.

- G. During drilling and well construction, a “Driller’s Log” shall be prepared and submitted to the Town upon completion of the drilling.
- H. Upon completion of the geophysical logging, recommendations shall be submitted to The Town for approval prior to the installation of the well casing and screens.
- I. Grout of the surface casing shall be placed under pressure using an external tremie pipe in one continuous operation to a minimum depth of 100-feet.
- J. Grouting operations shall be performed in the presence of the Town’s Inspector and a VDH representative. Both agencies shall be notified a minimum of 48-hours in advance of the grouting operations.
- K. Grout mixtures shall be approved by VDH and the Town prior to installation. Grout shall be firmly set (minimum of 72-hours) prior to proceeding with the well construction.
- L. The well casing shall be stainless steel 316L. PVC well casing may be used with the prior approval of the Town and VDH as to material specifications and construction installation methods.
- M. The screen shall be stainless steel 316L continuous slot wire wound screen, reinforced with longitudinal bars; the bars having a cross section that will form an opening between each adjacent coil of wire.
- N. Prior to installation, the Consultant/Driller’s recommended screen slot and gravel size along with supporting calculations shall be submitted to the Town for approval.
- O. Prior to gravel packing, the hole shall be conditioned to ensure stability and to provide a clear filter cake. The gravel shall be disinfected by adding sufficient Chlorine to the placement fluid to produce a minimum Chlorine residual of 400 mg/l.
- P. The well shall be developed in such a way as to remove the fines and sort the gravel pack. Records of the development steps and the chemicals used shall be submitted to the Town.
- Q. A well plumbness and alignment, 48-hour pump test and recovery test shall be performed and the results documented and submitted to the Town.
- R. Water samples shall be collected and analyzed for all parameters, required by VDH, including VOC’s.
- S. Final pump size and setting recommendations, along with test results and supporting documentation, shall be submitted to the Town for review and approval prior to installation.

- T. The well shall be disinfected in accordance with VDH requirements.
- U. The Developer shall obtain construction and operational permits from VDH and DEQ.
- V. The Developer shall obtain all easements, approvals and regulatory permits.
- W. The Developer shall acquire and provide 3-phase electrical service for the facility.
- X. The water production facilities shall be equipped with a standby generator. Generator shall be rated for continuous duty and provide all power to operate the complete facility and systems.
- Y. The water production facility shall be equipped with a Town compatible SCADA system.
- Z. Shop drawings and operational, maintenance and repair manuals shall be provided to The Town, along with a one-year warranty on all facility components and workmanship.
- AA. Record drawings shall be submitted and the facilities shall be dedicated as a public water supply prior to acceptance by the Town. All required easements shall be dedicated to the Town with recorded documents submitted to the Town.
- BB. The facility shall be fenced.

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## **STANDARD DESIGN FORMS**

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## WATER DATA SHEET

Date: \_\_\_\_\_ Revised: \_\_\_\_\_

**I. GENERAL INFORMATION:**

- a. Project Name: \_\_\_\_\_
- b. Project Address: \_\_\_\_\_
- c. Developer: \_\_\_\_\_
- d. Submitted By: \_\_\_\_\_
- e. Contact Person: \_\_\_\_\_
- f. Address: \_\_\_\_\_  
\_\_\_\_\_
- g. Phone: \_\_\_\_\_ Fax: \_\_\_\_\_ Email: \_\_\_\_\_

**II. DESIGN INFORMATION:**

- a. Source of Water: \_\_\_\_\_
- b. Flow Information:

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

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

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

**WATER DATA SHEET (continued)**

Date: \_\_\_\_\_ Revised: \_\_\_\_\_

Project Name: \_\_\_\_\_

Project Address: \_\_\_\_\_

**III. FIRE FLOW INFORMATION:**

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

Date Performed: _____	Nozzle Size: 2-1/2 inch
Hyd. No. _____ Static _____ psi	Residual _____ psi
Hyd. No. _____ Pitot _____ psi	Flow _____ gpm
Hyd. No. _____ Pitot _____ psi	Flow _____ gpm
Hyd. No. _____ Pitot _____ psi	Flow _____ gpm
	Residual Flow _____ gpm
	Calculated Flow @ 20 psi _____ gpm

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

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

d. Hydraulic Analysis: Fire Flow + Maximum Day Demand + any applicable irrigation demands:  
\_\_\_\_\_ gpm @ \_\_\_\_\_ psi. > 20 psi (Node \_\_\_\_\_)  
*(Attach a hydraulic analysis that supports the above flow and pressure results)*

e. Number of existing fire hydrants: \_\_\_\_\_

f. Number of proposed fire hydrants: \_\_\_\_\_

**NOTE:** A maximum single flow from any fire hydrant shall not exceed 1,000 gpm.

**Fire Department Approval (Town use only):**

Approved by: \_\_\_\_\_

Date: \_\_\_\_\_

## WATER DATA SHEET (continued)

### IV. WATER DISTRIBUTION INFORMATION:

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

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

- b. Water Meter Assemblies:

Water Meter Size (Inches)	Quantity

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

- c. Casing Pipe:

Diameter \_\_\_\_\_ (Inches), Length \_\_\_\_\_ (Feet)

Diameter \_\_\_\_\_ (Inches), Length \_\_\_\_\_ (Feet)

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## SANITARY SEWER SYSTEM DATA SHEET

Date: \_\_\_\_\_ Revised: \_\_\_\_\_

**I. GENERAL INFORMATION:**

- a. Project Name: \_\_\_\_\_
- b. Project Address: \_\_\_\_\_
- c. Developer: \_\_\_\_\_
- d. Submitted By: \_\_\_\_\_
- e. Contact Person: \_\_\_\_\_
- f. Address: \_\_\_\_\_
- g. Phone: \_\_\_\_\_ Fax: \_\_\_\_\_ Email: \_\_\_\_\_

**II. DESIGN INFORMATION:**

A. Sanitary Sewer System: \_\_\_\_\_

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

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

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

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

D. Sanitary Sewer Manholes:

Standard Manholes: \_\_\_\_\_, Average Depth: \_\_\_\_\_

60-inch Manholes: \_\_\_\_\_, Average Depth: \_\_\_\_\_

E. Casing Pipe:

Diameter \_\_\_\_\_ (inches), Length: \_\_\_\_\_ (feet)

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## **APPENDIX A**

Smithfield Special Provisions to the HRPDC Regional  
Construction Standards (Sixth Edition)

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**Town of Smithfield Special Provisions to the  
HRPDC Regional Construction Standards (6<sup>th</sup> Edition)  
Appendix A**

<b>Item</b>	<b>Title</b>	<b>Page</b>	<b>Subsection</b>	<b>Modification</b>
1	Control of Work	105-07	V.5.4.B	Add the following to the list of items requiring coordinate values: <u>Storm Sewer</u> <ul style="list-style-type: none"> <li>• Manholes</li> <li>• Curb Inlets</li> <li>• Yard Drains</li> </ul>
2	Products and Materials	200-9	V.5.5	Corrugated metal pipe shall not be used in the Town.
3	Products and Materials	200-10	V.5.6.E.	Add the following sentence to end of paragraph:  For concrete color control, concrete mixtures for all exposed concrete surfaces of walks, curbs, gutters and pour-in-place structures shall be from the same supplier and cement manufacturer.
4	Products and Materials	200-18	V.5.10.E.1.a	Delete last sentence in paragraph and replace with the following:  Gate valves shall be manufactured by AVK or AFC.
5	Products and Materials	200-19	V.5.10.E.1.b	Add the following sentence to end of paragraph:  Gate valves 2” and smaller shall be manufactured by AVK or AFC.

**Town of Smithfield Special Provisions to the  
HRPDC Regional Construction Standards (6<sup>th</sup> Edition)  
Appendix A**

<b>Item</b>	<b>Title</b>	<b>Page</b>	<b>Subsection</b>	<b>Modification</b>
6	Products and Materials	200-19	V.5.10.E.2.a	Delete last sentence of paragraph and replace with: Gate valves 2” and smaller shall be manufactured by AVK or AFC.
7	Products and Materials	200-19	V.5.10.E.2.b	Delete
8	Products and Materials	200-21	V.5.10.F.3.b	Modify second sentence to the following: Straps shall be double strap stainless steel, 18-8, Type 304 fully passivated for corrosion resistance.
9	Products and Materials	200-24	V.5.10.I.3.c	Add Ford Meter Box Company and Mueller to list of acceptable manufacturers.
10	Products and Materials	200-24	V.5.11.A.3	Delete first sentence of paragraph and replace with the following: DI pipe for gravity sewers shall be Class 52.
11	Products and Materials	200-24	V.5.11.B.3	Modify to the following: PVC pipe sizes 4-inch through 15-inch in diameter and less than 10 feet deep shall conform to ASTM D3034 SDR 26. Fittings shall be heavy wall, H-Series Gasketed SDR 26.

**Town of Smithfield Special Provisions to the  
HRPDC Regional Construction Standards (6<sup>th</sup> Edition)  
Appendix A**

<b>Item</b>	<b>Title</b>	<b>Page</b>	<b>Subsection</b>	<b>Modification</b>
12	Products and Materials	200-39	V.5.19.B.6	Add the following sentence to the end of paragraph:  Pipe 2-inches and smaller shall be Municipex pipe, or Type K copper.
13	Products and Materials	200-40	V.5.19.C.1	HDPE pipe shall only be used for potable water applications when a carrier pipe is required for boring.
14	Products and Materials	200-41	V.5.19.E.1.a	Delete last sentence in paragraph and replace with the following:  Add AVK and AFC, to approved manufacturers.
15	Products and Materials	200-41	V.5.19.E.1.b	Add the following sentence to end of paragraph:  Gate valves 2” and smaller shall be manufactured by AVK or AFC only.
16	Products and Materials	200-42	V.5.19.E.2.a	Delete last sentence of paragraph and replace with:  Ball valves 2” and smaller shall be manufactured by AVK, AFC, or approved by Town.
17	Products and Materials	200-42	V.5.19.E.2.b	Delete
18	Products and Materials	200-44	V.5.19.G.6	Add 4 ½”American-Darling Mark 73-5 to the list of hydrants.
19	Products and Materials	200-44	V.5.19.H.3.f.3	Delete

**Town of Smithfield Special Provisions to the  
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Appendix A**

<b>Item</b>	<b>Title</b>	<b>Page</b>	<b>Subsection</b>	<b>Modification</b>
20	Products and Materials	200-45	V.5.19.H.4.b	Modify second sentence to the following: Straps shall be double strap stainless steel, 18-8, Type 304 fully passivated for corrosion resistance.
21	Products and Materials	200-48	V.5.20.A	Modify to the following: Copper tracer wire – shall be 10 gauge, solid wire with plastic coating and shall be attached to waterline.
22	Drainage Structures	302-5	II.2.1.C.3	Delete Section – Metal Pipe not allowed in Town.
23	Water Distribution Systems	801-7	II.2.4.B	Add the following sentence: Hydrants shall have a minimum of 18”-24” from back of curb, with a maximum distance of 8 feet.
24	Water Distribution Systems	801-10	II.2.7.R.8	Add: 8. For private service connections, Contractor shall follow approved site plan or submit a site plan for approval by the Town. The site plan will show the location of all connections. The Contractor shall notify the Town 48 hours in advance of making connections. Approved materials shall be on-site prior to making connections. A licensed plumber is required for all residential connections unless approved otherwise by the Town. The Contractor shall notify the Town when connection work is complete and leave trench open for inspection.

**Town of Smithfield Special Provisions to the  
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Appendix A**

<b>Item</b>	<b>Title</b>	<b>Page</b>	<b>Subsection</b>	<b>Modification</b>
25	Water Distribution Systems	801-13	II.2.8.B.2	Add the following sentence:  Contractor shall be required to soak mains for 24 hours prior to testing.
26	Water Distribution Systems	801-13	II.2.8.B.7	Delete and replace with the following:  No pressure drop, no leaks.
27	Water Distribution Systems	801-13	II.2.8.B.8	Delete
28	Sanitary Gravity Sewer Systems	802-12	II.2.4.B.d	Add the following sentence to the end of the second paragraph:  Manhole labels provided in video inspection must correspond to the manhole labels shown on the construction documents and record drawings.
29	Sanitary Force Main Systems	803-13	II.2.7.B.8	Delete and replace with the following:  No pressure drop, no leaks.
30	Sanitary Force Main Systems	803-13	II.2.7.B.9	Delete
31	Sanitary Force Main Systems	803-13	II.2.7.C.3	Delete. Delete table 803-1 (referenced in paragraph 3C)

**Town of Smithfield Special Provisions to the  
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Appendix A**

<b>Item</b>	<b>Title</b>	<b>Page</b>	<b>Subsection</b>	<b>Modification</b>
1	Standard Details	CI_01	24" Curb & Gutter	Delete and Replace with Town of Smithfield Detail CI-1
2	Standard Details	CI_02	30" Curb & Gutter	Delete and Replace with Town of Smithfield Detail CI-1
3	Standard Details	RC_01	Pavement Patching Detail For Flexible Pavement	Delete and Replace with Town of Smithfield Detail RC-1
4	Standard Details	DS_03	Curb Inlet/Catch Basin Frame and Cover	Delete. Reference VDOT Detail DI-3A, and IC-2.
5	Standard Details	WD_01	Single & Dual Service Connections	Revise service line to 1 inch. Service line shall be Municipex pipe.
6	Standard Details	WD_02	Water Service Installation Detail	Service line shall be Municipex pipe.
7	Standard Details	WD_03	Water Meter Box (Type I)	Delete Note 1 and replace with: Meter box to be A.Y. McDonald MFG Model # 74MBLNLRG. Meter boxes that must be installed in driveways shall be Carson HW 1324-18 and must be used with a cast iron 1324 box lid.
8	Standard Details	WD_04	Water Meter Box (Type II)	Delete
9	Standard Details	WD_05	Blow-off Assembly	Delete Note 1 and replace with: Blow-off assembly to be supplied by GIL Industries (Model: Slim Line 2" Flushing Hydrant) or Ford Meter Box Company.

**Town of Smithfield Special Provisions to the  
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Appendix A**

<b>Item</b>	<b>Title</b>	<b>Page</b>	<b>Subsection</b>	<b>Modification</b>
10	Standard Details	WD_12	Not Used	Delete
11	Standard Details	WD_15	Precast Vault – H2O Loading	Megalug with rods to be used on bypass for meter vaults.
12	Standard Details	SS_04	Sanitary Sewer Interior Drop Manhole	Delete and Replace with Town of Smithfield Detail S-3.
13	Standard Details	SS_05	Sanitary Sewer Exterior Drop Manhole	Delete
14	Standard Details	SS_11	Sanitary Sewer Lateral Cleanout Frame and Cover	Revise Note 1: Clean out Frame and Cover to be Capitol Foundry Model NPN-CW-18
15	Standard Details	SS_13	Sanitary Sewer Main Line Clean Out Box	Delete
16	Standard Details	SS_14	Sanitary Sewer Service Connection	To be used only when approved by Town of Smithfield. Refer to Smithfield Detail S-1 or S-2.
17	Standard Details	SS_15	Dual Sanitary Sewer Service Connections	Use 6"x6"x6" Wye and 6" piping throughout. Delete Note 4.
18	Standard Details	SS_16	Deep Sanitary Sewer Service Connection	Delete and Replace with Town of Smithfield Details S-1, S-2.
19	Standard Details	WS_02	Valve Setting Detail	Use 12" Truss Pipe Riser Box.
20	Standard Details	WS_03	Manual Air Vent Assembly	Ball valve handle to face cover.
21	Smithfield Standard Details	W-1	Temporary Construction Meter Installation	Add Detail.

**Town of Smithfield Special Provisions to the  
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Appendix A**

<b>Item</b>	<b>Title</b>	<b>Page</b>	<b>Subsection</b>	<b>Modification</b>
22	Smithfield Standard Details	S-1	Sewer Lateral By Developer	Add Detail.
23	Smithfield Standard Details	S-2	Sewer Lateral By Plumber	Add Detail.
24	Smithfield Standard Details	S-3	Sanitary Sewer Interior Drop Manhole	Add Detail.
25	Smithfield Standard Details	RC-1	Pavement Patching	Add Detail.
26	Smithfield Standard Details	JR-1	Joint Restraint Table	Add Detail.
27	Smithfield Standard Details	S-5	Junction Box Detail	Add Detail.

**APPENDIX B**  
Smithfield Standard Details



HOSE BIBB w/ VACUUM BREAKER

STANDPIPE

SUPPORT POST

18" MIN.

EXISTING GRADE

NOTE: SEE NOTES ON W23.2

STD. W14.0  
METER BOX

MODIFY EXTENSION TO  
ACCEPT LOCKING LID

JAM NUTS ONLY (TYP)

DRAINAGE HOLES

WHEN CONNECTING PRIVATE SERVICE,  
SPEAR TRANSITION FEMALE ADAPTER  
SLIP x FIPT IS REQUIRED IF PVC  
SERVICE EXTENSION IS USED.

6" MIN. VDOT #57  
STONE BEDDING



TOWN OF SMITHFIELD  
DESIGN AND CONSTRUCTION STANDARDS

TEMPORARY CONSTRUCTION METER  
INSTALLATION

DWG #: W-1

SCALE: N.T.S

DWN BY: TOWN

AUG 2017

## CONSTRUCTION METER INSTALLATION REQUIREMENTS

1. CONSTRUCTION METER INSTALLATION INSPECTIONS: TO ENSURE PROTECTION OF THE WATER METER AND THE HEALTH OF THE COMMUNITY, A REQUEST FOR A CONSTRUCTION WATER METER SHALL CONFORM WITH THE FOLLOWING PARAMETERS:
  - A. WATER METER BOX INSTALLATION SHALL MAINTAIN A MINIMUM 18-INCH HORIZONTAL EDGE-TO-EDGE CLEARANCE FROM DRIVEWAYS AND/OR DRIVE PATHS, SIDEWALKS, BIKE PATHS, CURBING AND ADJACENT WATER METER BOXES.
  - B. THE ASSEMBLY SHALL BE FULLY INTACT; WITH A BASE AND A LID.
  - C. METER BASE AND EXTENSION SHALL BE PROPERLY ALIGNED AND CONNECTED TO PREVENT WATER AND DEBRIS FROM ENTERING THE BOX.
  - D. THE INTERIOR OF THE METER BOX MUST BE FREE OF DEBRIS AND WATER.
  - E. THE METER BOX SETTER MUST BE CONNECTED TO THE RESIDENCE IN ACCORDANCE WITH THE CODE COMPLIANCE REGULATIONS; OR A STANDPIPE MUST BE INSTALLED TO PREVENT CONTAMINATION AS FOLLOWS:
    - i. THE PLUMBER SHALL CONNECT A TEMPORARY PIPE ON THE OWNER'S SIDE OF THE METER BOX
    - ii. THE STANDPIPE WILL BE SUFFICIENTLY RIGID TO SUPPORT ITSELF WHEN CONNECTED AND SUPPLYING WATER; OR A SUPPORT POST, OF EQUAL HEIGHT, SHALL BE POSITIONED AND CONNECTED TO THE STANDPIPE TO PROVIDE SUCH SUPPORT.
    - iii. THE STANDPIPE SHALL HAVE A HOSE BIB WITH VACUUM BREAKER.
    - iv. THE ENTIRE ASSEMBLY MUST NOT LEAK AND BE PROTECTED FROM FREEZING.
  - F. THE METER SETTER MUST MAINTAIN ITS ORIGINAL SPACING AND ALIGNMENT. A SHIPPING SPACER IS PROVIDED WITH METER BOX ASSEMBLIES TO RETAIN THESE DIMENSIONS. THE SHIPPING SPACER IS NOT PROVIDED AS A WATER CONDUIT. FOR HEALTH PURPOSES, ANY USE OF AN UNAPPROVED CONDUIT, SUCH AS A SHIPPING SPACER OR MODIFIED JUMPER, SHALL INCUR A FINE.
    - i. IF THE CONTRACTOR BELIEVES THE ALIGNMENT OR SHIPPING SPACER HAS BEEN DISTURBED DURING STANDPIPE CONNECTION, THE CONTRACTOR MAY ELECT TO LEAVE THE STANDPIPE CONNECTION EXPOSED.
    - ii. PROVIDED THE REST OF THE METER BOX PERIPHERY IS BACKFILLED AND THE METER BOX ASSEMBLY MEETS ALL OTHER PARAMETERS, THE CUSTOMER SERVICE TECHNICIAN (CST) WILL INSTALL THE METER AND MAKE THE ADJUSTMENTS.
    - iii. THE CST WILL RETURN THE FOLLOWING DAY TO CHECK FOR COMPLETE BACKFILLING. IF THE METER BOX HAS NOT BEEN COMPLETELY BACKFILLED, THE CST SHALL LOCK OUT OR REMOVE THE WATER METER UNTIL THE BACKFILL PROCESS IS COMPLETED AND THE CONTRACTOR CALLS FOR ANOTHER INSPECTION/METER INSTALLATION.
  - G. IF A METER IS INSTALLED AND A WATER LEAK IS OBSERVED, THE METER MAY BE PULLED OR LOCKED OUT UNTIL THE SOURCE OF THE WATER DISCHARGE IS IDENTIFIED AND CORRECTED BY THE CONTRACTOR.
  - H. CONTRACTORS AND PLUMBERS SHALL NOT ENTER THE WATER METER BOX FOR ANY REASON; UNLESS SMITHFIELD PROVIDES APPROVAL FOR THE CONTRACTOR TO RELOCATE, REPLACE, OR REPAIR THE WATER METER ASSEMBLY. AFTER THE CONTRACTOR CONCLUDES THE APPROVED ACTIVITY, SMITHFIELD WILL BE CONTACTED FOR INSPECTION.
2. MULTIPLE VISITS TO INSTALL A WATER METER:
  - A. FIRST VISIT: THE METER IS INSTALLED UNLESS THE WATER METER BOX ASSEMBLY DOES NOT CONFORM TO STANDARDS. CUSTOMER SERVICE SHALL CONTACT THE CONTRACTOR TO MAKE THE NECESSARY ADJUSTMENTS.
  - B. SECOND VISIT: IF THE NECESSARY ADJUSTMENTS HAVE BEEN COMPLETED, THE CST WILL SET THE METER. IF THE NECESSARY ADJUSTMENTS HAVE NOT BEEN MADE, THE METER WILL NOT BE SET AND THE WORK ORDER RETURNED TO CUSTOMER SERVICE FOR CONTRACTOR CONTACT.
  - C. THIRD AND SUBSEQUENT VISIT(S): METER INSTALLATION SHALL NOT BE ATTEMPTED UNTIL THE CONTRACTOR PAYS A \$25 RE-INSPECTION FEE TO CUSTOMER SERVICE.
  - D. ALL VISITATIONS WILL BE DOCUMENTED WITH DIGITAL PHOTOGRAPHY BY THE SMITHFIELD CST.
3. MODIFICATIONS AFTER THE METER IS SET: THE WATER METER WILL BE REMOVED OR LOCKED OUT FOR ANY OF THE FOLLOWING:
  - A. IF THE STANDPIPE IS REMOVED, WITHOUT IMMEDIATELY CONNECTING TO THE PERMANENT RESIDENTIAL WATER SERVICE.
  - B. THE SURFACE GRADE HAS CHANGED IN A MANNER TO NEGATIVELY IMPACT THE METER BOX ASSEMBLY.
  - C. A WALKING, PARKING, OR DRIVING SURFACE IS PLACED WITHIN 18" OF THE METER BOX ASSEMBLY.
  - D. ANY OTHER CHANGES WHICH FAIL TO COMPLY WITH THE STANDARDS AND SPECIFICATIONS STATED ABOVE.
  - E. UNPROTECTED STANDPIPE IN FREEZING OR POTENTIAL FREEZING WEATHER.



TOWN OF SMITHFIELD  
DESIGN AND CONSTRUCTION STANDARDS

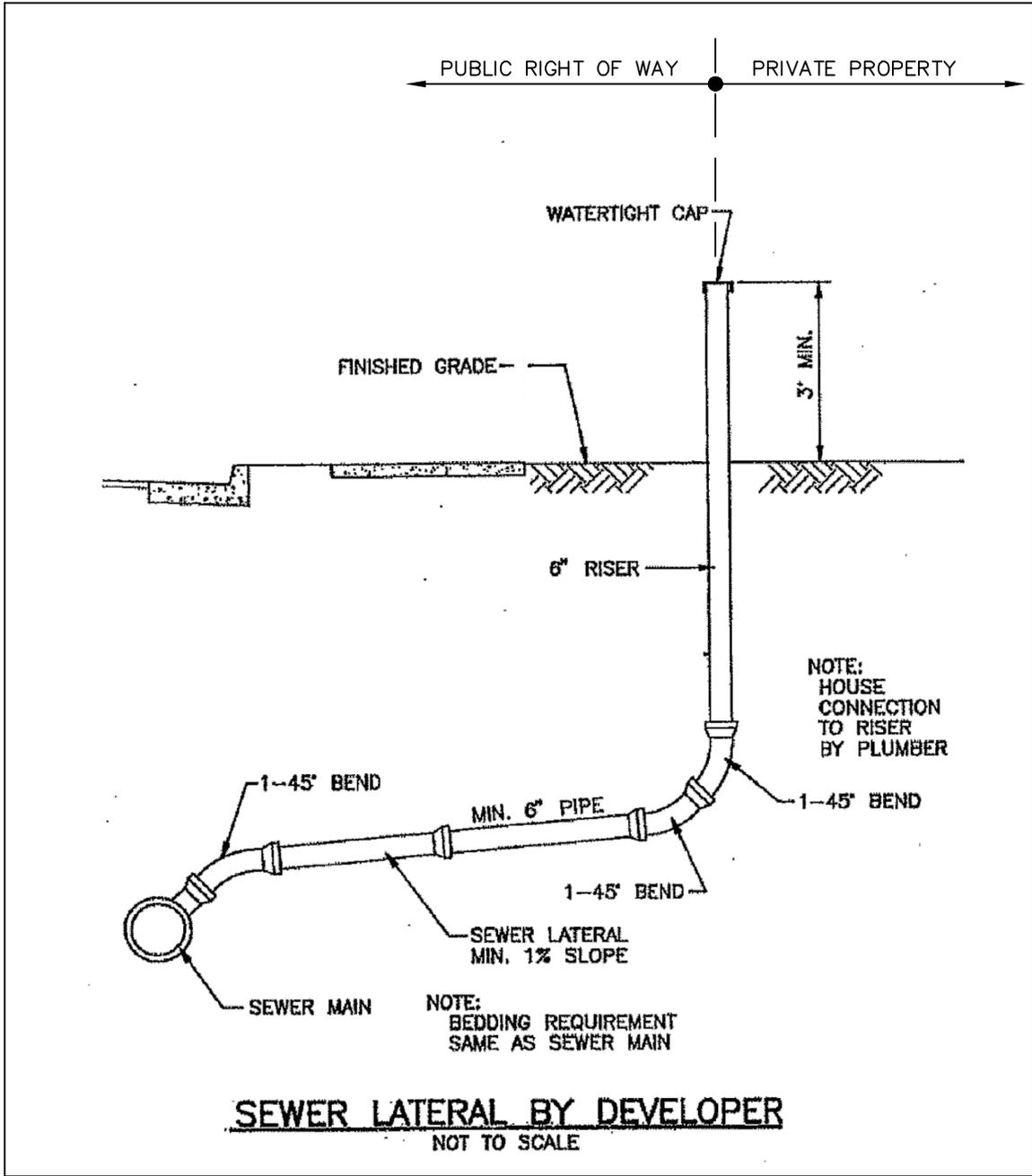
TEMPORARY CONSTRUCTION METER  
INSTALLATION

DWG #: W-1.2

SCALE: N.T.S

DWN BY: TOWN

AUG 2017



TOWN OF SMITHFIELD  
DESIGN AND CONSTRUCTION STANDARDS

SEWER LATERAL BY DEVELOPER

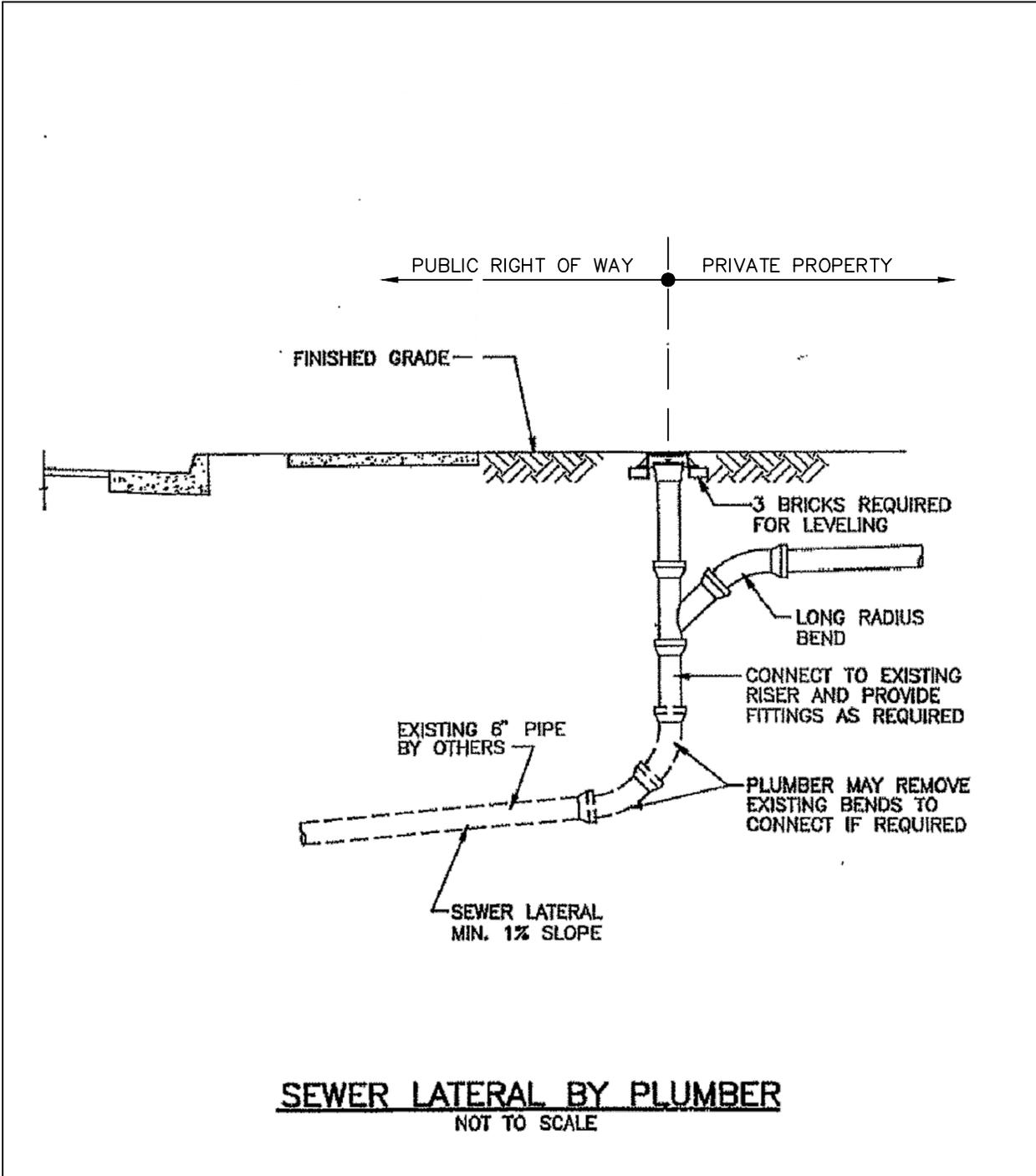
DWG #: S-1

SCALE: N.T.S

DWN BY: TOWN

AUG 2017





TOWN OF SMITHFIELD  
DESIGN AND CONSTRUCTION STANDARDS

SEWER LATERAL BY PLUMBER

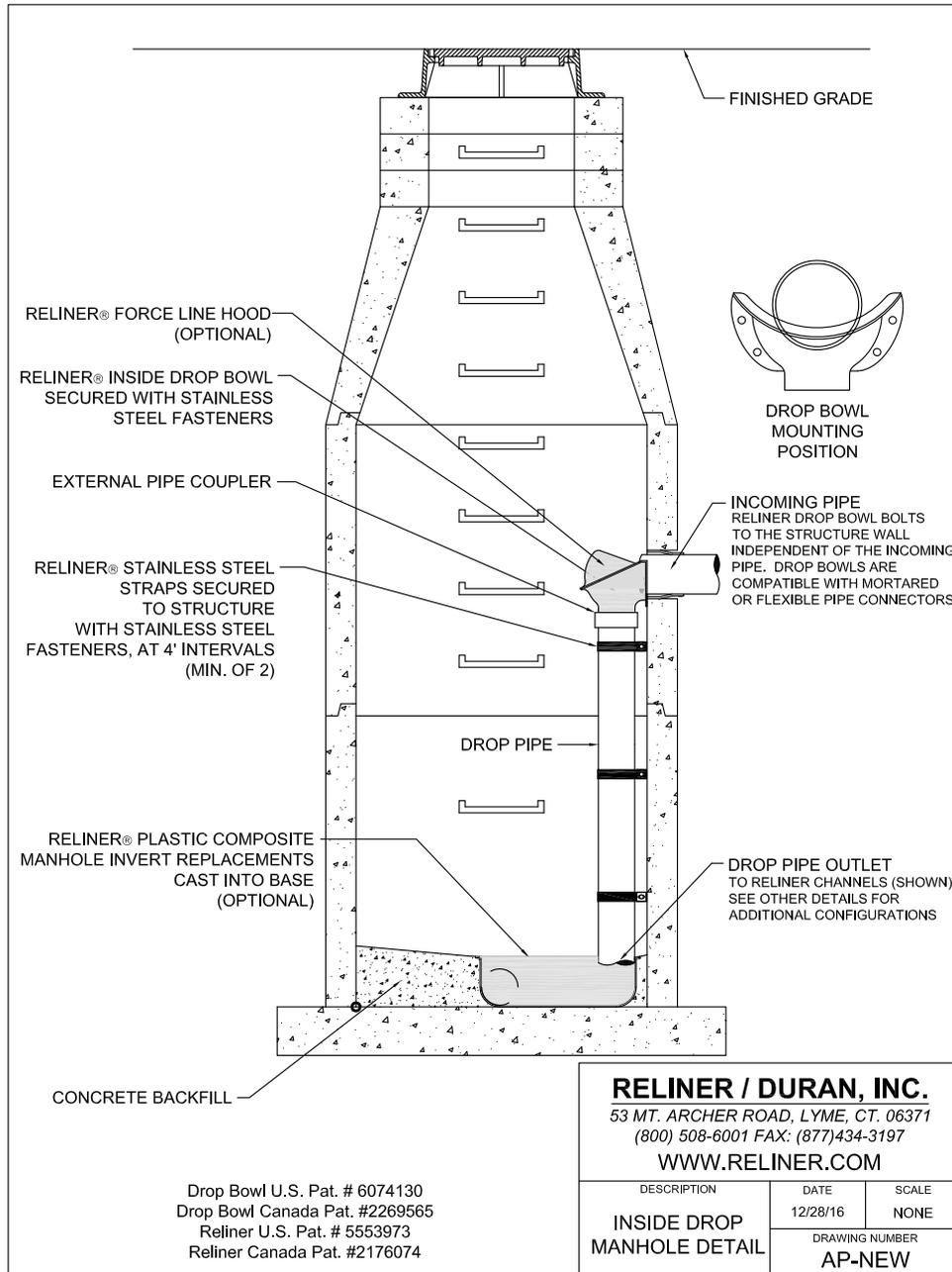
DWG #: S-2

SCALE: N.T.S

DWN BY: TOWN

AUG 2017





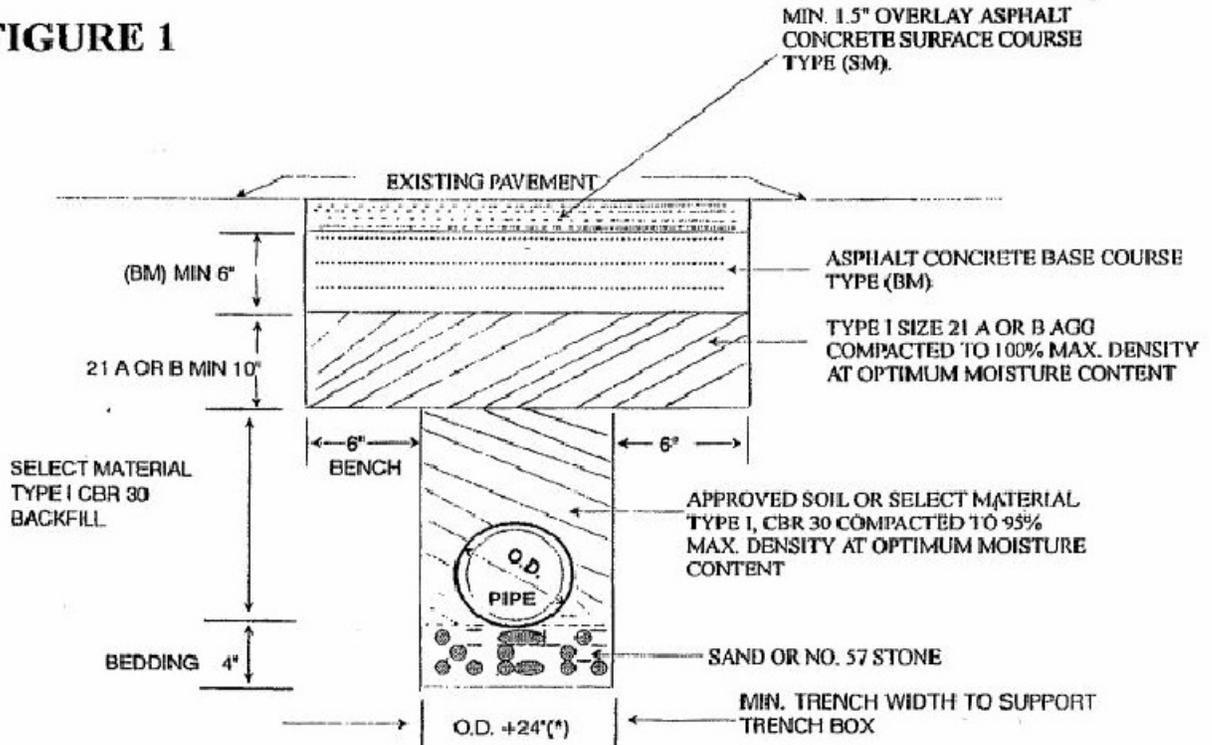
**NOTES:**

1. INTERIOR DROP TO BE USED IN NEW AND EXISTING MANHOLES.
2. SOLVENT WELD JOINTS ON ALL PIPING AND FITTINGS
3. MAINLINE TO PVC DROP CONNECTION SHALL BE MADE WITH APPROVED COUPLING.
4. LOCATION OF DROP CONNECTION SHALL NOT CONFLICT WITH THE LOCATION OF THE MANHOLE STEPS.
5. BOTTOM BEND TO BE AT 45 DEGREES WITH RESPECT TO THE DOWNSTREAM FLOW.
6. PRECAST CONCRETE MANHOLE TO BE IN COMPLIANCE WITH ASTM C-478.
7. INTERIOR DROP SHALL BE NO MORE THAN 6 INCHES FROM MANHOLE WALL.
8. ALL PVC PIPE AND FITTINGS SHALL BE SCHEDULE 40.

	<b>TOWN OF SMITHFIELD</b> DESIGN AND CONSTRUCTION STANDARDS	
	<b>SANITARY SEWER INTERIOR          DROP MANHOLE</b>	
DWG #: S-3	SCALE: NTS	
AUG 2017		



**FIGURE 1**



\* FOR PIPE LESS THAN 12" THE TRENCH WIDTH MAY BE 36" MAXIMUM.  
SEE UB-1 (ROAD AND BRIDGE STANDARDS VOLUME II)

**CUT REPLACEMENT IN ROADS WITH ASPHALT CONCRETE BASE AND SURFACE**

NOTE: THE EXTENT OF MILL AND OVERLAY OF EXISTING ROAD SURFACE SHALL BE DETERMINED BY THE TOWN ENGINEER.

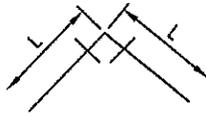
 <b>TOWN OF SMITHFIELD</b> DESIGN AND CONSTRUCTION STANDARDS	
PAVEMENT PATCHING	
DWG #: RC-1	SCALE: N.T.S
DWN BY: TOWN	AUG 2017

**Pavement Cut/ Repair Details Special Provisions**

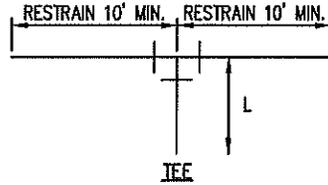
10/01/2000

1. All patches are to be replaced in accordance with the following regulations, detail on Figure 1 and/or direction of the Town's representative.
2. The residential/commercial owner or their representative will be required to replace the surface and base of the roads in accordance with the current VDOT Road and Bridge Standards and this Special Provision.
3. Backfill material shall include a minimum of four (4") inches of bedding materials (sand or #57 stone). The balance of the backfill shall be approved soil compacted to the bottom of the sub-base layer (Type I, Size 21A or 21B). The entire backfill shall be free from wood, decaying material, asphalt, concrete, ice, frost, large clods, stones and debris.
4. Backfill material shall be compacted to a minimum of 95% of the theoretical maximum density at optimum moisture content, as determined by VDOT testing procedures. Use mechanical tamping throughout the depth of the trench in six (6") inch layers to insure that adequate support is provided for the sub-base layer (Type I, Size 21A or 21B).
5. It shall be the option of the Towns' representative to request and review the backfill compaction test results and/or authorize the monitoring of the compaction.
6. Cuts in road with Surface Course and Asphalt Concrete Base shall be replaced with ten (10") inches of Type I, Size 21A or 21B aggregate compacted to 100% of the theoretical maximum density at optimum moisture content covering the entire trench width in addition to a bench of six (6") inches from all sides, this layer shall serve as sub-base. An Asphalt Concrete Base course of six (6") inch minimum thickness or matching the existing base thickness, shall be placed over the sub-base. A Surface Asphalt Concrete course of a minimum 1½" shall be placed on top of the base covering the trench width. The Asphalt Concrete Surface course shall be slightly higher 1/8" to ¼" than the existing surface to provide a smooth grade into the existing pavement surface.
7. Cuts in surface treated roads with aggregate base course shall be replaced with the same layers as roads with asphalt base except the sub-base layer (Type I, Size 21A) is reduced to six (6") inches and the base asphalt layer to four (4") inches but still keeping a six (6") bench. The surface course shall be a surface treatment matching the existing surface.
8. The cut to be backfilled shall be dry as practicable at the time of the backfilling by pumping, bailing, draining or other approved dewatering methods.
9. All cuts' sides shall be trimmed to neat straight lines and a tack coat shall be applied at a rate of 0.05 - 0.15 gallons per square yard of RC - 250 or CAE - 2 before placing the plant mix.
10. Replacement of pavement shall be from edge of pavement except when individual cuts are made and not covering the entire width of the pavement.
11. Placement of all Asphalt Concrete and surface treated courses shall be rolled where possible with a unit having a manufacturer's rating of ten (10) tons and rolled until the aggregate is keyed into the bitumen. Where rolling is not possible, a mechanical tamp will be used. In all cuts stone is to be placed in the trench daily up to a maximum length of 500 feet, at which time the pavement shall be covered with a temporary or permanent asphalt patch. If the application of the bituminous layer is delayed for adverse weather conditions, the owner/contractor shall provide and maintain a base course that is acceptable to the Town until such time as the appropriate pavement patch can be applied and completion of the installation of the gas, sewer, water, lines, etc., the owner/contractor shall restore the pavement in the manner prescribed within ten (10) days.
12. The owner/contractor will be responsible for any depression greater than 1/4" that occurs within three (3) years of the completion of the patching. Correction shall consist of milling and replacing 1Yz" of the surface mix.

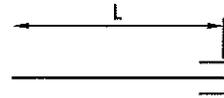
DWG #: RC-1.2	SCALE: N.T.S
DWN BY: TOWN	AUG 2017



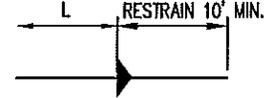
HORIZONTAL/VERTICAL BEND



TEE



PLUG & VALVES



REDUCER

NOTE: L = CORRESPONDING LENGTH BELOW (FT)

### MINIMUM RESTRAINED JOINT LENGTHS (L)

FITTING	11.25°	22.5°	45°	90°	PLUG/VALVE	REDUCER	TEE
4" HORIZONTAL BEND	2'	4'	7'	17'	-	-	-
6" HORIZONTAL BEND	2'	5'	10'	24'	-	-	-
8" HORIZONTAL BEND	3'	6'	13'	31'	-	-	-
10" HORIZONTAL BEND	4'	8'	16'	38'	-	-	-
12" HORIZONTAL BEND	4'	9'	18'	44'	-	-	-
4" VERTICAL BEND	5'	10'	22'	-	-	-	-
6" VERTICAL BEND	7'	15'	31'	-	-	-	-
8" VERTICAL BEND	9'	19'	40'	-	-	-	-
10" VERTICAL BEND	11'	23'	48'	-	-	-	-
12" VERTICAL BEND	13'	26'	56'	-	-	-	-
4" PLUG/VALVE	-	-	-	-	52'	-	-
6" PLUG/VALVE	-	-	-	-	74'	-	-
8" PLUG/VALVE	-	-	-	-	96'	-	-
10" PLUG/VALVE	-	-	-	-	115'	-	-
12" PLUG/VALVE	-	-	-	-	135'	-	-
12x12	-	-	-	-	-	-	104'
12x10	-	-	-	-	-	40'	77'
12x8	-	-	-	-	-	72'	48'
12x6	-	-	-	-	-	98'	11'
12x4	-	-	-	-	-	117'	5'
10x10	-	-	-	-	-	-	84'
10x8	-	-	-	-	-	39'	57'
10x6	-	-	-	-	-	71'	22'
10x4	-	-	-	-	-	94'	5'
8x8	-	-	-	-	-	-	65'
8x6	-	-	-	-	-	40'	33'
8x4	-	-	-	-	-	69'	5'
6x6	-	-	-	-	-	-	43'
6x4	-	-	-	-	-	38'	8'
4x4	-	-	-	-	-	-	22'

NOTES:

1. LOOPED WATER SYSTEMS SHALL HAVE RESTRAINT PROVIDED ON BOTH SIDES OF ALL VALVES AND FITTINGS.
2. LENGTHS SHOWN ABOVE ARE MINIMUM REQUIREMENTS. CONDITIONS WORSE THAN THE DESIGN PARAMETERS INDICATED, WHETHER ANTICIPATED DURING DESIGN OR ENCOUNTERED DURING CONSTRUCTION, WILL REQUIRE SUBMITTAL OF DESIGN CALCULATIONS FOR SMITHFIELD REVIEW AND APPROVAL.
3. DEPTH OF BURY ON LOW SIDE OF VERTICAL BENDS ASSUMED AS 6 FEET.
4. COMPUTATIONS BASED ON FORD METER BOX UNIFLANGE PIPE THRUST RESTRAINT PROGRAM V.3.00.
5. GATE VALVES CALCULATED AS DEAD END FITTING TYPE
6. PIPE SIZES LARGER THAN 12" SHALL HAVE THE RESTRAINED LENGTH CALCULATED AND APPROVED BY SMITHFIELD THEN PLACED ON THE PLANS. THE DESIGN PARAMETERS SHOWN SHALL BE THE MINIMUM CONDITIONS.

DESIGN PARAMETERS:

TEST PRESSURE = 150 PSI  
 PIPE MATERIAL = PVC  
 TRENCH TYPE IV  
 SOIL TYPE = ML  
 DEPTH OF BURY = 3'  
 SAFETY FACTOR = 1.5



TOWN OF SMITHFIELD  
 DESIGN AND CONSTRUCTION STANDARDS

JOINT RESTRAINT TABLE

DWG #: JR-1

SCALE: N.T.S

DWN BY: TOWN

AUG 2017



PROVIDE INSULATED BARRIER TYPE TERMINAL STRIPS WITH SOLDERLESS BOX LUGS IN TOP SECTION FOR CONNECTING CONDUCTORS IN CORDS FROM PUMPS AND FLOAT SWITCHES TO CONDUCTORS IN CONDUIT FROM CONTROL PANEL. PROVIDE BARE COPPER GROUND BUS BONDED TO BOX WITH DRILLED AND TAPPED HOLES FOR 1/4" BRASS MACHINE SCREWS FOR CONNECTING ALL EQUIPMENT GROUND CONDUCTORS.

PROVIDE EIGHT STRAIGHT MALE-TREAD, CORD CONNECTORS WITH SEALING GASKETS AND LOCK NUTS (CROUSE-HINDS CGB-SG SERIES OR EQUAL) INDIVIDUAL PLATE, FOUR SHALL BE 1/2" CONDUIT SIZE, TWO 1" CONDUIT SIZE. PROVIDE NOEPRENE BUSHINGS IN CONNECTORS TO MATCH SIZES OF CORDS FROM PUMPS & FLOAT SWITCHES

16 GAUGE STAINLESS STEEL DIVIDER PLATE WITH 1" TURNED-UP FLANGE AT FRONT. SECURE WITH CONTINUOUS WELD ALL AROUND

1/2" DIA. STAINLESS STEEL ROD FOR SUPPORT OF STAINLESS STEEL BASKET-WEAVE CORD GRIPS ON EACH CORD FROM A PUMP OR A FLOAT SWITCH. DRILL AND TAP EACH END FOR MACHINE SCREWS

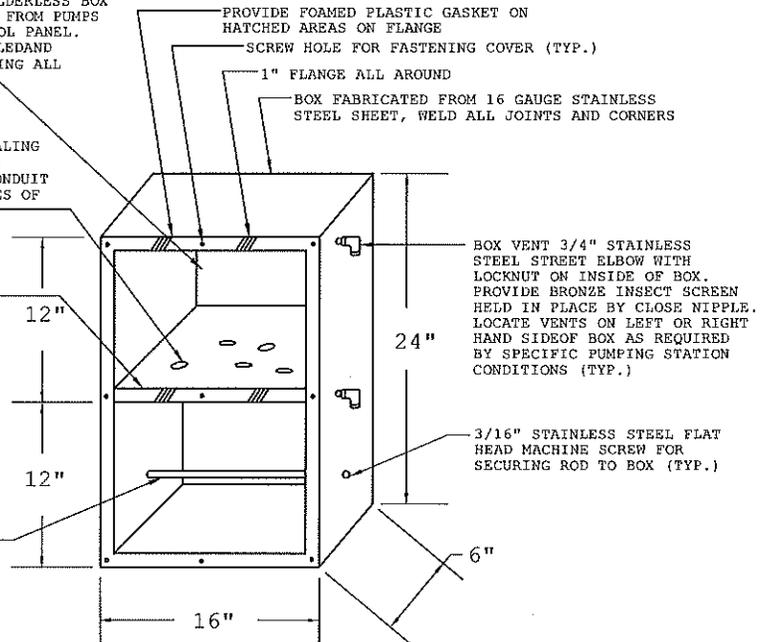
PROVIDE FOAMED PLASTIC GASKET ON HATCHED AREAS ON FLANGE  
SCREW HOLE FOR FASTENING COVER (TYP.)

1" FLANGE ALL AROUND

BOX FABRICATED FROM 16 GAUGE STAINLESS STEEL SHEET, WELD ALL JOINTS AND CORNERS

BOX VENT 3/4" STAINLESS STEEL STREET ELBOW WITH LOCKNUT ON INSIDE OF BOX. PROVIDE BRONZE INSECT SCREEN HELD IN PLACE BY CLOSE NIPPLE. LOCATE VENTS ON LEFT OR RIGHT HAND SIDE OF BOX AS REQUIRED BY SPECIFIC PUMPING STATION CONDITIONS (TYP.)

3/16" STAINLESS STEEL FLAT HEAD MACHINE SCREW FOR SECURING ROD TO BOX (TYP.)



NOTES:

1. THE TERMINAL BOXES WILL BE FURNISHED BY THE OWNER. CONTRACTOR RESPONSIBLE FOR INSTALLATION, CONNECTORS, TERMINAL STRIPS, WIRING, ETC. FOR A COMPLETE FUNCTIONAL INSTALLATION.
2. PROVIDE SINGLE 16 GAUGE STAINLESS STEEL COVER PLATE (NOT SHOWN) FOR BOX SECURED TO FLANGES WITH TEN 1/8" FLAT HEAD STAINLESS STEEL SELF TAPPING SCREWS.
3. SECURE BOX TO CONCRETE PUMP CHAMBER TOP WITH FOUR 3/8" STAINLESS STEEL LAG BOLTS SET IN EXPANSION ANCHORS IN THE CONCRETE. SECURE TO STEEL PUMP CHAMBER TOP WITH FOUR 3/8" STAINLESS STEEL MACHINE BOLTS WITH NUTS, FLAT WASHERS AND LOCK WASHERS, DRILL HOLES IN STEEL TOP FOR SCREWS. REINFORCE BOTTOM FLANGES OF TERMINAL BOX WITH 1/8" X 1" X 12" FLAT STAINLESS STEEL BARS WHERE LAG BOLTS OR MACHINE BOLTS ARE LOCATED.



TOWN OF SMITHFIELD  
DESIGN AND CONSTRUCTION STANDARDS

JUNCTION BOX DETAIL

DWG #: S-5

SCALE: N.T.S.

DWN BY: TOWN

03/06/06



**APPENDIX C**

Town of Smithfield 2003 Geodetic Control

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# Town of Smithfield

## 2003 Geodetic Control



**LANDMARK**  
**DESIGN GROUP**

**TOWN OF SMITHFIELD**  
**2003 GEODETIC CONTROL NETWORK**

THE DATA PUBLISHED HEREIN FOR MONUMENTS A THROUGH T WAS PREPARED FOR THE TOWN OF SMITHFIELD, VIRGINIA, DECEMBER 19, 2003, BY THE LANDMARK DESIGN GROUP, INC.

THE HORIZONTAL VALUES FOR THE STATIONS DESCRIBED WERE ESTABLISHED UTILIZING GPS AND CONVENTIONAL SURVEY METHODS. BALDWIN & GREGG, LTD. PERFORMED THE GPS OBSERVATIONS, HOLDING THE PUBLISHED COORDINATE VALUES FOR EXISTING ISLE OF WIGHT COUNTY CONTROL STATIONS 2, 6, AND 11. EXISTING ISLE OF WIGHT COUNTY STATIONS 1-8, 11, 12 AND 18 WERE OBSERVED FOR THE CREATION OF THIS NETWORK; IT IS ADVISED THAT CARE SHOULD BE TAKEN WHEN UTILIZING THE PUBLISHED ISLE OF WIGHT COUNTY CONTROL WITH THE HORIZONTAL CONTROL DATA SHOWN HEREIN.

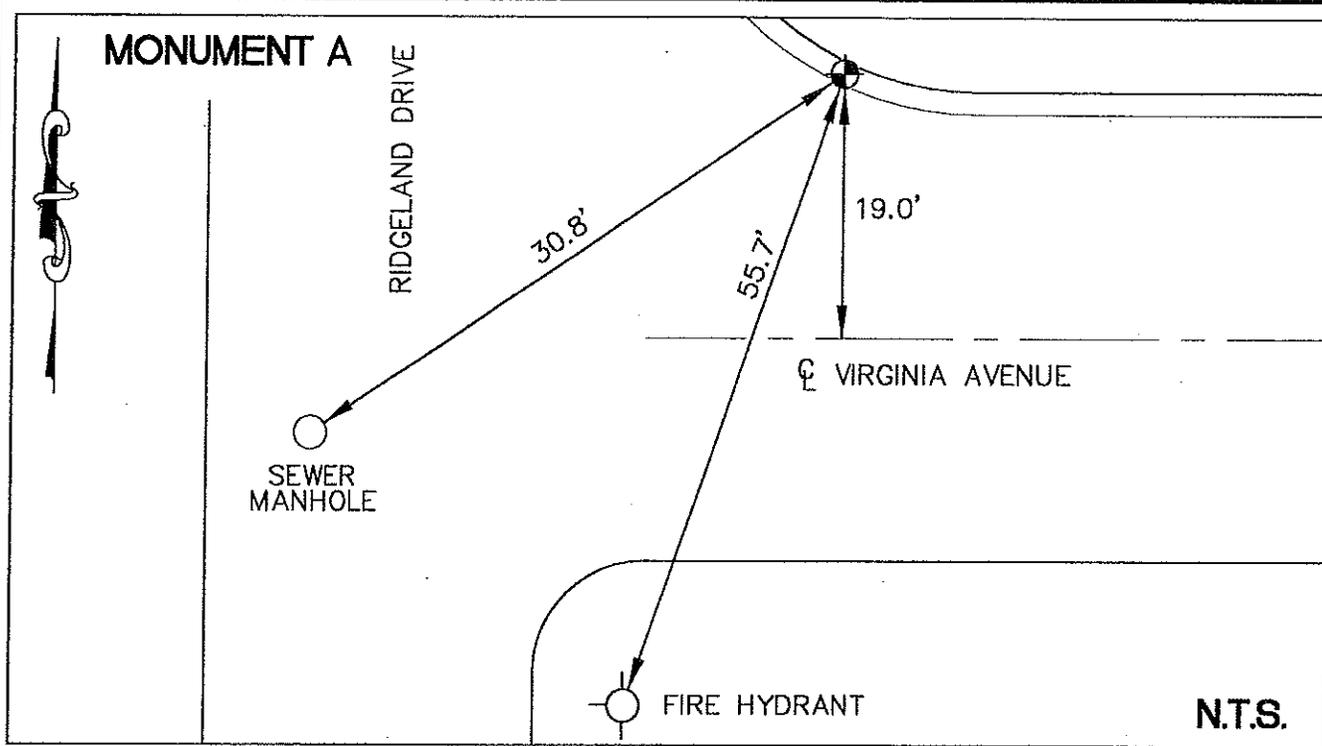
ELEVATIONS LISTED FOR MONUMENTS A THROUGH T WERE ESTABLISHED UTILIZING THREE-WIRE LEVELING METHODS, HOLDING PUBLISHED ISLE OF WIGHT COUNTY STATION 2 HAVING A PUBLISHED ELEVATION OF 40.6, NAVD88. DURING THE COURSE OF THE PROJECT IT WAS DISCOVERED THAT PUBLISHED ISLE OF WIGHT COUNTY STATIONS 1, 3 AND 4 HAD THE FOLLOWING ELEVATION DIFFERENCES:

STA	PUBLISHED ELEVATION	LMDG CORRECTED ELEVATION (1)
1	39.1	38.6
3	29.7	29.5
4	33.2	33.1

(1) CORRECTED ELEVATIONS ARE BASED ON DATA OBTAINED BY THREE-WIRE LEVELING METHODS, HOLDING THE PUBLISHED ELEVATION FOR ISLE OF WIGHT COUNTY STATION 2. STATIONS 5 THROUGH 8 WERE OBSERVED AND WERE FOUND TO BE CONSISTENT WITH THE PUBLISHED DATA.

PLEASE NOTIFY THE TOWN OF SMITHFIELD IF ANY OF THE CONTROL MONUMENTS AS DESCRIBED HEREIN ARE MISSING OR FOUND DISTURBED.

TOWN OF SMITHFIELD  
2003 GEODETIC CONTROL NETWORK



LOCATED:

MONUMENT IS A 1" BRASS DISK SET IN THE TOP OF CURB ON THE NORTHEAST CORNER OF THE INTERSECTION OF RIDGELAND DRIVE AND VIRGINIA AVENUE

**MONUMENT A**

GEODETIC COORDINATES: NAD 83 (ISLE OF WIGHT 1996)

N 36°59'33.60246"

W 76°36'35.90327"

STATE PLANE COORDINATES: NAD 83 - SOUTH ZONE (US SURVEY FOOT) (ISLE OF WIGHT 1996)

NORTHING (FT): 3,526,414.2471

EASTING (FT): 12,034,863.5870

SCALE FACTOR: 0.999966671

CONVERGENCE: 01°08'49.57536"

ELEVATION: NAVD 88 (ISLE OF WIGHT 1996)

ELEVATION (FT): 34.4

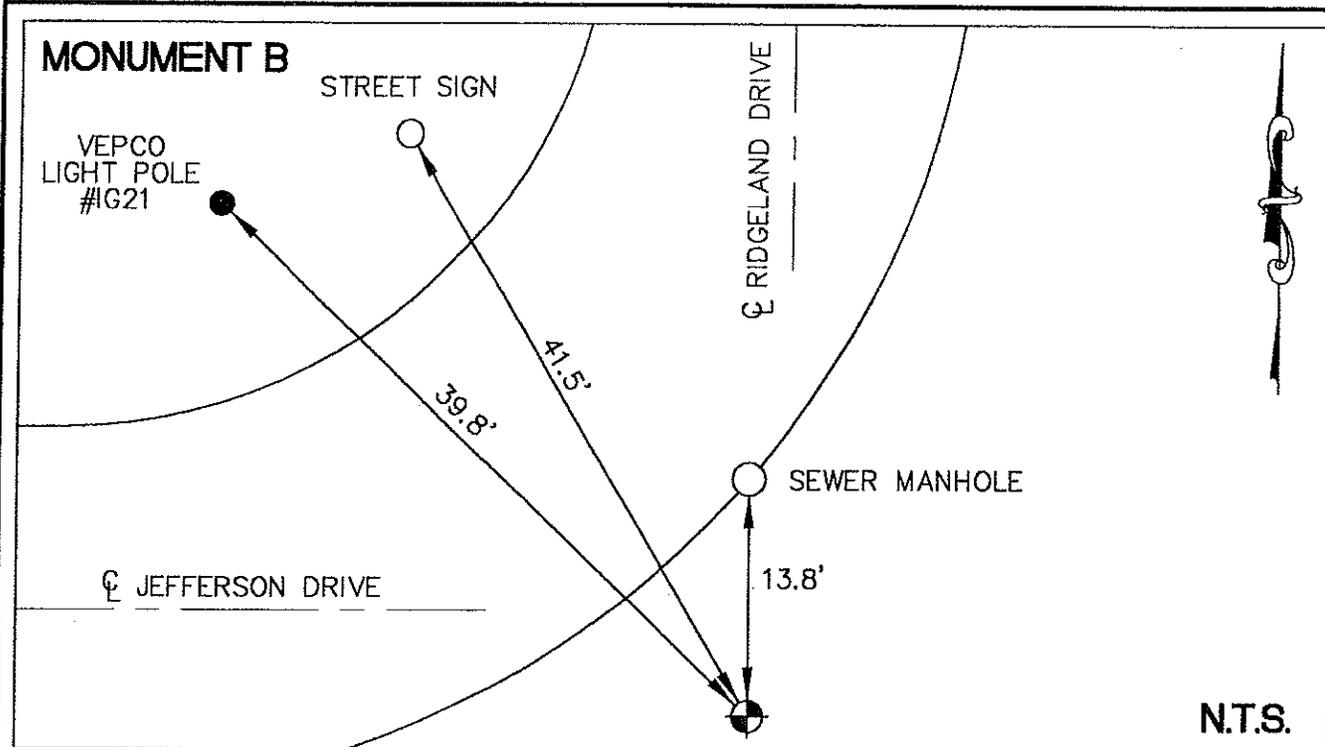
DATE: 12/19/03

**LANDMARK**  
**DESIGN GROUP**  
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Landscape Architects • Environmental Consultants

5544 Greenwich Road  
Suite 200  
Virginia Beach, VA 23462  
Tel. (757) 473-2000  
Fax (757) 497-7933  
Email: lmdg@landmarkdg.com

**BALDWIN**  
**& GREGG** LTD.  
SURVEYORS • ENGINEERS • PLANNERS

TOWN OF SMITHFIELD  
2003 GEODETIC CONTROL NETWORK



LOCATED:

MONUMENT IS A 2" ALUMINUM DISK SET 0.3' BELOW THE NATURAL GROUND SURFACE AT THE SOUTH SIDE OF THE CURVE CREATING THE INTERSECTION OF JEFFERSON DRIVE AND RIDGELAND DRIVE

MONUMENT B

GEODETIC COORDINATES: NAD 83 (ISLE OF WIGHT 1996)

N 36°59'16.55967"

W 76°36'38.52595"

STATE PLANE COORDINATES: NAD 83 - SOUTH ZONE (US SURVEY FOOT) (ISLE OF WIGHT 1996)

NORTHING (FT): 3,524,686.7085

EASTING (FT): 12,034,685.3565

SCALE FACTOR: 0.999967211

CONVERGENCE: 01°08'47.98359

ELEVATION: NAVD 88 (ISLE OF WIGHT 1996)

ELEVATION (FT): 33.2

DATE: 12/19/03

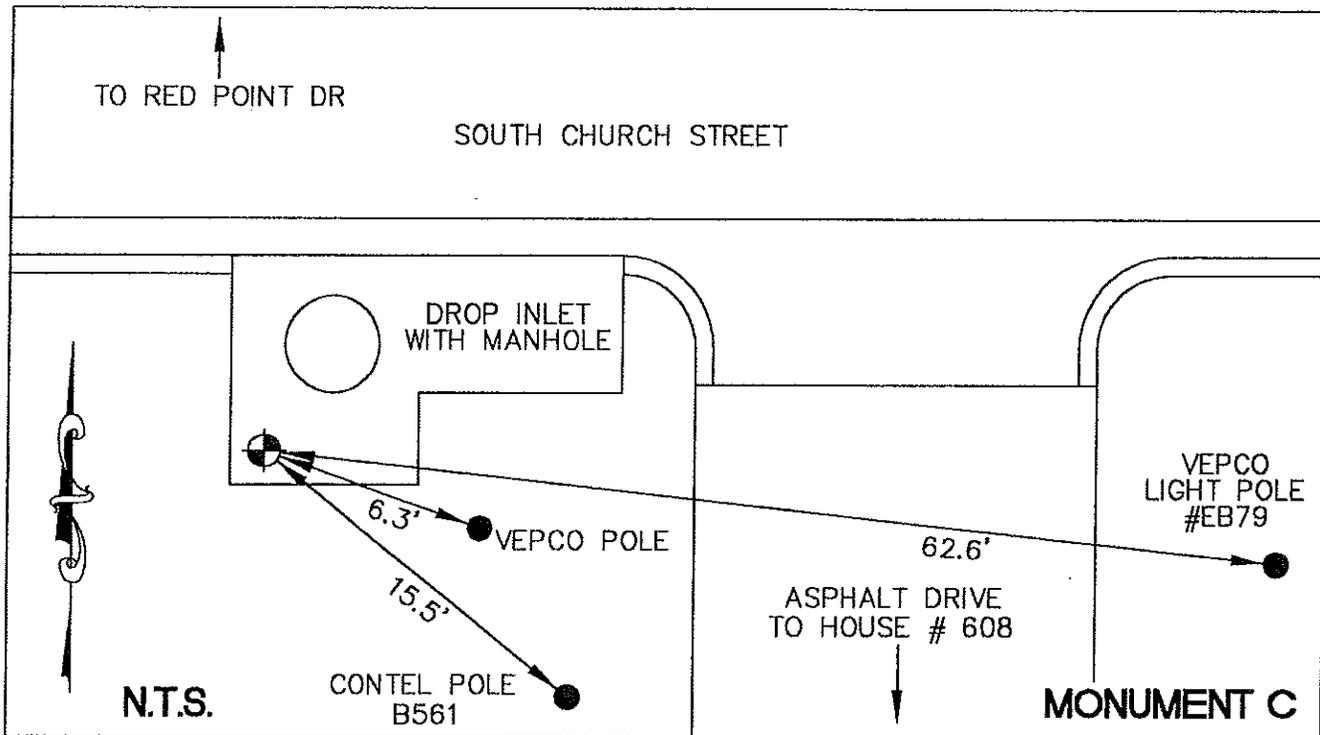
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**TOWN OF SMITHFIELD  
2003 GEODETIC CONTROL NETWORK**



**LOCATED:**

MONUMENT IS A 1" BRASS DISK SET IN THE SOUTHWEST CORNER OF A DROP INLET LOCATED AT THE INTERSECTION OF SOUTH CHURCH STREET AND THE DRIVEWAY LEADING TO 608 SOUTH CHURCH STREET

**MONUMENT C**

**GEODETIC COORDINATES:** NAD 83 (ISLE OF WIGHT 1996)

N 36°58'55.30549"

W 76°37'00.40083"

**STATE PLANE COORDINATES:** NAD 83 - SOUTH ZONE (US SURVEY FOOT) (ISLE OF WIGHT 1996)

NORTHING (FT): 3,522,502.1350

EASTING (FT): 12,032,953.8735

SCALE FACTOR: 0.999967894

CONVERGENCE: 01°08'34.70719"

**ELEVATION:** NAVD 88 (ISLE OF WIGHT 1996)

ELEVATION (FT): 23.7

DATE: 12/19/03

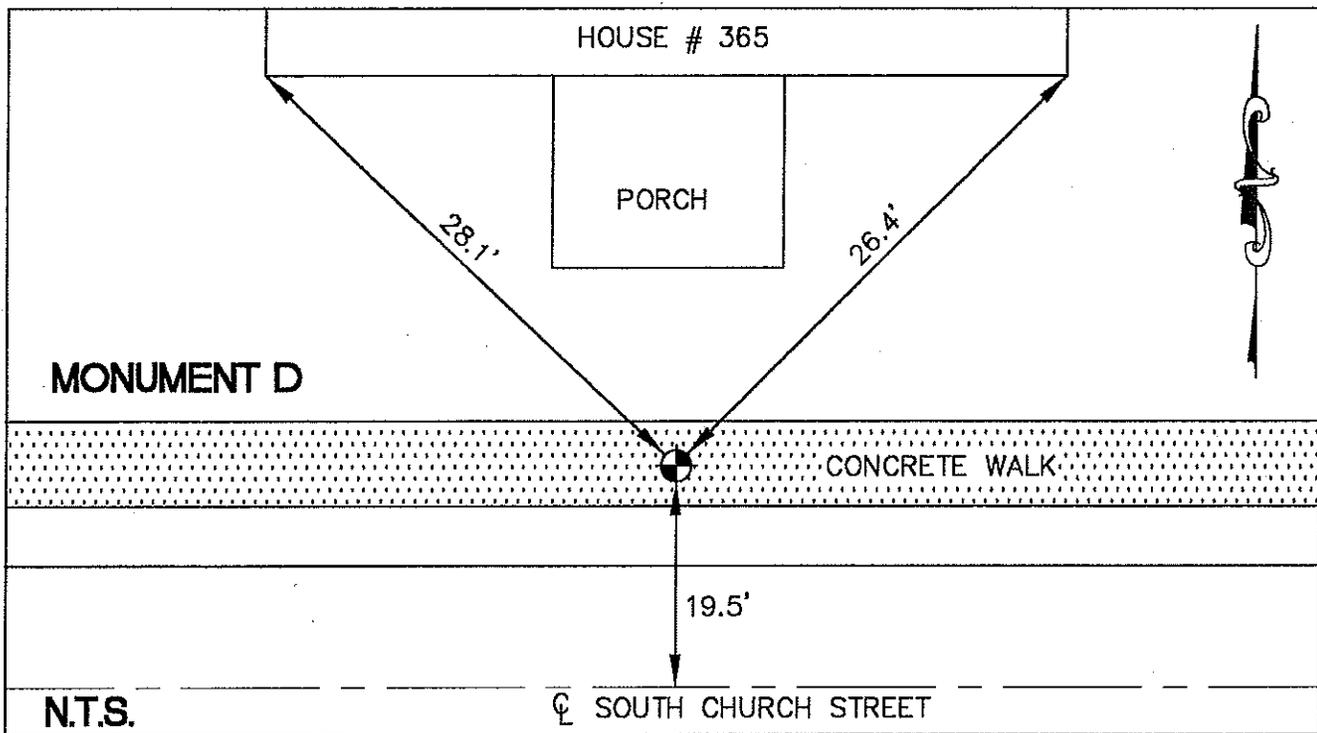
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& GREGG**  
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**TOWN OF SMITHFIELD  
2003 GEODETIC CONTROL NETWORK**



**LOCATED:**

MONUMENT IS A 1" BRASS DISK SET IN THE CENTER OF THE SIDEWALK ON THE NORTH SIDE OF SOUTH CHURCH STREET IN FRONT OF 2 STORY FRAME HOUSE # 365 SOUTH CHURCH STREET (NOT SUITABLE FOR GPS)

**MONUMENT D**

GEODETIC COORDINATES: NAD 83 (ISLE OF WIGHT 1996)

N 36°58'55.50063"

W 76°37'31.76161"

STATE PLANE COORDINATES: NAD 83 - SOUTH ZONE (US SURVEY FOOT) (ISLE OF WIGHT 1996)

NORTHING (FT): 3,522,471.2276

EASTING (FT): 12,030,409.4786

SCALE FACTOR: 0.999967888

CONVERGENCE: 01°08'15.67355"

ELEVATION: NAVD 88 (ISLE OF WIGHT 1996)

ELEVATION (FT): 25.0

DATE: 12/19/03

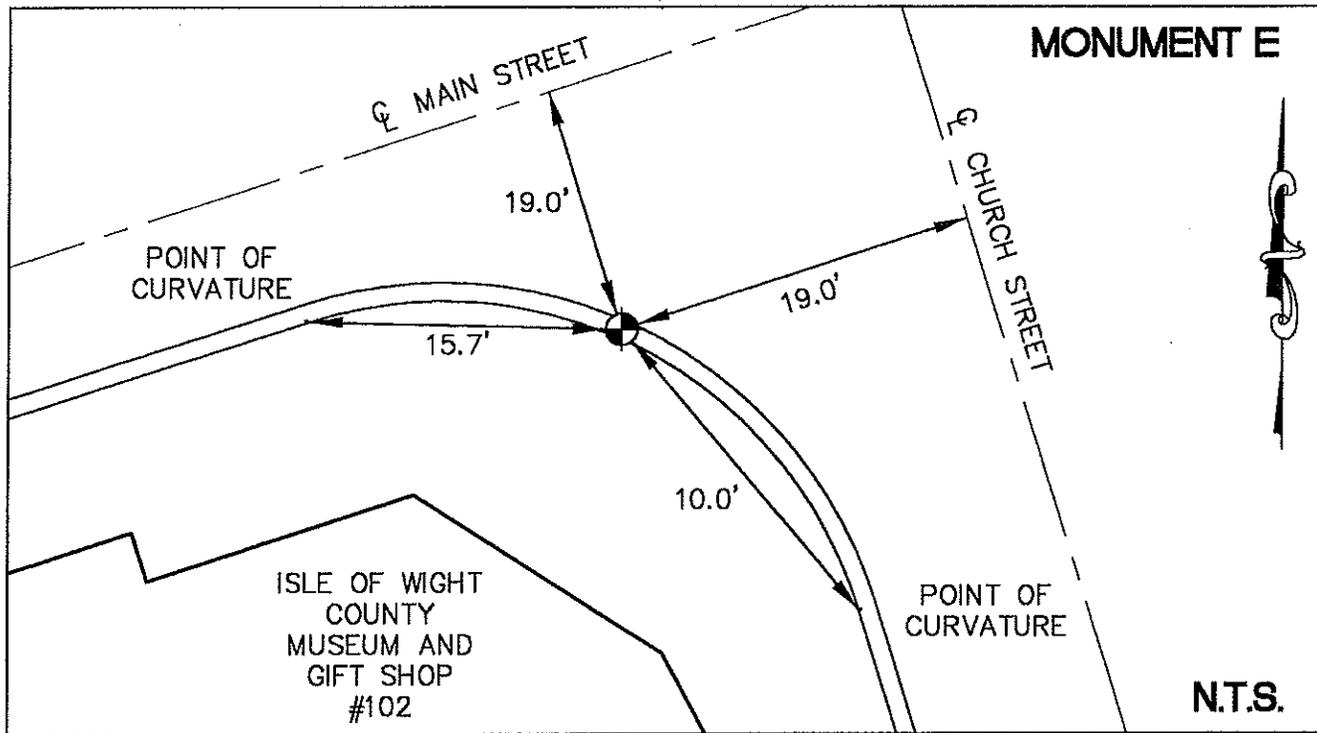
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**TOWN OF SMITHFIELD  
2003 GEODETIC CONTROL NETWORK**



**LOCATED:**

MONUMENT IS A 1" BRASS DISK SET IN THE TOP OF THE GRANITE CURB AT THE SOUTHWEST INTERSECTION OF MAIN STREET AND CHURCH STREET, IN FRONT OF THE ISLE OF WIGHT COUNTY MUSEUM AND GIFT SHOP (NOT SUITABLE FOR GPS)

**MONUMENT E**

GEODETIC COORDINATES: NAD 83 (ISLE OF WIGHT 1996)

N 36°58'56.09176"

W 76°37'51.56599"

STATE PLANE COORDINATES: NAD 83 - SOUTH ZONE (US SURVEY FOOT) (ISLE OF WIGHT 1996)

NORTHING (FT): 3,522,499.1423

EASTING (FT): 12,028,801.7512

SCALE FACTOR: 0.999967869

CONVERGENCE: 01°08'03.65378"

ELEVATION: NAVD 88 (ISLE OF WIGHT 1996)

ELEVATION (FT): 34.6

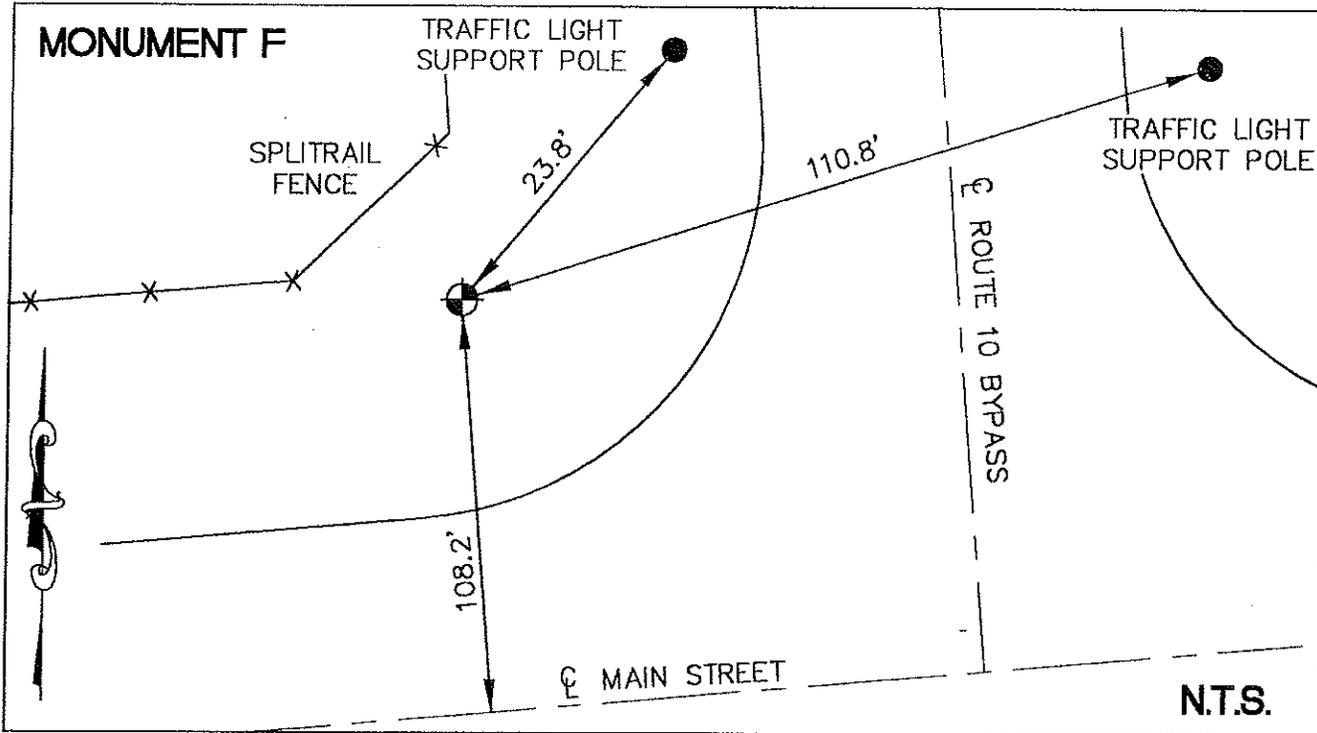
DATE: 12/19/03

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**TOWN OF SMITHFIELD  
2003 GEODETIC CONTROL NETWORK**



**LOCATED:**

MONUMENT IS A 2" ALUMINUM DISK SET 0.3' BELOW THE NATURAL GROUND SURFACE AT THE NORTHWEST CORNER OF THE INTERSECTION OF THE ROUTE 10 BYPASS AND MAIN STREET

**MONUMENT F**

**GEODETIC COORDINATES:** NAD 83 (ISLE OF WIGHT 1996)

N 36°58'38.65688"

W 76°38'27.45329"

**STATE PLANE COORDINATES:** NAD 83 - SOUTH ZONE (US SURVEY FOOT) (ISLE OF WIGHT 1996)

NORTHING (FT): 3,520,678.7160

EASTING (FT): 12,025,925.2750

SCALE FACTOR: 0.999968437

CONVERGENCE: 01°07'41.87289"

**ELEVATION:** NAVD 88 (ISLE OF WIGHT)

ELEVATION (FT): 34.6

DATE: 12/19/03

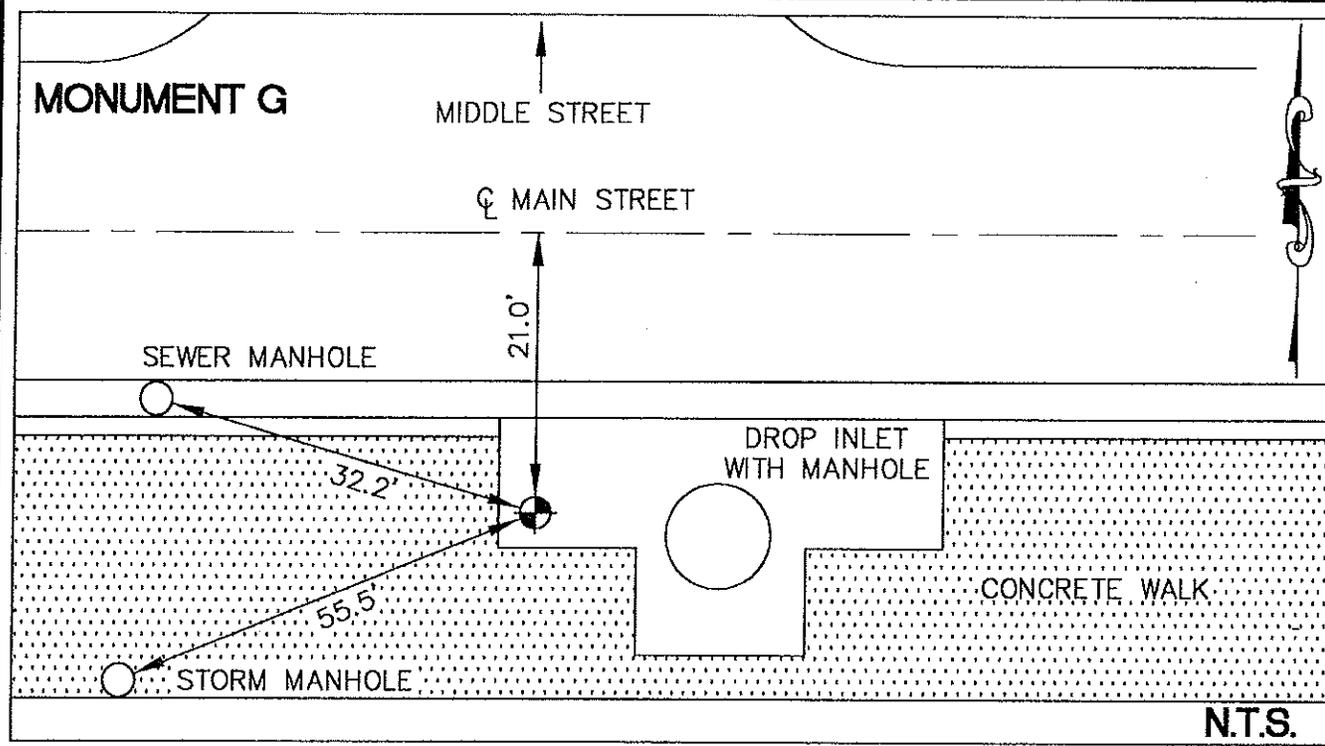


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TOWN OF SMITHFIELD  
2003 GEODETIC CONTROL NETWORK



LOCATED:

MONUMENT IS A 1" BRASS DISK SET IN THE SOUTHWEST CORNER OF A DROP INLET LOCATED ON THE SOUTH SIDE OF MAIN STREET ACROSS FROM MIDDLE STREET

**MONUMENT G**

GEODETIC COORDINATES: NAD 83 (ISLE OF WIGHT 1996)

N 36°58'32.08690"

W 76°38'43.21921"

STATE PLANE COORDINATES: NAD 83 - SOUTH ZONE (US SURVEY FOOT) (ISLE OF WIGHT 1996)

NORTHING (FT): 3,519,989.2275

EASTING (FT): 12,024,659.3040

SCALE FACTOR: 0.999968653

CONVERGENCE: 01°07'32.30416"

ELEVATION: NAVD 88 (ISLE OF WIGHT 1996)

ELEVATION (FT): 35.0

DATE: 12/19/03

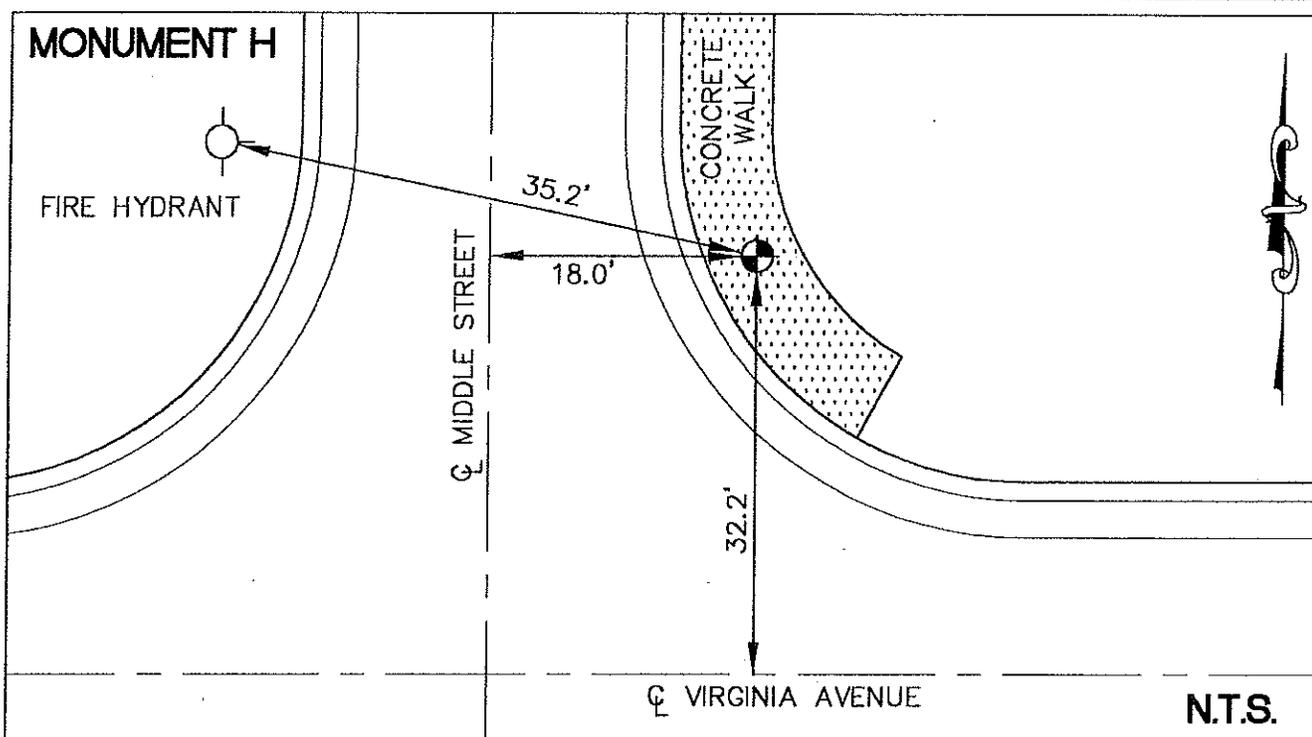
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**LOCATED:**

MONUMENT IS A 1" BRASS DISK SET IN THE CENTER OF THE SIDEWALK AT THE NORTHEAST CORNER OF THE INTERSECTION OF MIDDLE STREET AND VIRGINIA AVENUE

**MONUMENT H**

GEODETIC COORDINATES: NAD 83 (ISLE OF WIGHT 1996)

N 36°58'42.59304"

W 76°38'47.07106"

STATE PLANE COORDINATES: NAD 83 - SOUTH ZONE (US SURVEY FOOT) (ISLE OF WIGHT 1996)

NORTHING (FT): 3,521,045.4240

EASTING (FT): 12,024,325.9500

SCALE FACTOR: 0.999968308

CONVERGENCE: 01°07'29.96637"

ELEVATION: NAVD 88 (ISLE OF WIGHT 1996)

ELEVATION (FT): 34.9

DATE: 12/19/03

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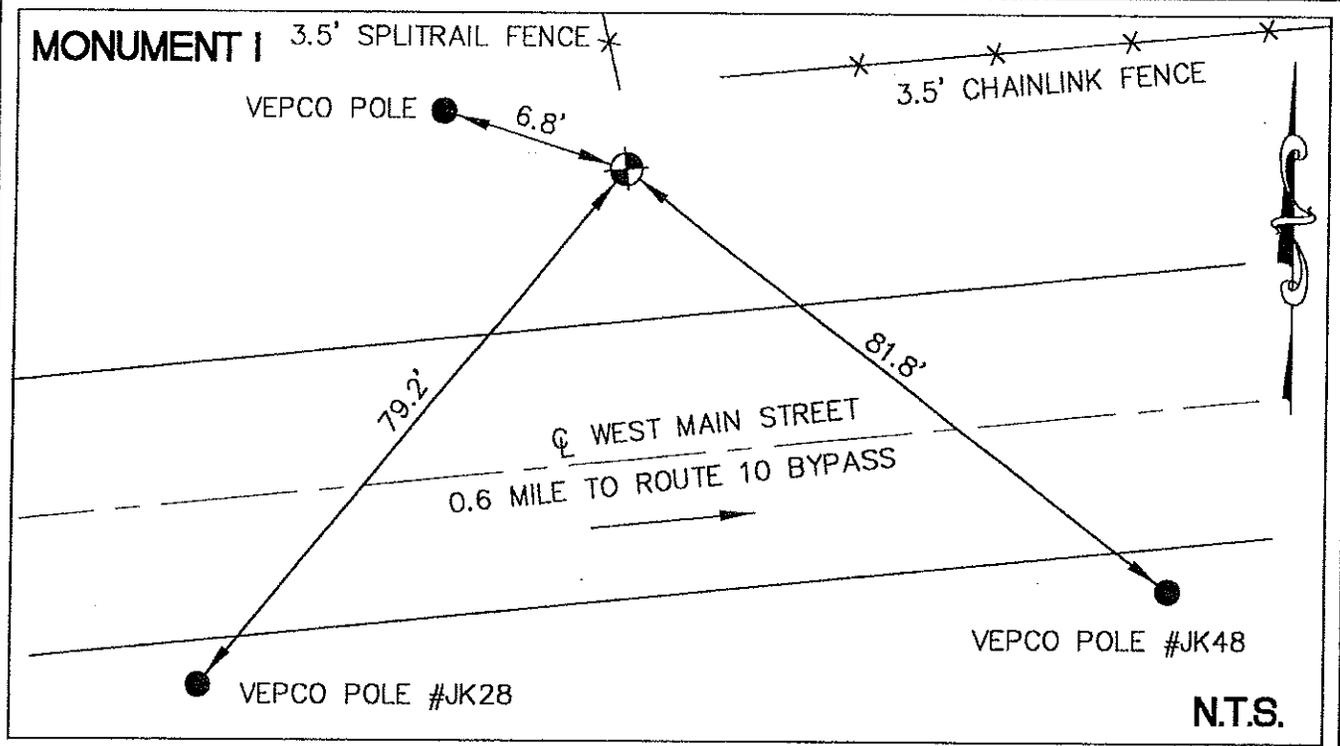
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**LOCATED:**

MONUMENT IS A 2" ALUMINUM DISK SET 0.4' BELOW THE NATURAL GROUND ON THE NORTH SIDE OF WEST MAIN STREET, SIX TENTHS (0.6) OF A MILE FROM THE ROUTE 10 BYPASS, ON THE WESTERN PROPERTY LINE OF SMITHFIELD MIDDLE SCHOOL

**MONUMENT I**

**GEODETIC COORDINATES:** NAD 83 (ISLE OF WIGHT 1996)

N 36°58'23.91790"

W 76°39'03.89035"

**STATE PLANE COORDINATES:** NAD 83 - SOUTH ZONE (US SURVEY FOOT) (ISLE OF WIGHT 1996)

NORTHING (FT): 3,519,130.3145

EASTING (FT): 12,022,998.4775

SCALE FACTOR: 0.999968923

CONVERGENCE: 01°07'19.75833"

**ELEVATION:** NAVD 88 (ISLE OF WIGHT 1996)

ELEVATION (FT): 59.1

DATE: 12/19/03

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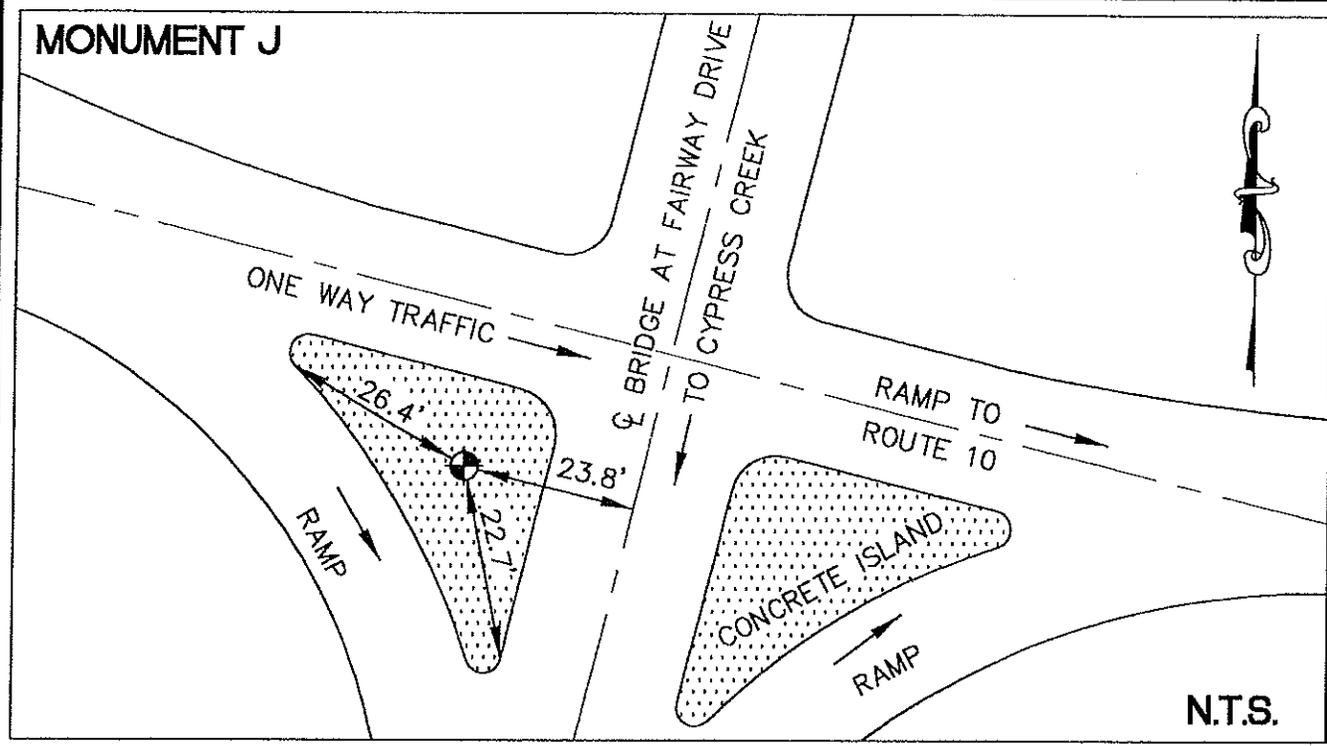
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LOCATED:

MONUMENT IS A 1" BRASS DISK SET IN THE CENTER OF A CONCRETE ISLAND NEAR THE ON-RAMP TO FAIRWAY DRIVE SOUTH

MONUMENT J

GEODETIC COORDINATES: NAD 83 (ISLE OF WIGHT 1996)

N 36°58'13.52592"

W 76°37'59.10159"

STATE PLANE COORDINATES: NAD 83 - SOUTH ZONE (US SURVEY FOOT) (ISLE OF WIGHT 1996)

NORTHING (FT): 3,518,182.9880

EASTING (FT): 12,028,275.5880

SCALE FACTOR: 0.999969268

CONVERGENCE: 01°07'59.08024"

ELEVATION: NAVD 88 (ISLE OF WIGHT 1996)

ELEVATION (FT): 54.9

DATE: 12/19/03

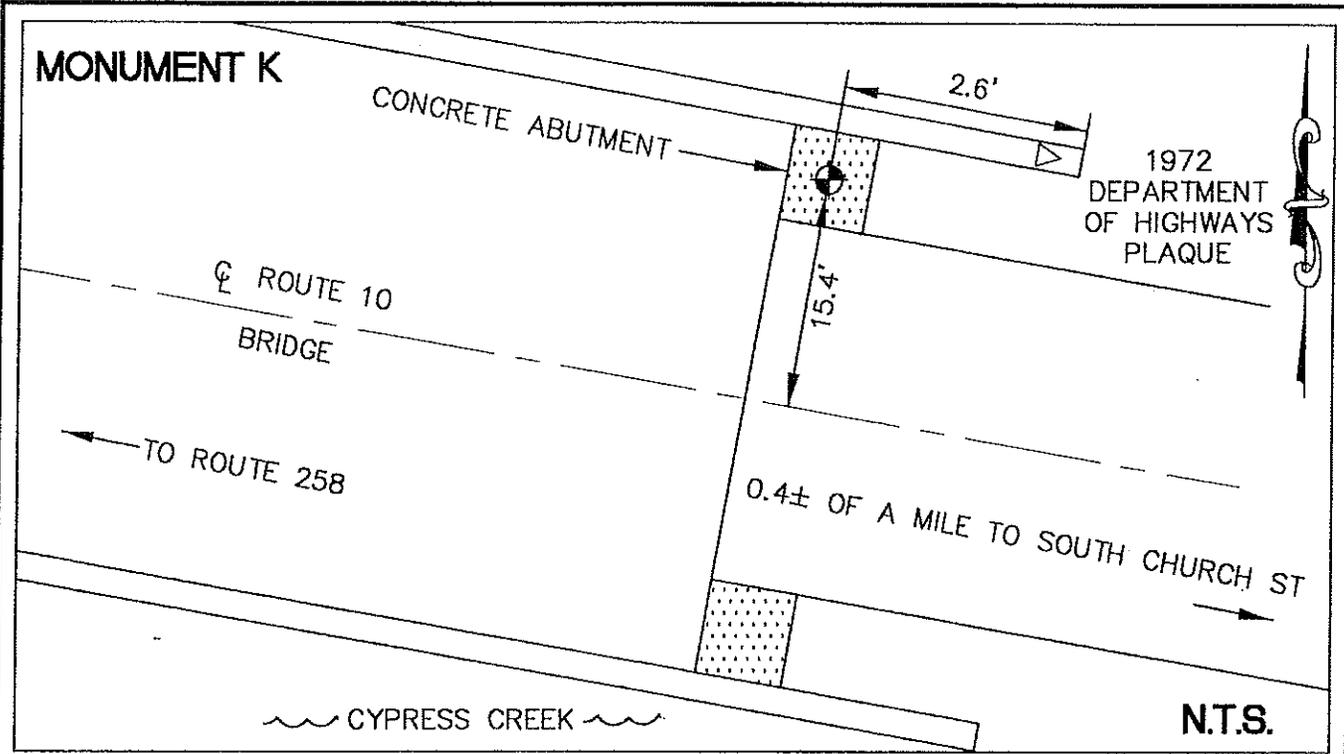
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LOCATED:

MONUMENT IS A 1" BRASS DISK SET ON A CONCRETE ABUTMENT ON THE NORTHEAST SIDE OF THE ROUTE 10 BRIDGE OVER CYPRESS CREEK

**MONUMENT K**

GEODETIC COORDINATES: NAD 83 (ISLE OF WIGHT 1996)

N 36°57'53.48806"

W 76°36'44.19287"

STATE PLANE COORDINATES: NAD 83 - SOUTH ZONE (US SURVEY FOOT) (ISLE OF WIGHT 1996)

NORTHING (FT): 3,516,277.7385

EASTING (FT): 12,034,393.6770

SCALE FACTOR: 0.999969941

CONVERGENCE: 01°08'44.54420"

ELEVATION: NAVD 88 (ISLE OF WIGHT 1996)

ELEVATION (FT): 22.1

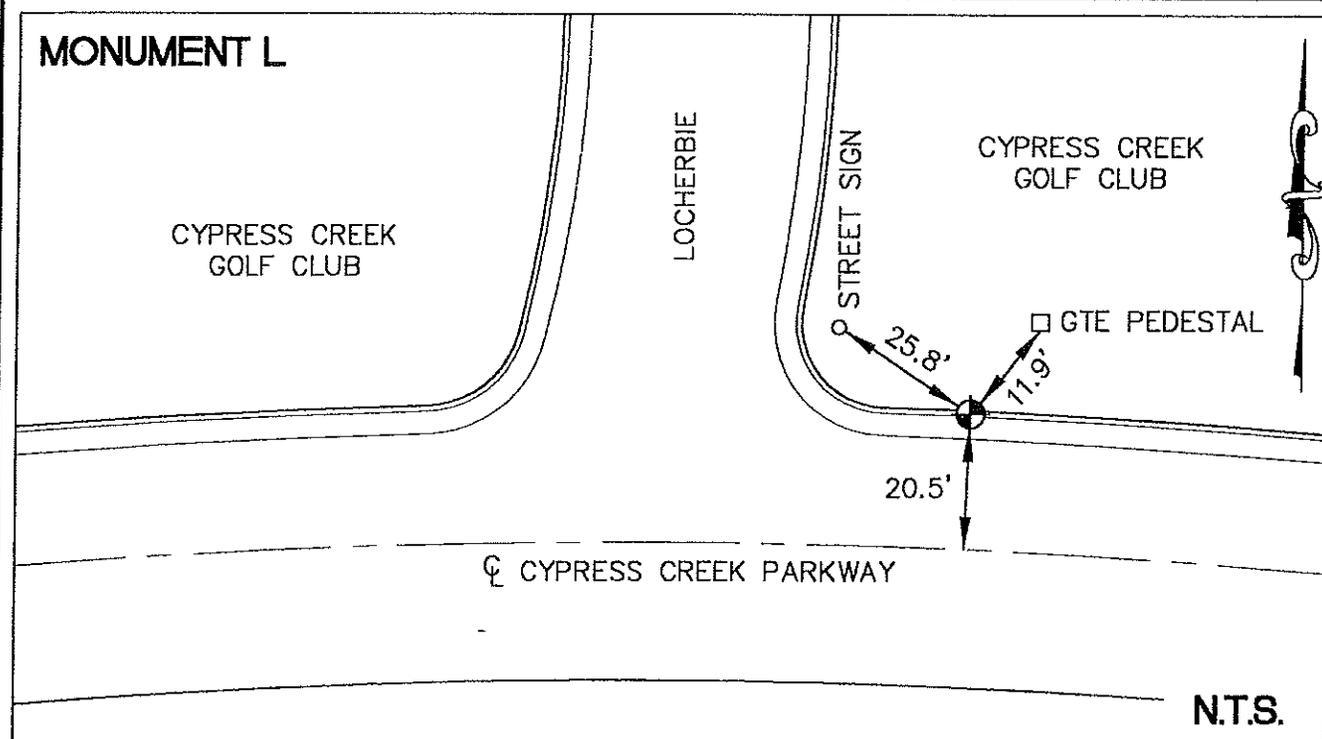
DATE: 12/19/03

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LOCATED:

MONUMENT IS A 1" BRASS DISK SET IN THE TOP OF THE CURB AT THE NORTHEAST CORNER OF THE INTERSECTION OF LOCHERBIE AND CYPRESS CREEK PARKWAY

**MONUMENT L**

GEODETIC COORDINATES: NAD 83 (ISLE OF WIGHT 1996)

N 36°57'47.86677"

W 76°37'27.42163"

STATE PLANE COORDINATES: NAD 83 - SOUTH ZONE (US SURVEY FOOT) (ISLE OF WIGHT 1996)

NORTHING (FT): 3,515,639.4170

EASTING (FT): 12,030,897.4390

SCALE FACTOR: 0.999970132

CONVERGENCE: 01°08'18.30759"

ELEVATION: NAVD 88 (ISLE OF WIGHT 1996)

ELEVATION (FT): 31.3

DATE: 12/19/03

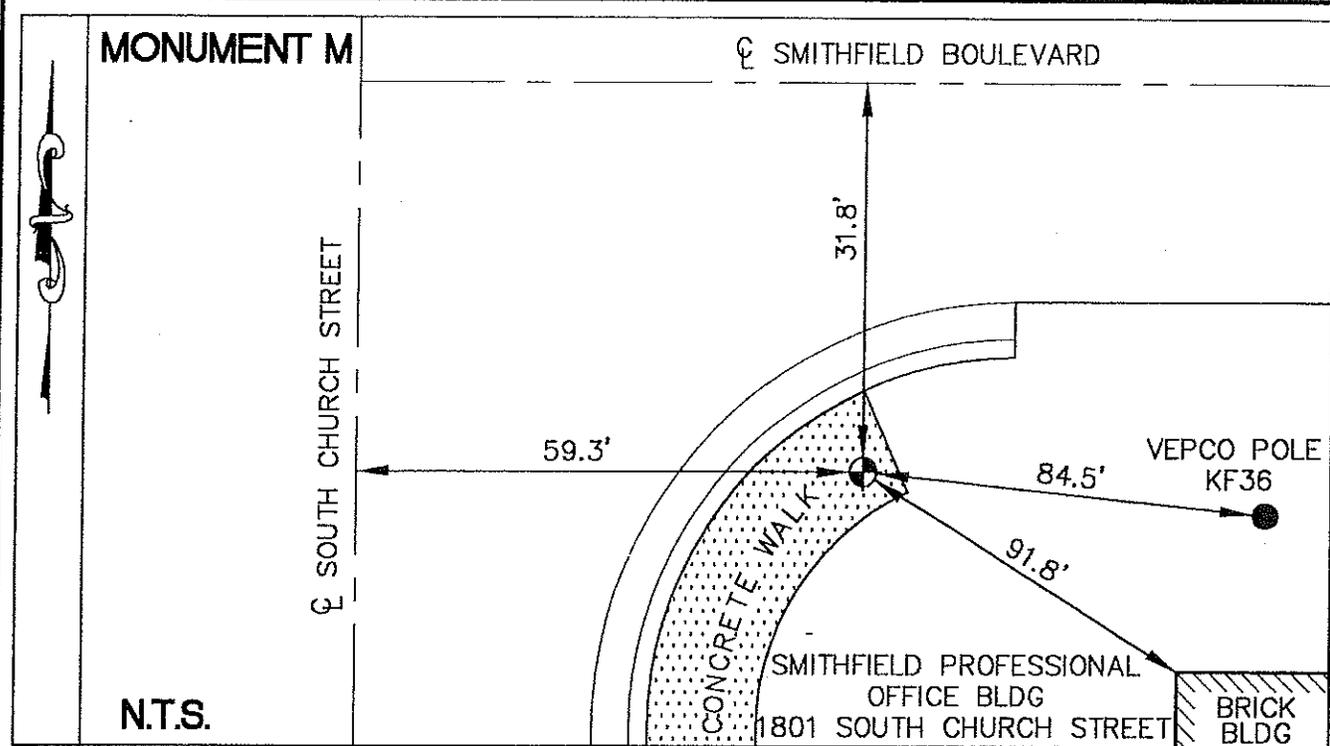
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**LOCATED:**

MONUMENT IS A 1" BRASS DISK SET IN THE SIDEWALK ON THE SOUTHEAST CORNER OF THE INTERSECTION OF SOUTH CHURCH STREET AND SMITHFIELD BOULEVARD

**MONUMENT M**

**GEODETIC COORDINATES:** NAD 83 (ISLE OF WIGHT 1996)

N 36°57'57.35637"

W 76°36'24.30411"

**STATE PLANE COORDINATES:** NAD 83 - SOUTH ZONE (US SURVEY FOOT) (ISLE OF WIGHT 1996)

NORTHING (FT): 3,516,701.2020

EASTING (FT): 12,035,999.5810

SCALE FACTOR: 0.999969811

CONVERGENCE: 01°08'56.61519"

**ELEVATION:** NAVD 88 (ISLE OF WIGHT 1996)

ELEVATION (FT): 41.1

DATE: 12/19/03

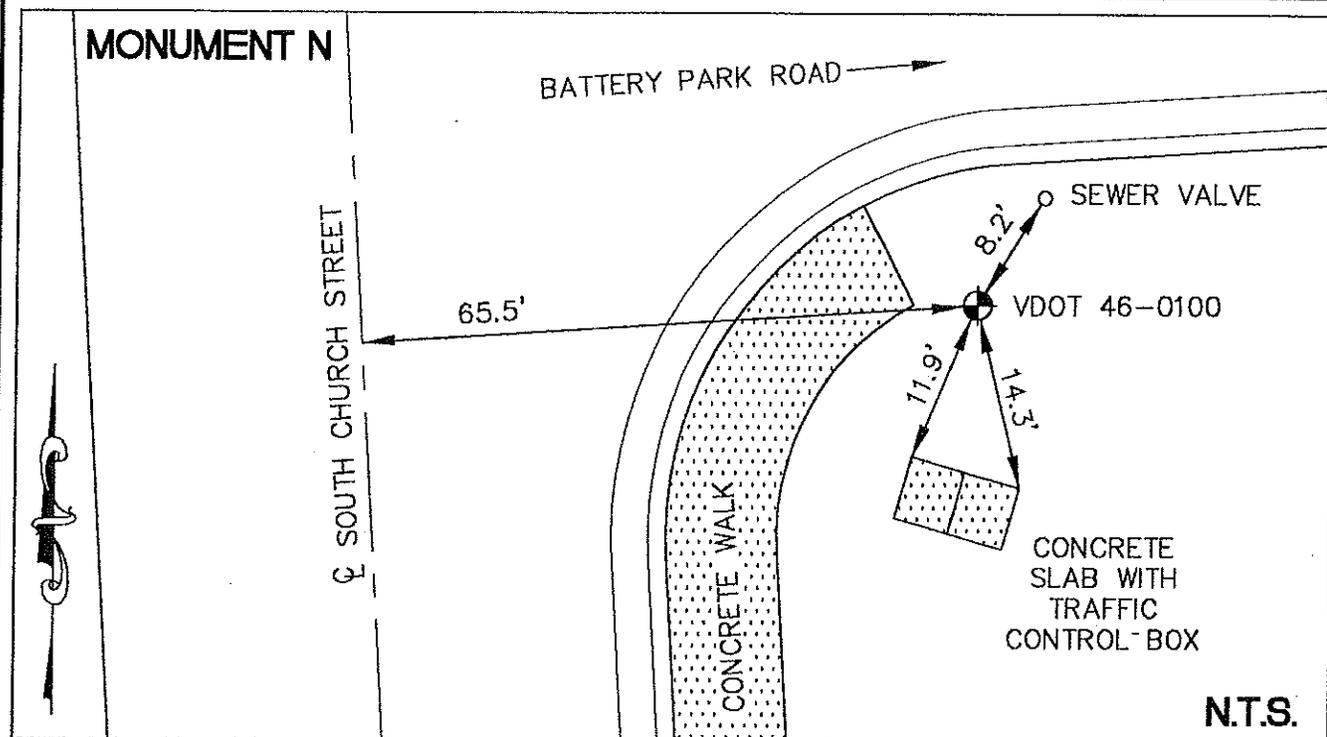
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**LOCATED:**

MONUMENT IS AN EXISTING DEPARTMENT OF TRANSPORTATION MONUMENT STAMPED 46-0100 SET 0.2' BELOW NATURAL GROUND ON THE SOUTHEAST CORNER OF THE INTERSECTION OF SOUTH CHURCH STREET AND BATTERY PARK ROAD

**MONUMENT N**

**GEODETIC COORDINATES:** NAD 83 (ISLE OF WIGHT 1996)

N 36°58'22.92529"

W 76°36'35.18322"

**STATE PLANE COORDINATES:** NAD 83 - SOUTH ZONE (US SURVEY FOOT) (ISLE OF WIGHT 1996)

NORTHING (FT): 3,519,268.9065

EASTING (FT): 12,035,065.1025

SCALE FACTOR: 0.999968955

CONVERGENCE: 01°08'50.01238"

**ELEVATION:** NAVD 88 (ISLE OF WIGHT 1996)

ELEVATION (FT): 41.2

DATE: 12/19/03



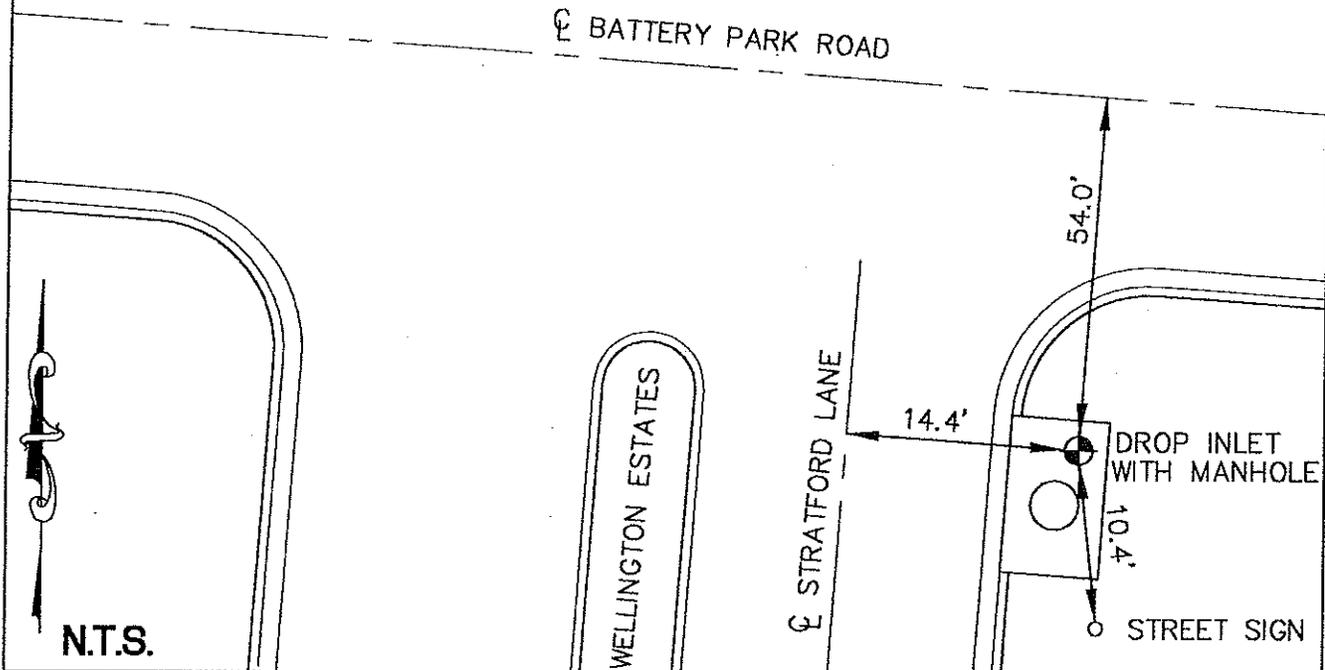
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TOWN OF SMITHFIELD  
2003 GEODETIC CONTROL NETWORK

MONUMENT O



LOCATED:

MONUMENT IS A 1" BRASS DISK SET IN THE TOP OF A DROP INLET AT THE SOUTHEAST CORNER OF THE INTERSECTION OF BATTERY PARK ROAD AND STRATFORD LANE

MONUMENT O

GEODETIC COORDINATES: NAD 83 (ISLE OF WIGHT 1996)

N 36°58'27.77708"

W 76°35'54.86818"

STATE PLANE COORDINATES: NAD 83 - SOUTH ZONE (US SURVEY FOOT) (ISLE OF WIGHT 1996)

NORTHING (FT): 3,519,825.1860

EASTING (FT): 12,038,325.9745

SCALE FACTOR: 0.999968795

CONVERGENCE: 01°09'14.48058"

ELEVATION: NAVD 88 (ISLE OF WIGHT 1996)

ELEVATION (FT): 23.1

DATE: 12/19/03

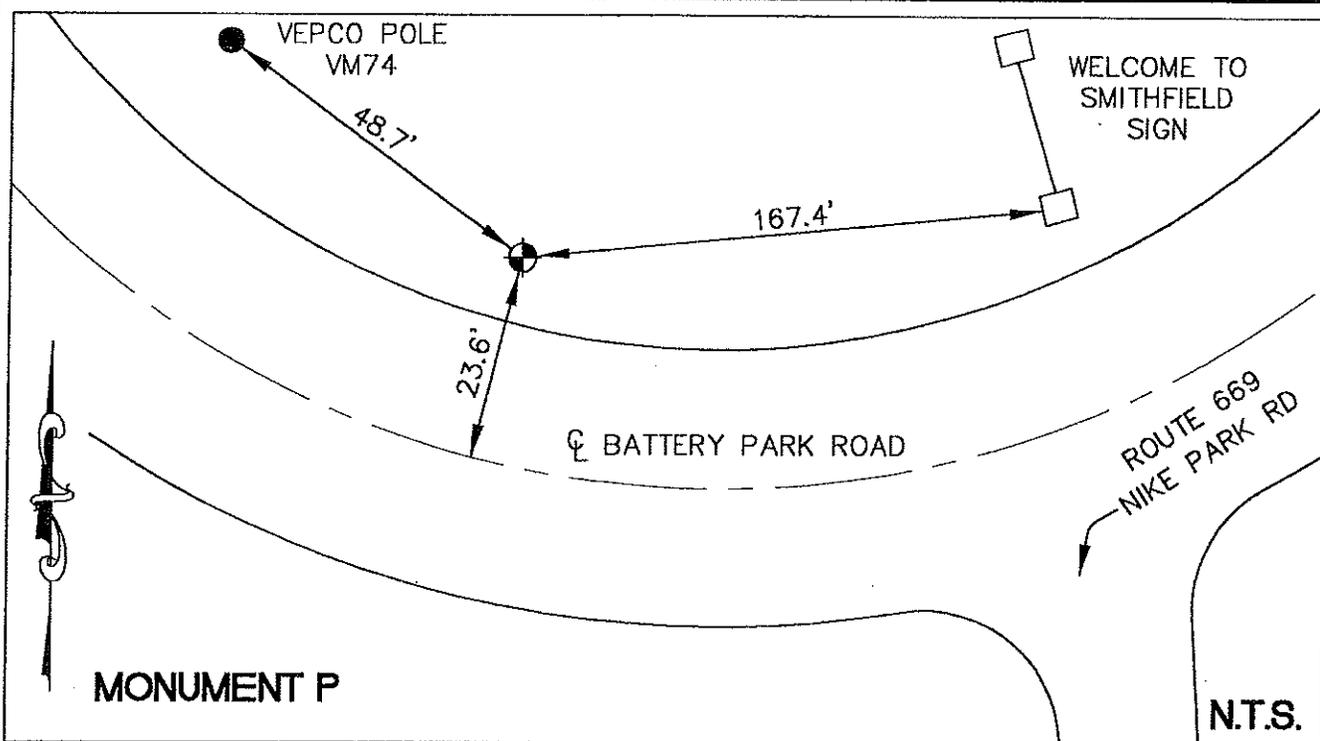
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LOCATED:

MONUMENT IS A 2" ALUMINUM DISK SET 0.3' BELOW NATURAL GROUND ON THE NORTH SIDE OF BATTERY PARK ROAD APPROXIMATELY 167.4' WEST OF SOUTHERNMOST CORNER OF "WELCOME TO SMITHFIELD" SIGN

**MONUMENT P**

GEODETIC COORDINATES: NAD 83 (ISLE OF WIGHT 1996)

N 36°58'32.22952

W 76°35'14.79888

STATE PLANE COORDINATES: NAD 83 - SOUTH ZONE (US SURVEY FOOT) (ISLE OF WIGHT 1996)

NORTHING (FT): 3,520,341.0670

EASTING (FT): 12,041,567.6040

SCALE FACTOR: 0.999968648

CONVERGENCE: 01°09'38.79963"

ELEVATION: NAVD 88 (ISLE OF WIGHT 1996)

ELEVATION (FT): 22.7

DATE: 12/19/03

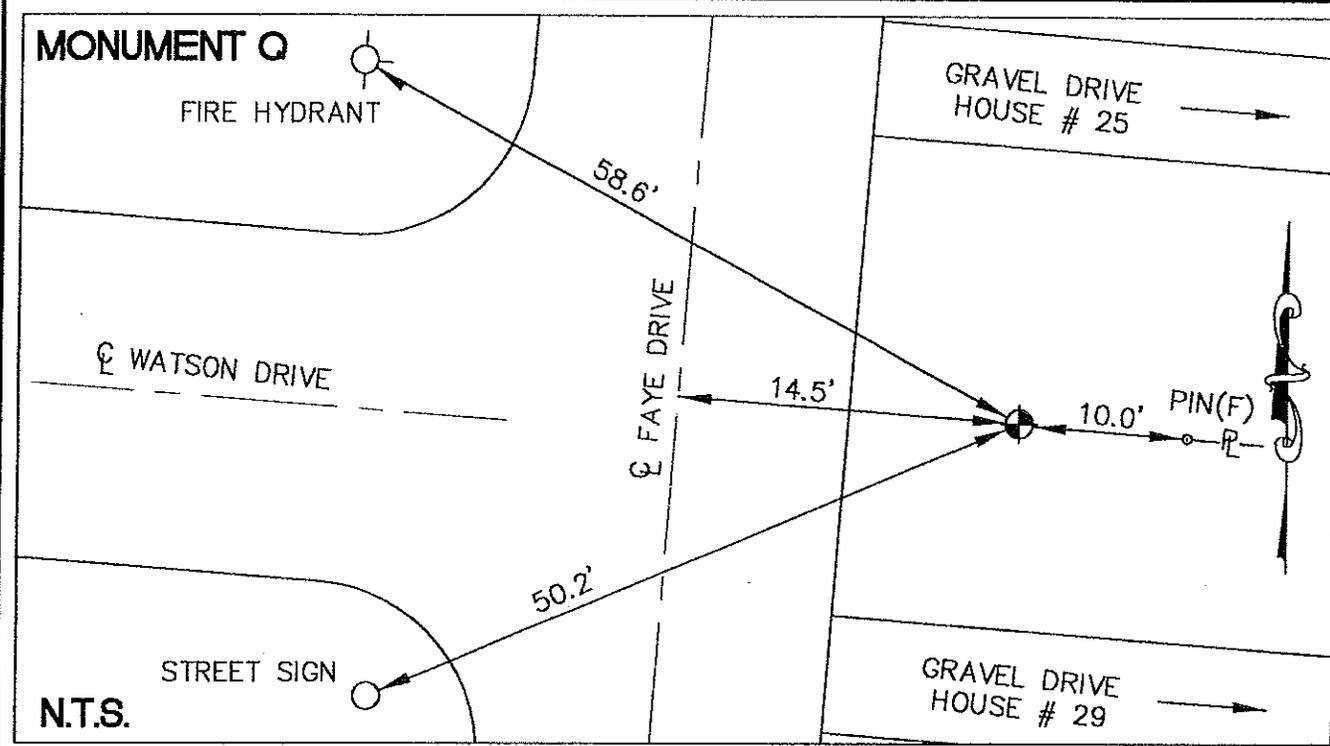
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LOCATED:

MONUMENT IS A 2" ALUMINUM DISK SET IN CONCRETE 0.2' BELOW NATURAL GROUND EAST OF THE INTERSECTION OF WATSON DRIVE AND FAYE DRIVE

**MONUMENT Q**

GEODETIC COORDINATES: NAD 83 (ISLE OF WIGHT 1996)

N 36°59'22.58358"

W 76°35'40.80565"

STATE PLANE COORDINATES: NAD 83 - SOUTH ZONE (US SURVEY FOOT) (ISLE OF WIGHT 1996)

NORTHING (FT): 3,525,389.9235

EASTING (FT): 12,039,354.9805

SCALE FACTOR: 0.999967019

CONVERGENCE: 01°09'23.01548"

ELEVATION: NAVD 88 (ISLE OF WIGHT 1996)

ELEVATION (FT): 20.5

DATE: 12/19/03

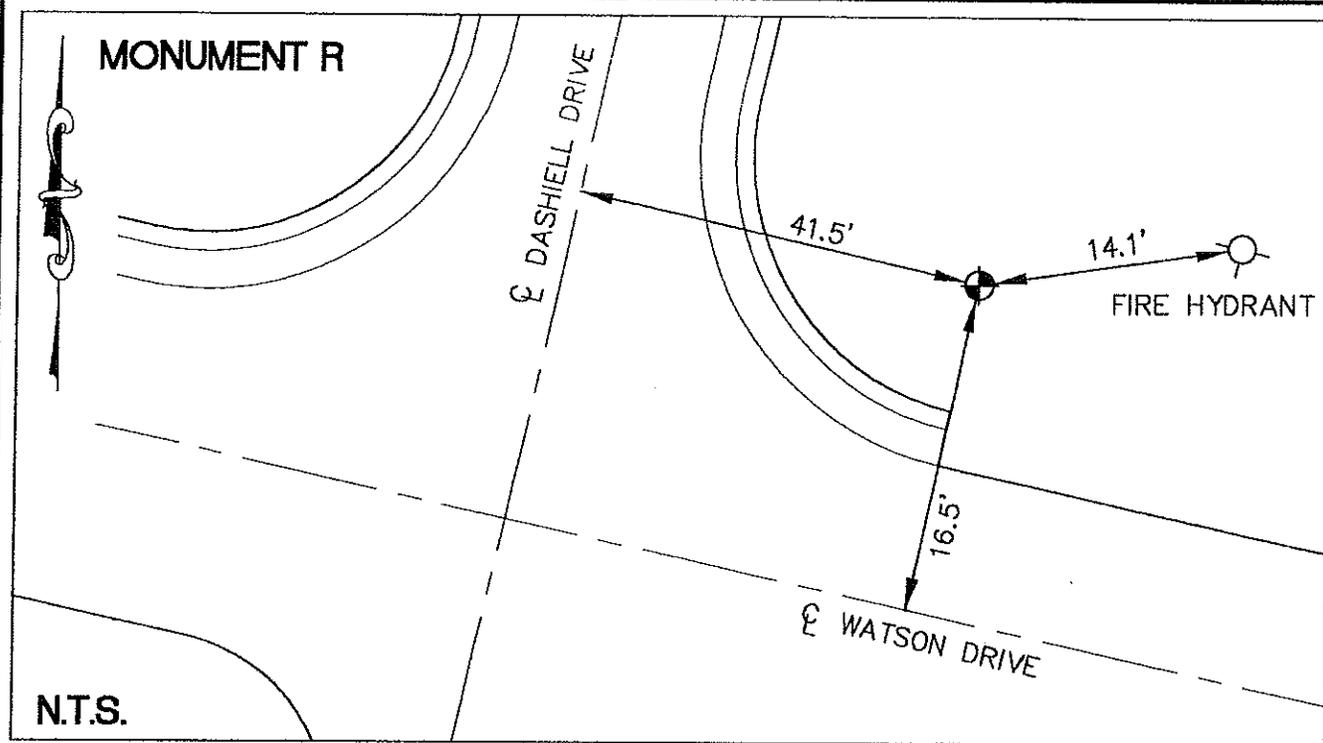
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LOCATED:

MONUMENT IS A 2" ALUMINUM DISK SET 0.3' BELOW NATURAL GROUND AT THE NORTHEAST CORNER OF THE INTERSECTION OF DASHIELL DRIVE AND WATSON DRIVE

**MONUMENT R**

GEODETIC COORDINATES: NAD 83 (ISLE OF WIGHT 1996)

N 36°59'25.94613"

W 76°36'03.35734"

STATE PLANE COORDINATES: NAD 83 - SOUTH ZONE (US SURVEY FOOT) (ISLE OF WIGHT 1996)

NORTHING (FT): 3,525,693.0630

EASTING (FT): 12,037,518.9265

SCALE FACTOR: 0.999966913

CONVERGENCE: 01°09'09.32830"

ELEVATION: NAVD 88 (ISLE OF WIGHT 1996)

ELEVATION (FT): 24.1

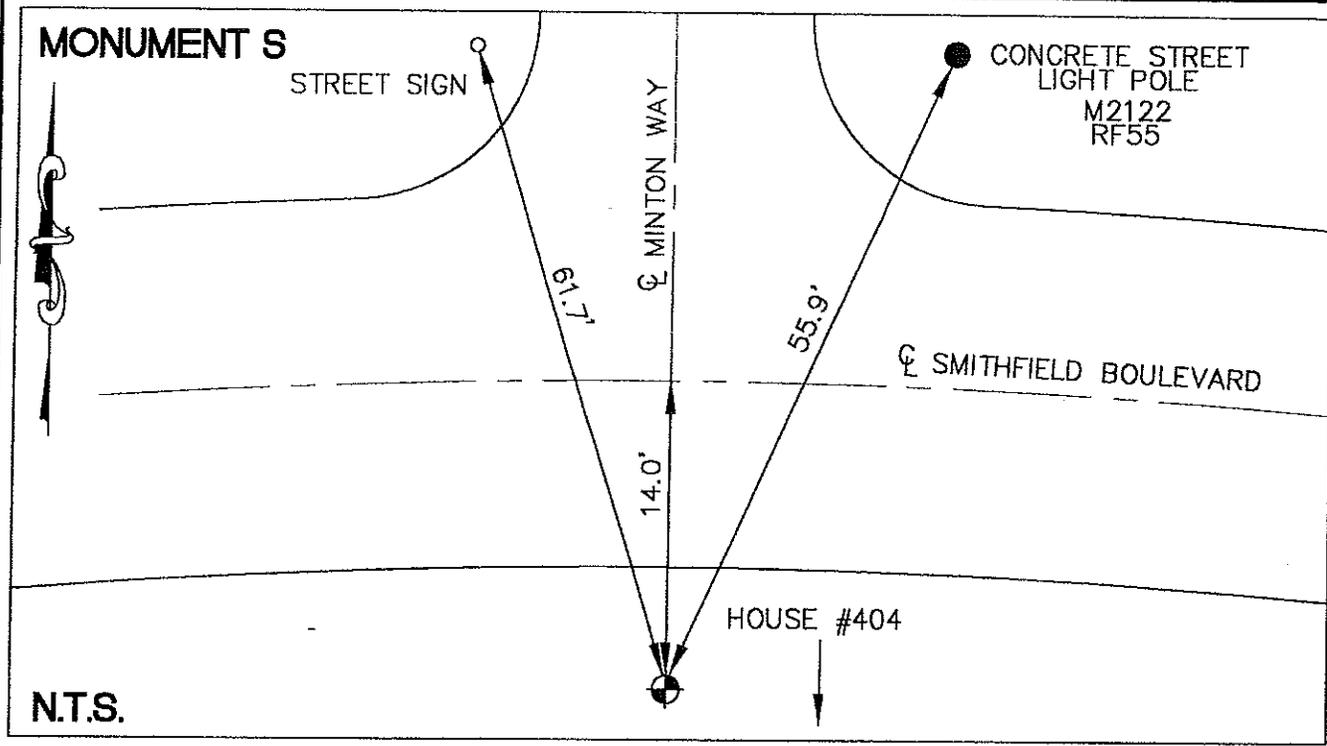
DATE: 12/19/03

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**LOCATED:**

MONUMENT IS A 2" ALUMINUM DISK SET 0.2' BELOW NATURAL GROUND SOUTH OF THE INTERSECTION OF MINTON WAY AND SMITHFIELD BOULEVARD, IN FRONT OF 404 SMITHFIELD BOULEVARD

**MONUMENT S**

**GEODETIC COORDINATES:** NAD 83 (ISLE OF WIGHT 1996)

N 36°57'57.40014"

W 76°35'40.77049"

**STATE PLANE COORDINATES:** NAD 83 - SOUTH ZONE (US SURVEY FOOT) (ISLE OF WIGHT 1996)

NORTHING (FT): 3,516,776.7015

EASTING (FT): 12,039,531.6970

SCALE FACTOR: 0.999969809

CONVERGENCE: 01°09'23.03682"

**ELEVATION:** NAVD 88 (ISLE OF WIGHT 1996)

ELEVATION (FT): 22.8

DATE: 12/19/03

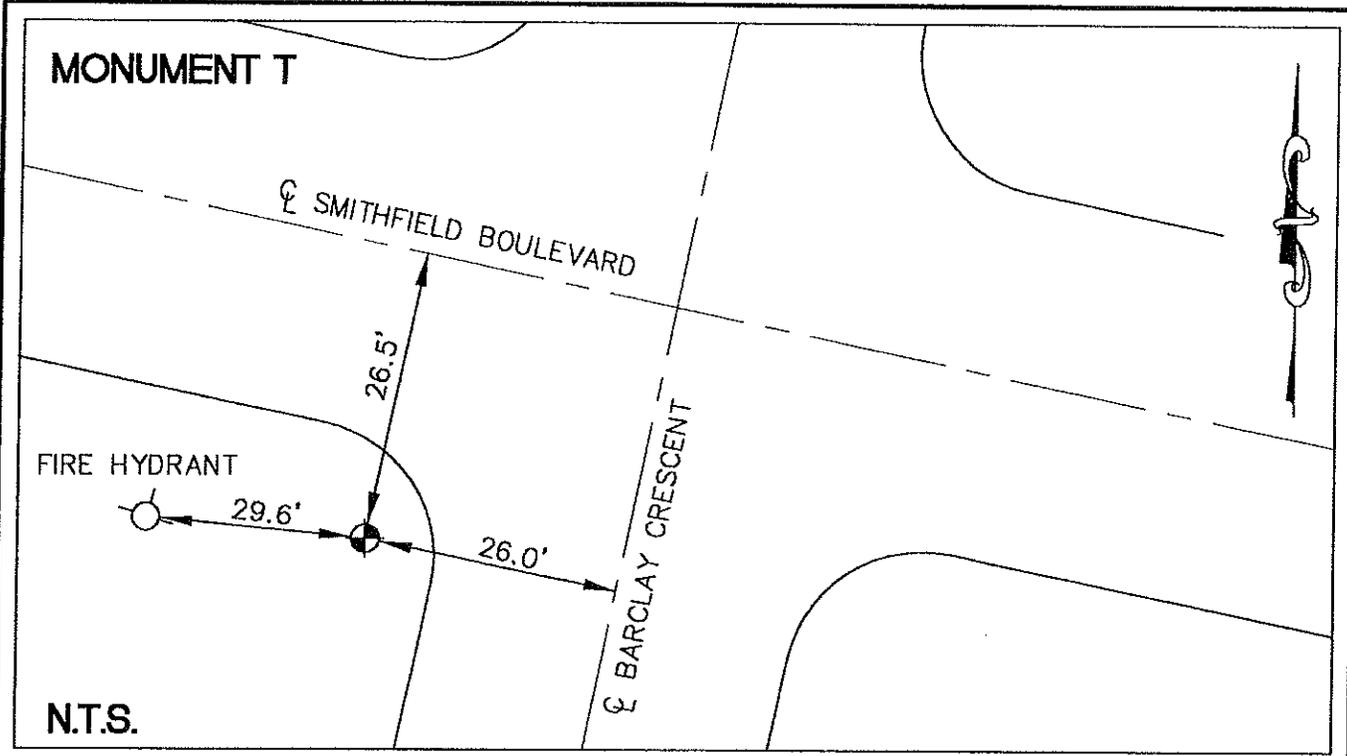
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LOCATED:

MONUMENT IS A 2" ALUMINUM DISK SET 0.3' BELOW NATURAL GROUND AT THE SOUTHWEST CORNER OF THE INTERSECTION OF SMITHFIELD BOULEVARD AND BARCLAY CRESCENT

**MONUMENT T**

GEODETIC COORDINATES: NAD 83 (ISLE OF WIGHT 1996)

N 36°57'54.80813"

W 76°35'21.18219"

STATE PLANE COORDINATES: NAD 83 - SOUTH ZONE (US SURVEY FOOT) (ISLE OF WIGHT 1996)

NORTHING (FT): 3,516,546.7405

EASTING (FT): 12,041,126.3440

SCALE FACTOR: 0.999969897

CONVERGENCE: 01°09'34.92544"

ELEVATION: NAVD 88 (ISLE OF WIGHT 1996)

ELEVATION (FT): 18.6

DATE: 12/19/03

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## **APPENDIX D**

### Water and Sanitary Sewer System Design Checklist

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**TOWN OF SMITHFIELD  
WATER AND SANITARY SEWER SYSTEM DESIGN CHECKLIST**

Project Name: \_\_\_\_\_

Project Address: \_\_\_\_\_

Developer: \_\_\_\_\_

Architect/Engineer: \_\_\_\_\_

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_ E-mail: \_\_\_\_\_

Plan Preparer Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Submittal # (Circle): 1 2 3 4 5

\*\*\*\*\*

NOTE: This checklist shall be completed and accompany each water and sanitary sewer pipeline design submittal. The checklist shall be signed by the plan preparer certifying compliance of the design with the Town of Smithfield and HRPDC standards as well as the requirements of this checklist. This checklist serves only as a guide for the preparer in developing the construction drawings and is not intended to be all encompassing. It is the responsibility of the engineer and/or surveyor to ensure the plans and calculations comply with all governing regulations, standards and specifications. Plans submitted without a completed checklist will be returned without review. Any applicant response indicating “No” shall be explained on this checklist with the reason for noncompliance.

\*\*\*\*\*

**I. GENERAL:**

		YES	NO	N/A
1.	Developer's/Applicant's name, contact person(s), street address, phone number and fax number on title sheet.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2.	Engineer's/Surveyor's firm, address, phone number and fax number on title sheet.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3.	North arrow and graphic scale bars provided on all applicable plan sheets.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4.	Utility plan <u>clearly</u> depicts all existing and proposed site features, including contours. Legend provided on the plan which correctly reflects the development plan.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5.	An overall utility plan provided for large development areas and subdivisions, or where deemed necessary by the Town of Smithfield.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

		YES	NO	N/A
6.	All existing and proposed right-of-ways and/or easements properly shown, labeled, dimensioned and, where applicable, recordation referenced. Refer to the Smithfield Design Standards Section 2.5 for Town easement requirements.	0	0	0
7.	Town of Smithfield standard General Notes for Water Distribution and Sanitary Sewer Systems (current edition) included in their entirety on the plan. Refer to Smithfield Design Standards Section 6.1.	0	0	0
8.	All plan sheets sealed, signed and dated by engineer and/or surveyor overseeing the design. Refer to Smithfield Design Standards Section 1.2 for sealing requirements.	0	0	0
9.	Vertical and horizontal datum established in accordance with Smithfield Design Standards Section 1.3. Clearly reference the County monument or benchmark specifically used for the project. TBM established on-site	0	0	0
10.	Date of plan submittal and/or revision noted on the cover. Professional seal date shall reflect the plan submittal date.	0	0	0
11.	Plan and profiles developed at a maximum scale of 1"=40' horizontal and 1"=4' vertical. Plan and profile horizontal scales shall be the same. Profile vertical scale shall be a tenth of the horizontal scale. Sheet size no larger than 24x36 shall be submitted.	0	0	0
12.	A minimum horizontal separation of ten (10) feet, edge to edge, maintained between sanitary sewer lines and water lines, water service connections and sanitary sewer laterals, unless approved otherwise by the Town of Smithfield.	0	0	0
13.	Provide call-outs, either individually or tabularized for all facility features, clearly referencing or labeling applicable Town and HRPDC details for the project (i.e. Typical Water Service Installation, HRPDC WD_02). Only provide those sanitary sewer or water system details on the plan which are either required by other regulatory agency review or have been modified from the standards.	0	0	0
14.	Provide profiles for all water and sanitary sewer mains to include stub-outs for future extensions. All utility crossings (water, sanitary sewer, storm, etc.) shall be shown on the profile.	0	0	0
15.	Engineer's/Surveyor's letter of response provided indicating how and where on the plans each Town of Smithfield comment has been addressed.	0	0	0
16.	Miss Utility notation provided, including phone number.	0	0	0
17.	Existing and proposed street names (label as "Public" or "Private" where applicable), lot and parcel numbers clearly labeled on the plans.	0	0	0
18.	Existing water or sanitary sewer mains previously abandoned and/or removed are clearly labeled on the plan. Provide notes describing how existing facility is to be abandoned (i.e. grouted/ plugged, etc).	0	0	0
19.	Plat provided to the Town for review and approval prior to recordation. Refer to Section 3 of this checklist.	0	0	0
20.	Proposed Town utility lines are shown with reference distances from curb & gutter, edge of pavement, right-of-way, etc.	0	0	0

		YES	NO	N/A
21.	A minimum cover of 36-inches provided over all Town water and sanitary sewer force mains.	0	0	0
22.	Existing utilities size and, if known, material shown and labeled. Test hole data provided on plans and in report format.	0	0	0
23.	Proposed utility pipe lengths and structures shown on the Water and Sanitary Sewer System Data Sheets agree with the plan.	0	0	0
24.	Bore pit data such as bore location; length of bore; pit location and dimensions; casing diameter and thickness; and casing stationing and invert are shown and labeled.	0	0	0
25.	All water service and/or sanitary sewer service lines are extended perpendicular from the respective main and are located within the right-of-way or a dedicated Town of Smithfield Utility Easement (except in cul-de-sacs).	0	0	0
26.	Sanitary sewer and water mains within fill areas are designed in accordance with Smithfield Design Standards Section 2.32.	0	0	0
27.	Transformer locations have been shown on the site plan and maintain required clearances from Town of Smithfield utilities.	0	0	0
28.	Items pertinent to the Utility Plans and Profiles (i.e. Smithfield General Notes, HRPDC/Smithfield detail tabularized references, thrust restraint lengths, etc) are required on the Utility Plans and/or Profiles. If not, a note shall be provided on each Utility Plan and profile sheet referencing where these items are located.	0	0	0
29.	The plan revision block shall indicate all plan revisions/amendments made after plan approval. This shall include clearly indicating the plan revision/amendment by "clouding" the area.	0	0	0
30.	Include proposed street lighting and landscaping on the Utility plan. Locations shall agree with the Landscaping and Lighting Plans. Minimum clearance requirements with Smithfield infrastructure are met.	0	0	0
31.	Plat provided for extinguishment/abandonment of any existing Town of Smithfield Utility Easement (refer to Smithfield Design Standards Section 2.5).	0	0	0
32.	Location of all existing private utilities (gas, power, CATV, Tele, etc) are shown on the plan.	0	0	0
33.	Geotechnical report and sealed design calculations provided for pipe bridges.	0	0	0
34.	Roadway baseline geometry indicated on the plans. Required to confirm pipe deflections do not exceed HRPDC/Smithfield requirements.	0	0	0
35.	Provide a note on each Utility Plan Sheet indicating the plan sheet where the associated profile(s) can be found.	0	0	0
36.	All private underground storage tanks shall have leak monitors and secondary containment unit as required by Virginia State DEQ Regulations	0	0	0
<b>II.</b>	<b><u>Sanitary Sewer System:</u></b>	YES	NO	N/A
1.	Hydraulic Analysis shall be provided for all sanitary sewer force mains.	0	0	0

		YES	NO	N/A
2.	A completed Sanitary Sewer System Data Sheet submitted in accordance with Smithfield Design Standards Section 2.9B.	0	0	0
3.	Plan clearly shows and describes proposed sanitary sewer connections to existing sewer.	0	0	0
4.	Sanitary sewer service provided to each lot or parcel.	0	0	0
5.	Required spacing of manholes and pipe slopes have been maintained. Refer to Smithfield Design Standards Section 2.15 and 2.17.	0	0	0
6.	Pipe material (PVC or DIP), size, slope, direction of flow and length clearly labeled on plans. Structure inverts correctly calculate based on data shown.	0	0	0
7.	Force main and/or pump station plans submitted to the Department of Environmental Quality (DEQ), Office of Wastewater Engineering for approval. DEQ approval is required prior to Town of Smithfield approval. Refer to Smithfield Design Standards Section 1.2 for other regulatory submittal requirements. (A copy of the engineers DEQ transmittal must be attached to this checklist when submitted.) Certification provided SCAT regulations are met if not reviewed by DEQ	0	0	0
8.	Show and label existing septic system locations. Applicant shall coordinate this with the local Department of Health records.	0	0	0
9.	Manhole structure minimum slope difference between invert in and invert out elevation is maintained. Refer to Smithfield Design Standards Section 2.16 and 2.17.	0	0	0
10.	Manholes greater than 10 feet deep and interior drop manholes are shown and labeled on the plan as 60" diameter.	0	0	0
11.	Proper vertical separation provided between sanitary sewer facilities and other utilities. Refer to Smithfield Design Standards Section 2.21.	0	0	0
12.	Manual air vent assemblies installed at all high points along force mains.	0	0	0
13.	Internal drop connections shown and labeled on the plan when a vertical drop exceeds 2 feet.	0	0	0
14.	The engineer/surveyor has field verified the inverts of the existing manhole(s).	0	0	0
15.	Ground coverage over sanitary sewer pipe meets minimum depth criteria. Refer to Smithfield Design Standards Section 2.19	0	0	0
16.	All sanitary sewer lines are designed with the entry into the manhole at an angle of 90-degrees or greater to the downstream line, unless otherwise approved by the Town.	0	0	0
17.	Sanitary sewers positioned at all manhole junctions in accordance with Smithfield Design Standards Section 2.16. Minimum elevation difference across manhole from inlet to outlet shall be 0.1 feet.	0	0	0
18.	All gravity sanitary sewer lines and force mains located within roadways shall be located at the quarter point.	0	0	0
19.	Force main thrust restraint requirements clearly shown and labeled on the plans or as a minimum, references by note Smithfield standard detail JR-1 on <u>each</u> applicable profile sheet.	0	0	0

	YES	NO	N/A
20. Pump stations designed in accordance to Smithfield Standards and Specifications.	0	0	0
21. Grease trap locations and size clearly identified on the plan. Refer to Smithfield Design Standards Section 2.24 for requirements.	0	0	0
22. Calculations submitted for proposed force main and low pressure lines substantiating pipe size and velocity.	0	0	0
23. Plans submitted to Hampton Roads Sanitation District (HRSD) for review and approval, when necessary. (The engineer shall prepare HRSD flow certificates for Smithfield signature and make the submission to HRSD).	0	0	0
24. All pipe between manholes are of a like material and class.	0	0	0
25. Baseline stationing provided on the plan and profile for cross-referencing.	0	0	0
26. Provide inverts of all sanitary sewer laterals connecting directly into a manhole as part of the structure description.	0	0	0
27. Design data shown on the plan(s) and profile(s) agree (i.e. inverts, line size, pipe material, etc).	0	0	0
28. Termination of proposed utilities for future extension/ phases is clearly shown on the plan and profile.	0	0	0
29. HRSD approval has been obtained for any waste flow containing chemicals discharging into the Town of Smithfield or HRSD sanitary sewer system.	0	0	0
30. Provide sanitary sewer manhole depth as part of the structure description.	0	0	0
31. Sanitary sewer laterals shall not connect to the mainline within 5-feet of a manhole. Laterals upstream and within 5-feet of the manhole shall connect directly into the manhole where necessary.	0	0	0
32. Sanitary sewer lateral mainline connections are not located beneath drainage piping.	0	0	0
33. Shallow sanitary sewer manhole ( HRPDC detail SS_03) locations clearly labeled on the plan.	0	0	0
34. Where force mains connect into a gravity sanitary sewer system, plan identifies those manholes requiring epoxy coating and the type of coating required (refer to Smithfield Design Standards Section 2.17G).	0	0	0
35. Existing sewer manholes shall be vacuum tested at proposed connection points and shall be witnessed by the Town of Smithfield Inspector. Note provided on the plan.	0	0	0
36. Grinder pump locations indicated on the plan.	0	0	0
37. System capacity calculations or hydraulic modeling provided to support Flow Acceptance process for all proposed extensions and existing receiving systems.	0	0	0

**III. Water Distribution System:**

	YES	NO	N/A
1. Hydraulic Analysis submitted in accordance with Smithfield Design Standards Section 2.8.	0	0	0
2. A completed Water Data Sheet submitted in accordance with Section 2.9B.	0	0	0
3. Plan clearly shows and describes proposed water system connection(s) to the existing system.	0	0	0
4. Proposed fire hydrant locations meet the conditions of Smithfield Design Standards Section 2.26F & 2.26G and/or as specified by the Town of Smithfield Fire Department.	0	0	0
5. Water service provided to each lot or parcel.	0	0	0
6. Proper vertical separation provided between water main and other utilities. Refer to Smithfield Design Standards Section 2.21.	0	0	0
7. Manual air vent assemblies installed at all high points along water mains. System designed to minimize manual air vents required (i.e. slight adjustment to pressure pipeline profile)	0	0	0
8. All waterlines located within roadways shall be at the quarter point.	0	0	0
9. Dead-end waterlines provided with a blow-off assembly.	0	0	0
10. Valve locations do not exceed 800 feet. Required valving at intersections shall be two (2) at each tee intersection and three (3) at crosses.	0	0	0
11. Water main sizes shown on the plans meet the conditions set forth in Smithfield Design Standards Section 2.2 and agree with the Hydraulic Analysis.	0	0	0
12. Water meters shown and labeled, including proposed size. Provide calculations in accordance with Smithfield Design Standards Section 2.9A.5.b substantiating the proposed meter(s) sizing.	0	0	0
13. Plan and profile show all fittings, water meters, fire hydrants and valves including sizes. Each appurtenance is properly labeled with stationing annotated for all sheets.	0	0	0
14. Water main stubs for future extensions are designed as specified in Smithfield Design Standards Section 2.7.	0	0	0
15. Location of water meter boxes maintain a minimum 18-inch horizontal edge-to-edge clearance from driveways and/or drive paths, sidewalks, bike paths, curbing and adjacent water meter boxes.	0	0	0
16. Submittal provided to the Virginia Department of Health (VDH) for review and approval in accordance with Smithfield Design Standards Section 1.2. VDH approval is required prior to Town approval. (A copy of the engineers VDH transmittal must be attached to this checklist when submitted.)	0	0	0
17. For waterline tie-ins, the existing valve(s) to be used for shut-off is shown and labeled on the plan.	0	0	0

		YES	NO	N/A
18.	Irrigation proposed for the development has been addressed according to Town Standards Section 2.8J.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
19.	Proposed water production facilities or modifications thereto shall be submitted separately to the Chief Engineer of Water for review and approval.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
20.	A backflow prevention device is provided on domestic and fire service connections in accordance with Town Standards Section 2.29 and the Commonwealth of Virginia, State Board of Health Waterworks Regulations.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
21.	Waterline thrust restraint requirements clearly shown and labeled on the plans or as a minimum, references by note Smithfield standard detail JR-1 on <u>each</u> applicable profile sheet.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
22.	Waterline sizes meet the requirements of Town Standards Section 2.2 and 2.3.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
23.	Waterline fittings, bends and service line connections are not located beneath drainage piping.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
24.	Where meter vaults are proposed, a detail shall be provided on the Utility Plans meeting the requirements of the HRPDC Detail. This shall include labeling line sizes, fittings and the required meter size/type (i.e. Neptune Tru/Flo Compound Meter, Turbine Meter, Protectus III, etc). Show and label valving on the vault bypass line.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
25.	Culvert size, length and inverts are shown on the plan where required.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
26.	Water Sample Station(s) shown and labeled where required by Smithfield.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
27.	The Applicant shall contact Smithfield if the development will likely have finished floors less than 70-feet in elevation. Depending on project location, Smithfield system pressures may exceed 80-psi at the service tap for these properties. If so, the development shall comply with the Uniform Statewide Building Code and requirements shall be clearly noted on the plan.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**IV. Site Plan/Subdivision Plat Submittals:**

	YES	NO	N/A
1. All subdivision plats proposing Smithfield Utility Easements shall include the following note on the plat: "Easements denoted as "Smithfield Utility Easements" are for the exclusive use of the Town and the property owner. Other utility service providers desiring to use these easements with the exception of perpendicular utility crossings must obtain authorization for access and use from Smithfield and the property owner. Additionally, Smithfield shall not be held responsible for any damage to improvements within this easement, from any cause".	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. The following note shall be included on all subdivision plats: " Any existing unused well(s) shall be abandoned in accordance with State Private Well Regulations and Town of Smithfield Code".	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Add a note on the plat which clearly states whether or not the parcel(s) are served by Public Water and/or Public Sewer.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. For family subdivisions, clearly show the location of all existing water and sanitary sewer service connections, if any. Any services requiring abandonment/relocation shall be done in accordance with the Smithfield requirements.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. Proposed easement widths and locations agree with the approved subdivision or site plan and meet the requirements of the Smithfield Criteria Section 2.5.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. All proposed subdivision grinder pump locations shall be clearly identified on the plat and meet the conditions of Smithfield Criteria Section 2.35.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. All professional seals and certificates on the plat are signed and dated.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. Existing Smithfield easements are shown and a reference provided where recorded.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**V. Geo-Thermal Wells:**

1. All subdivision and site plans proposing geo-thermal wells shall include the system requirements as outlined in Section 2.36 .1 Smithfield Design Standards.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. A detail of the proposed geo-thermal well is included on the plans and shows all necessary information.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. If the proposed geo-thermal well is within 1500 feet radius of a public water well or otherwise a potential influence to a public well, are the requirements of Section 2.36.1 Smithfield Design Standards met by the plans.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## **APPENDIX E**

### Smithfield Water and Sanitary Sewer Master Plan Guidelines

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**TOWN OF SMITHFIELD**  
**WATER AND SANITARY SEWER MASTER PLAN GUIDELINES**

The guidelines below are general in nature and are provided to assist the Designer in developing Master Utility Plans. These guidelines are not intended to be all encompassing. Smithfield’s review of the Master Utility Plan may require additional items be addressed which are not noted below. It is recommended the Applicant meet with Smithfield to discuss the project and layout of public utilities prior to developing the Master Utility Plan.

**GENERAL:**

- \_\_\_\_\_ 1. Proposed subdivision/development layout shown. Any development Phasing/Sections clearly delineated on the plan.
- \_\_\_\_\_ 2. Plan provided at a legible scale.
- \_\_\_\_\_ 3. Existing contours shown and labeled.
- \_\_\_\_\_ 4. North arrow and graphic scale bar provided.
- \_\_\_\_\_ 5. Developer’s and Engineer’s contact information provided on the plan.
- \_\_\_\_\_ 6. Existing Smithfield Utilities shown and size labeled. Proposed connection point(s) identified.
- \_\_\_\_\_ 7. Source of mapping identified on the plan (County GIS, aerial mapping, physical survey, etc).
- \_\_\_\_\_ 8. Existing Smithfield Lift Stations and Well Facility locations identified on the plan.
- \_\_\_\_\_ 9. Master Utility Plan submitted to DEQ and/or VDH where required (refer to Smithfield Design Standards Section 1.2).
- \_\_\_\_\_ 10. Property lines, existing right-of-ways and adjoining parcels shown.

**SANITARY SEWER SYSTEM MASTER PLAN:**

- \_\_\_\_\_ 1. Gravity sewer and/or force main system layouts shown and agree with calculations/hydraulic modeling. Pipe sizes and direction of flow indicated.
- \_\_\_\_\_ 2. Sanitary Sewer Summary table provided on the plan with Phases/Sections tabulated individually. Table shall include the number of dwelling units, commercial/retail square footage, the per unit flow multiplier (per Smithfield Design Standards Table 2.1), duration, the Average Daily Flow (GPD) and the Peaked Flow (GPM). Totals (#units, sewer flow, etc) shall be provided at the bottom of the Summary Table.
- \_\_\_\_\_ 3. Peaked Flows are shown cumulative along the sewer network. The composite flow at the discharge point shall equal the Sanitary Sewer Summary Table flow.
- \_\_\_\_\_ 4. Manholes shown at key locations with reference label. Structure rim and invert elevations provided.
- \_\_\_\_\_ 5. Manhole spacing and minimum pipe slope meet Smithfield requirements.
- \_\_\_\_\_ 6. Sewer collection and/or force mains sized to accommodate future system extension.
- \_\_\_\_\_ 7. Any manholes exceeding 10-feet in depth are clearly identified on the plan (refer to Smithfield Design Standards Section 2.19).

- \_\_\_\_\_ 8. Lift Station location(s) and size coordinated with the Chief Engineer of Wastewater.
- \_\_\_\_\_ 9. Existing sewer collection systems checked to confirm the number of ERC's proposed do not exceed system capacity.
- \_\_\_\_\_ 10. Sewer bridges identified on the plan.
- \_\_\_\_\_ 11. Lots requiring grinder pumps are identified with "GP". Typically up to 5% of the total # of proposed lots to be served by grinder pumps, unless approved by the Chief Engineer of Wastewater.
- \_\_\_\_\_ 12.. Invert of existing manhole(s) proposed for connection field verified.
- \_\_\_\_\_ 13. Calculations provided for force main and low pressure lines substantiating required pipe size and velocity.
- \_\_\_\_\_ 14. Sanitary sewer system designed in accordance with Smithfield Design Standards 2.10 E thru H.

**WATER SYSTEM MASTER PLAN:**

- \_\_\_\_\_ 1. Water Distribution system layout shown. Pipe sizes, node labeling and pipe segment labeling agree with the hydraulic modeling.
- \_\_\_\_\_ 2. Water Demand Summary table provided on the plan with Phases/Sections tabulated individually. Table shall include the number of dwelling units, commercial/retail square footage, the per unit flow multiplier, duration, the Average Daily Demand (GPM), Max Day Demand (GPM), Peak Hour (GPM), proposed irrigation requirements and required fire flow at each node. Totals (#units, demands, etc) shall be provided at the bottom of the Summary Table. Node demands listed agree with the hydraulic model.
- \_\_\_\_\_ 3. Pump location and reservoir identified on the plan and agrees with the fire flow test performed.
- \_\_\_\_\_ 4. Any reduction in required fire flows (per Smithfield Design Standards Section 2.11) shall be approved by the Fire Department prior to Smithfield approval of the Master Plan. A maximum single flow from any fire hydrant shall not exceed 1,000 gpm.
- \_\_\_\_\_ 5. Hydraulic modeling provided in accordance with Smithfield Design Standards Section 2.8 and sealed by a Licensed Professional Engineer registered in the Commonwealth of Virginia.
- \_\_\_\_\_ 6. System design considers possibility of system extension to adjoining parcels.
- \_\_\_\_\_ 7. System looped (either internal to the site or connection to existing mains) to eliminate dead-end lines where feasible.
- \_\_\_\_\_ 8. Waterline sizes meet conditions of Smithfield Design Standards Section 2.2.
- \_\_\_\_\_ 9. Water Sample Stations identified.
- \_\_\_\_\_ 10. If irrigation is not proposed for the development, a note shall be added to the Master Plan clearly stating this.