



Facilities Standards Manual

**As amended through
July 1, 2022**

Index of Loudoun County Facilities Standards Manual Amendments (Since 2000)

Application Number	Title	Chapters Amended	Adoption Date	Effective Date
DOAM-2021-0003	FSM Traffic Study Amendments	Chapter 4	5/11/22	7/1/22
DOAM-2021-0002	FSM Stormwater Amendments	Chapters 5 & 8	1/12/22	2/1/22
DOAM-2018-0001	Buffer and Landscaping Amendments	Chapters 7 & 8	11/21/19	1/1/20
DOAM-2018-0002	FSM Amendments (Emergency Vehicle Preemption, Fire Apparatus Access Roads, Driveway Detail, LDIA bonds)	Chapters 4 & 8	10/17/19	10/18/19
DOAM-2017-0001	FSM Amendments (Trees, Archaeology, Steep Slopes & Bonding)	Chapters 7 & 8	12/13/17	1/15/18
DOAM-2016-0002	Floodplain and Bonding	Chapters 5, 7 & 8	10/12/16	11/1/16
DOAM-2012-0003	Phase 3 Amendments	Chapters 4, 6, 7 & 8	2/11/15	4/1/15
DOAM-2013-0002	Stormwater Amendments	Chapters 1 & 5	5/21/14	7/1/14
DOAM-2012-0002	Phase 2 Amendments	Chapters 2, 3, 4, 5, 6 & 8	5/8/13	7/1/13
DOAM-2012-0001	Phase 1 Amendments	Chapters 6, 7 & 8	10/3/12	11/1/12
DOAM-2010-0001	FSM Amendments	Chapters 4, 7 & 8	11/8/10	11/8/10
DOAM-2009-0002	Limestone Overlay District	Chapters 6 & 8 & LSDO	2/17/10	2/17/10
DOAM-2009-0001	FSM Amendments	Chapters 4, 5, 6 & 8	11/9/09	11/9/09
DOAM-2007-0002	FSM Amendments	Chapters 2, 4, 5, 6, 7 & 8	12/4/07	12/4/07
DOAM-2007-0001	Rural Addition Program	LSDO	7/10/07	7/10/07
DOAM-2005-0003	Western Loudoun Zoning	Chapters 4 & 8 & LSDO	12/5/06	12/5/06
DOAM-2004-0001	FSM/LSDO Amendments	Chapters 4, 5, 7, 8, LSDO	6/16/05	7/1/05
DOAM-2002-0001	FSM Amendments	Chapters 2, 4, 5, 6, 7 & 8	6/17/02	7/1/02*
DOAM-2000-0001	LSDO Administrative Items	LSDO	4/29/2000	4/29/2000

Additional information pertaining to the approved DOAMs, including redline text of the amendments, is available in the Board Meeting Documents folder by adoption date: <http://www.loudoun.gov/index.aspx?NID=3426>

* Enforcement of the Virginia Stormwater Management Handbook was deferred 120 days to enable the County to hire the staff resources and conduct the training necessary to successfully implement the new regulations.

Loudoun County Facilities Standards Manual

- **Chapter 1 Authority**
- **Chapter 2 Water Supply and Distribution Systems**
- **Chapter 3 Waste Collection and Disposal Systems**
- **Chapter 4 Transportation**
- **Chapter 5 Water Resource Management**
- **Chapter 6 Soils, Geotechnical, Geophysical and Hydrogeological Studies**
- **Chapter 7 Environmental Design Standards**
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CHAPTER 1.000

AUTHORITY

1.100 GENERAL

1.200 INTERPRETATION AND REVISION

1.300 NECESSARY REFERENCE MATERIAL

CHAPTER 1.000

AUTHORITY

1.100 GENERAL

This document, entitled the Loudoun County Facilities Standards Manual, has been developed and designed to assist the public and the development community in determining the policies, which apply to land development in the County. It contains information primarily concerned with the design and construction standards and guidelines for improvements related to subdivisions and site plans.

The majority of the information contained herein is a compilation of existing requirements already in place. This document will serve as a central reference for these items.

Except as specified below, each land development application shall be subject to the version of the Facilities Standards Manual in effect at the time of initial acceptance. Land Development Applications for Record Plats, Dedication Plats, or Easement Plats shall be subject to the version of the Facilities Standards Manual in effect at the time of the initial submission and acceptance of the Construction Plans and Profiles or Site Plans upon such plat is based.

- A. Each land development application shall conform to the current stormwater management technical criteria in Chapter 5 of this manual, unless subject to 9VAC25-870-47 or grandfathered in accordance with the Virginia Stormwater Management Program (VSMP) grandfathering provisions of Chapter 1096 of the Codified Ordinances (and 9VAC25-870-48). Land development applications that are grandfathered shall meet the technical criteria of Part II.C (9VAC25-870-93 through 9VAC25-870-99), as well as the following requirements:
1. The land development application shall have been approved prior to July 1, 2012.
 2. The land development application shall be a proffered plan of development, Special Exception, Preliminary Plat of Subdivision, Record Plat, Construction Plans and Profiles, or Site Plan. In addition, the following land development applications have been determined by Loudoun County as being the equivalent thereto: Rezoning, Rural Economy Site Plan, Dedication Plat, Boundary Line Adjustment, Preliminary/Record Subdivision, Family Subdivision, Subdivision Waiver/Low Density Waiver, Easement and Vacation Plat, Dedication Plat, Plat and Plan Revision, Site Plan Amendment, or any other application as approved by the Director.
 3. The land development application referenced in Subsection 1 and Subsection 2 above shall have included a Layout. "Layout" means a conceptual drawing sufficient to provide for the specified stormwater

management facilities required at the time of approval, as defined in 9VAC-25-870-10.

4. The land development application has not been subsequently modified or amended in a manner resulting in an increase in the amount of phosphorus leaving each point of discharge, and such that there is no increase in the volume or rate of runoff. In order to verify this condition, a comparison of the layouts between the original land development application and the modified version may be utilized. If the comparison of layouts is not conclusive, a comparison of performance-based calculations found in the technical criteria of Part II.C (9VAC25-870-10) as well as water quantity engineering calculations shall be required.
 5. Land development applications on parcels or lots which are part of a residential, commercial, or industrial subdivision served by an approved stormwater management facility designed to treat the said parcel or lot shall be deemed grandfathered.
- B. In the event any land development application is made for a development which is served by or subject to a previously approved roadway, such previously approved roadway would not have to be upgraded to meet current standards.
- C. Any land development application proposing:
1. a site redevelopment involving major reconstruction or major demolition, or
 2. a revision or construction modification to alter stormwater management facilities which (a) is in conjunction with a change to the land use on-site that would result in an increase in runoff over that for which the facility was originally designed or (b) benefits additional land areas not previously utilizing the improvements included that results in an increase in runoff over which the facility was originally designed, except when such changes are minimal in nature with negligible impact.

shall be subject to the current version of this manual.

1.200 INTERPRETATION AND REVISION

A. Interpretation

These standards and guidelines are designed to supplement the provisions of existing Federal and State regulations and County codes and ordinances. Nothing herein shall be deemed to waive or modify other requirements of existing codes. Except as expressly provided otherwise in this document, the Director of Building and Development is the designated official charged with the administration of the standards and requirements contained in this manual and, in administering them, shall treat them as guidelines. The Director may allow for variations of given standards where the effect of such variation is in keeping with established engineering practices and procedures and shall make the final decision on all questions regarding interpretation of this manual, after reviewing recommendations from the designated departments, authorities, boards, and committees.

B. Revision

As new basic information on design criteria becomes available and is accepted, and as Federal, State, and County laws, regulations, and standards are changed, they will be reflected in this publication after at least an annual review. Any record plats, final site plans or construction plans and profiles submitted prior to the approval of any revisions will comply with the standards in effect at the time of the officially accepted submission for such record plats, final site plans, and/or construction plans and profiles.

C. Facilities Standards Manual Review Committee

This committee shall consist of at least seven representatives appointed by the Board of Supervisors of Loudoun County. The candidates for appointment may be any persons whom the Board of Supervisors deem qualified. In addition to public notification and request for citizen participation on the Review Committee, nominations shall be requested from, but not limited to the following organizations:

National Association of Industrial & Office Parks
Loudoun Chamber of Commerce
Virginia Society of Professional Engineers
Virginia Association of Surveyors
Heavy Construction Contractors Association
Associated Building Contractors
Northern Virginia Building Industry Association
Piedmont Environmental Council
Washington Area Council of Engineering Laboratories
Consulting Engineers Council
Association of Soil & Foundation Engineers
Association of Engineering Geologists
Virginia Association of Professional Soil Scientists

Virginia Association of Geologists
Loudoun County Board of Realtors
Engineers & Surveyors Institute

The majority of members shall be actively involved in the Loudoun County Community and shall represent professionals registered to practice engineering, surveying, geology, landscape, architecture, or soil science in Virginia.

Committee members shall elect a chairman. The Director of Building and Development or his designee shall serve as secretary to the committee. County staff members may serve as advisory staff to the committee but shall not be appointed to sit on committee.

Members shall be appointed for a term of not less than one year and no more than four years and shall serve until replaced. If a member resigns, the Board of Supervisors will appoint a replacement.

The committee shall meet at least once a year to review the Facilities Standards Manual and shall advise the Director of Building and Development of their findings and recommendations. Whenever a change in the Facilities Standards Manual is proposed, the Director of Building and Development shall request the advice of the committee prior to requesting a public hearing for consideration of changes to the FSM.

D. Appeals

Any applicant who is aggrieved by an interpretation or decision made by the Director in the administration of the standards and requirements contained in this manual may, within five (5) working days of receiving written notice of such decision or interpretation, deliver a written notice to the Director requesting the Chairman of the Facilities Standards Manual Review Committee (the Committee), to appoint a subcommittee to review the matter. Such subcommittee shall consist of at least three members of the Committee. Such subcommittee shall hear the matter at the Department of Building and Development at a time convenient to the applicant and the Director, but in no event more than thirty (30) days after the notice and request is delivered to the Director, and shall make a written recommendation to the Director, stating the basis for such recommendation.

Upon receiving such recommendation from the subcommittee, the Director shall render a final decision within five (5) working days thereafter. If the applicant is aggrieved by such final decision, the applicant may take such action as is otherwise provided by law with respect to the subject land use application at the appropriate time.

Any applicant who files an appeal under this subsection of the Facilities Standards Manual shall waive, during the period of pendency of the appeal, any right to require the County to take any action to approve or disapprove the application pursuant to any statutory or other legally imposed timeline requirement. Any applicant giving notice of such appeal shall execute and deliver to the said Director such written waiver along with such notification in substantially the following language:

"I/we hereby waive any right I/we may have to require the County to take any action to approve or disapprove the subject application during the pendency of the appeal, such that the time which elapses from the date of delivery of this notification to the Director until the date of the final decision on this appeal by the Director shall not be counted in determining the date as of which County action on the application is legally required."

The thirty (30) day period for action on this appeal shall not commence until such written waiver has been delivered to the Director.

E. Disclaimer of Liability

The purpose of this manual is to establish reasonable land development standards and guidelines for the protection and promotion of the general health, safety, and welfare of the County's residents. Approval of plans and plats by the County or its agencies pursuant to the ordinance and this manual, is not intended and shall not be deemed as a guarantee or warranty for any individual, landowner, or developer that any improvements will be designed, planned, constructed, or operated in any particular manner or be free from defects. Such approval shall create no duty or result in any liability on the part of the County, its officials, or employees for any claim, demand, suit, or damages alleged to have resulted from the development, construction, existence, or operation of improvements constructed pursuant to such approved plans or plats. Further, no such approval shall operate as or be deemed as a waiver of any provision or requirement of the ordinance, or this manual, unless such waiver has been specifically granted in writing by the Director as a variation allowed under Section 1.200.A hereof. In the event that any aspect of any such approved plan or plat fails to comply with any provision or requirement of this ordinance, or this manual, in effect at the time of such approval, such provision or requirement of the ordinance, or this manual, shall take precedence over the approved plans, and development shall be in accordance with the ordinance and this manual.

1.300 NECESSARY REFERENCE MATERIAL

In order to properly utilize this manual, the designer or user in general should have certain publications readily available, as they are referenced throughout this document.

A listing of the most commonly utilized publications is as follows:

["The Sewage Handling and Disposal Regulations,"](#) Board of Health, Commonwealth of Virginia.

["Virginia Water Works Regulations,"](#) State Health Department, Division of Water Engineering.

["Virginia Erosion and Sediment Control Handbook."](#)

[The Loudoun County Sanitation Authority's Design and Construction Standards for Sanitary Sewers and Water Supply System.](#)

The Building Official's Code Administrators, ["The BOCA Basic Building Code,"](#) latest edition.

["Interpretive Guide to the Use of Soils Maps, Loudoun County, Virginia,"](#) latest edition.

[Controlling Urban Runoff: A Practical Manual for Planning and Designing Urban BMPs.](#)

[Federal Manual for Identifying and Delineating Jurisdictional Wetlands.](#)

Additional reference materials specific to each subject area are listed at the end of each chapter.

CHAPTER 2.000

WATER SUPPLY AND DISTRIBUTION SYSTEMS

2.100 GENERAL

2.200 DESIGN AND CONSTRUCTION STANDARDS

2.201 LOCATION OF WATERMAINS IN REGARD TO PUBLIC RIGHT OF WAY

2.300 WATER SUPPLY WHERE WATER SYSTEMS ARE NOT AVAILABLE FOR FIRE PROTECTION

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Figure 1 - Dry Drafting Hydrant Fire Tank Detail (Public ROW)

Figure 2 - Dry Drafting Hydrant Fire Tank Detail (Private Access ESMT)

Figure 3 - Dry Hydrant Sign Type and Specifications

CHAPTER 2.000

WATER SUPPLY AND DISTRIBUTION SYSTEMS

2.100 GENERAL

There are several alternatives for providing domestic water supply and distribution to properties within Loudoun County. Adopted policies and long-term practice, however, generally favor extensions of existing systems in urban areas and the construction of private, individual systems in rural areas. Applicants are referred to the Comprehensive Plan, for statements as to current policy and to the Zoning Ordinance for statutory limitations on options in certain zoning districts.

Applicants are reminded that, in all cases, the applicable requirements of the Loudoun County Department of Health and/or the Virginia Department of Health, the Virginia Department of Health "Water Works Regulations", State and County codes and/or Town design and construction standards, where applicable, must be met. The applicant is referred to the Codified Ordinances of Loudoun County for local permitting requirements.

The most common domestic water systems in Loudoun County are:

Central Water Systems: The Loudoun County Sanitation Authority (Loudoun Water) is chartered to provide water and sewer service throughout Loudoun County. Loudoun Water's rights to provide service, however, are not exclusive and connection is not mandatory, except as mandated under the provisions of the Zoning Ordinance. While Loudoun Water is under no obligation to provide service, new services will be accepted in accordance with Loudoun Water policy. Loudoun Water's Policy is to require that new facilities be designed and constructed by the applicant, and dedicated to Loudoun Water for operation and maintenance. Loudoun Water has detailed design and construction standards for urban water distribution systems in development areas designated for public water supply systems.

Municipal Water Systems: The incorporated towns of western Loudoun County own and operate municipal water systems. The Comprehensive Plan permits the extension of these utilities to serve adjoining areas, particularly those designated as Joint Land Management Areas. The Towns, however, are not obligated to permit or provide such extensions, and in most cases the extension must be approved at the option of elected officials in both the subject town and the County. The Town of Leesburg has established policies and standards for such extensions in accordance with the annexation agreement.

Communal Water Systems: The Comprehensive Plan designates Loudoun Water as the agency to own and operate communal water systems. Loudoun Water has adopted standards for rural water supply systems to govern villages, hamlets, and other low-density developments. Therefore, applications for rural services will be guided by Loudoun Water and Virginia Department of Health standards, the Codified Ordinances of Loudoun County and Chapter 6 of the Facilities Standards Manual.

Private Water Systems: These are separate stand-alone systems permitted by the Loudoun County Department of Health and/or the Virginia Department of Health to serve individual users. The predominant source of supply is ground water from deep, drilled wells. These systems are generally utilized to serve residential development in rural areas and isolated businesses. Water systems routinely serving more than 25 employees or the public-at-large (restaurants, etc.) may be subject to more stringent state and federal regulations for non-community water supplies.

2.200 DESIGN AND CONSTRUCTION STANDARDS (Public Water Supply and Distribution Systems)

The design and construction of all central and communal water supply and distribution systems shall be in strict compliance with the [Loudoun Water Engineering Design Manual](#). Municipal water supply and distribution systems to be operated and maintained by incorporated towns shall be designed and constructed in conformance with the standards and requirements of the town having responsibility for the system. Where such jurisdiction does not have its own design standards, the applicant will meet the requirements as directed by the Health Director.

New water wells for potable water shall be designed in accordance with the Codified Ordinances of Loudoun County.

Water distribution systems associated with central and municipal water systems shall include provision for fire protection and be designed in accordance with the Codified Ordinances of Loudoun County.

2.201 LOCATION OF WATERMAINS IN REGARD TO PUBLIC RIGHT OF WAY

A. General

Watermains and distribution systems shall be allowed within the right-of-way of any roadway, except within limited access right-of-way, unless as determined by VDOT, there are design or safety issues, which would demand consideration of an alternate location. The preferred location for water mains and distribution systems is within the right-of-way or under the pavement of roadways. In all cases, water mains and distribution systems should be located so as to protect existing trees and vegetation and the Green Infrastructure.

B. Divided Roads

It is the general intent that water mains and distribution systems will not be allowed under the pavement of divided roads having four or more lanes. However, watermains within the right-of-way of such roads may be permitted subject to approval and consensus by VDOT. In accordance with VDOT's policy, the conditions listed in Items 1 through 4 below shall be present to allow placement of the watermain under the pavement of such roads. When watermains are permitted within the pavement of divided roadways, they are to be located five (5) feet from the outside edge of the pavement or seven (7) feet from the face of curb. It should be noted that for the conditions and situations cited below, VDOT, Loudoun Water or the County may determine that there are compelling design or safety issues which shall demand consideration of an alternate location. In any case, the applicant shall be notified of the appropriate watermain location prior to the approval of the preliminary subdivision application. In instances that require special consideration, applicants are encouraged to seek VDOT, Loudoun Water

and County concurrence of the waterline design concept prior to or during the preliminary plan process.

1. When the divided roadway is designed for aesthetic purposes rather than to meet projected traffic volumes.
2. In areas where an existing and sufficient interparcel access is available to provide an alternative route for traffic, as required for watermain maintenance.
3. Existing water lines are located under existing pavement.
4. The extension of water lines under undivided roadways through intersections widened, only through the intersection, to a divided section.

C. Undivided Roads

Watermains will be allowed under the pavement for all undivided roadways unless compelling design or safety issues are identified by VDOT, Loudoun Water or the County, as identified prior to preliminary plat approval. These water mains shall generally be placed within the pavement, no less than five feet from the outside edge of the gutter pan or seven feet from the face of curb.

2.300 WATER SUPPLY WHERE WATER SYSTEMS ARE NOT AVAILABLE FOR FIRE PROTECTION

2.310 GENERAL

This section identifies minimum water supply requirements for fire protection in areas where an extension of central and/or municipal water supply systems, or a communal water system capable of providing adequate water supply for fire protection purposes as approved by the Chief of the Department of Fire, Rescue and Emergency Management, is not available. The requirements contained within this section are minimum requirements, shall be applicable to land development applications which require approval by the County in accordance with the regulations set forth within the Land-Subdivision and Development Ordinance (LSDO), and shall not apply if the subdivision provides the mandated provision of building sprinkler systems within primary residential structures. In case of conflict between this section and standards of another applicable regulation, ordinance, code or law, the more stringent standards shall prevail.

2.320 DEFINITIONS (For purposes of Chapter 2 only)

Natural Water Source: Any natural water sources of cumulative volume capable of satisfying the minimum criteria for fire protection purposes. Examples of natural water sources include, but are not limited to: streams, ponds, rivers, lakes, and creeks or other like sources.

Man Made Water Source: Any man made sources of cumulative volume capable of supplying a minimum of 30,000 gallons of water year-round for fire protection purposes. Examples of man made water sources include, but are not limited to: cisterns, swimming pools, quarries, storage tanks, and other like sources.

Water Supply Facility: Any natural or man-made water source that is designated to supply water for fire protection purposes, including associated equipment such as, but not limited to, tanks, pipes, and dry hydrants.

2.330 DESIGN REQUIREMENTS

Detailed data, calculations, and other design information determining both the water supply required and the water supply available for fire protection purposes shall be provided on applicable land development applications. Water supply facilities shall be designed and constructed in accordance with the following specifications, and shall be approved by the Chief of the Department of Fire, Rescue and Emergency Management or his designee:

- A. Water supply facilities shall be required to serve hamlet subdivisions in the A-10 and A-3 zoning districts, principal/subordinate subdivisions cumulatively totaling more than five buildable lots in the AR-1 and AR-2 zoning districts, cluster subdivisions in the AR-1 and AR-2 zoning districts, or where otherwise required pursuant to proffers or conditions of approval of special exceptions. Voluntary

water supply facilities may also be provided. All water supply facilities shall meet the following design parameters:

1. Required water supply facilities using storage tanks shall consist of either two (2) tanks that each provide a minimum of 15,000 gallons of storage capacity, or one (1) tank that provides a minimum of 30,000 gallons of storage capacity. Voluntary water supply facilities using storage tanks shall consist of at least one (1) tank that provides a minimum of 15,000 gallons of storage capacity. See Figures 1 and 2 at the end of this Chapter.
2. Required water supply facilities shall be spaced every 2,600 linear feet of roadway or other spacing approved by the Chief of the Department of Fire, Rescue and Emergency Management or his designee.
3. The water supply facility shall be located within an easement granted to the County. Such easement shall extend 10 feet beyond any drafting pipe, storage tank, or other associated appurtenance. Where a pond is designated as a water supply facility, the entire pond shall be located within the easement.
4. Natural water sources, designated as a water supply facility, shall satisfy the following minimum criteria:
 - a. Streams, rivers, and creeks to be designated as natural water sources shall be capable of providing 1,000 gallons per minute of water supply for thirty minutes for fire protection purposes year-round.

OR

- b. Designated natural water sources with contributory watersheds, such as, without limitation, ponds, quarries, and other open impoundments, shall have a normal depth of five (5) feet at the draft pipe and contain a minimum of 30,000 gallons of water year-round.
 5. Permanent provision shall be made for the private maintenance, repair, and replacement of water supply facilities to ensure the operational integrity of said facilities, unless, on a case-by-case basis, the County, at its sole discretion, assumes certain maintenance responsibilities detailed in a water supply facility maintenance agreement between the property owner and the County.
- B. Access: All designated water supply facilities shall be accessible by a VDOT right-of-way, a Fire Apparatus Access Road as that term is defined in Chapter 4 of this Manual, or other travelway that is a minimum of 20 feet wide, capable of supporting a 34-ton vehicle (H-20 loading) in all weather conditions, located within an emergency access easement, and identified as a fire lane in accordance with FSM

Chapter 4, Diagram 16, or otherwise approved by the Chief of the Department of Fire, Rescue and Emergency Management or his designee.

1. Dry hydrants may be treated as standard fire hydrants and located within VDOT or private road rights-of-way or easements.
- C. Signage: Signs shall comply with the design requirements and installation specifications shown in Figure 3 at the end of this Chapter.
- D. Construction: Minimum specifications for construction of water supply facilities are shown in Figure 1 and Figure 2 at the end of this Chapter and should be adhered to in all cases, unless otherwise authorized by the Chief of the Department of Fire, and Rescue and Emergency Management.

2.400 WATER SUPPLY AND DISTRIBUTION SYSTEM REFERENCES

"Waterworks Regulation", [Commonwealth of Virginia/State Department of Health](#).

"Guide for Determination of Required Fire/Flow", Insurance Services Office, 160 Water Street, New York, NY 10038.

"Grading Schedule for Municipal Fire Protection", Insurance Services Office, 160 Water Street, New York, NY 10038.

["Loudoun Water Engineering Design Manual"](#).

["Codified Ordinances of Loudoun County"](#), Chapters 1040 Water Wells, 1042 Water Systems and 1044 Water Supply Emergency".

["Codified Ordinances of Loudoun County"](#), Chapter 1410 Virginia Uniform Statewide Building Code".

["AWWA Standards"](#), American Water Works Association".

["NFPA Standards"](#), National Fire Protection Association".

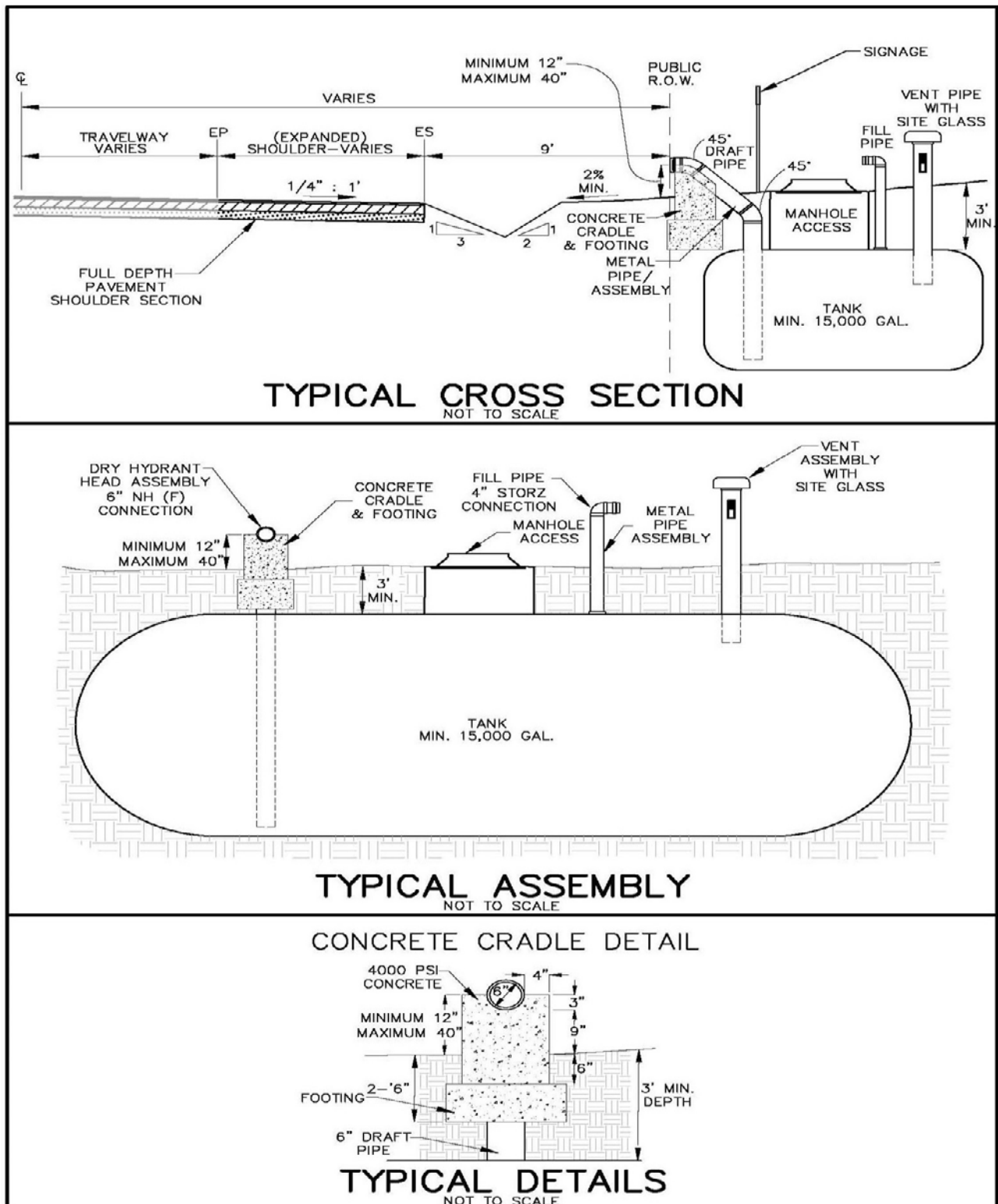
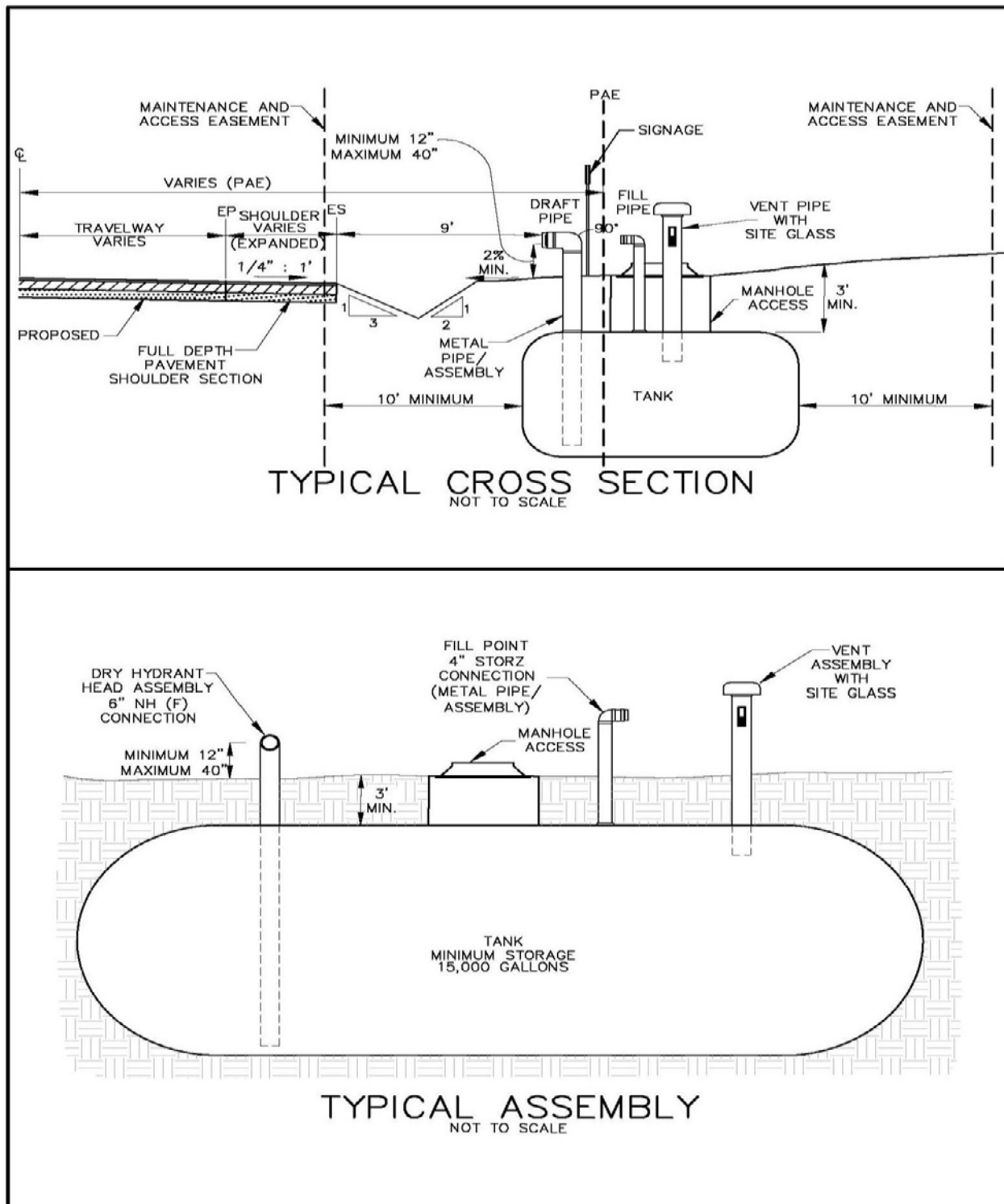


Figure 1

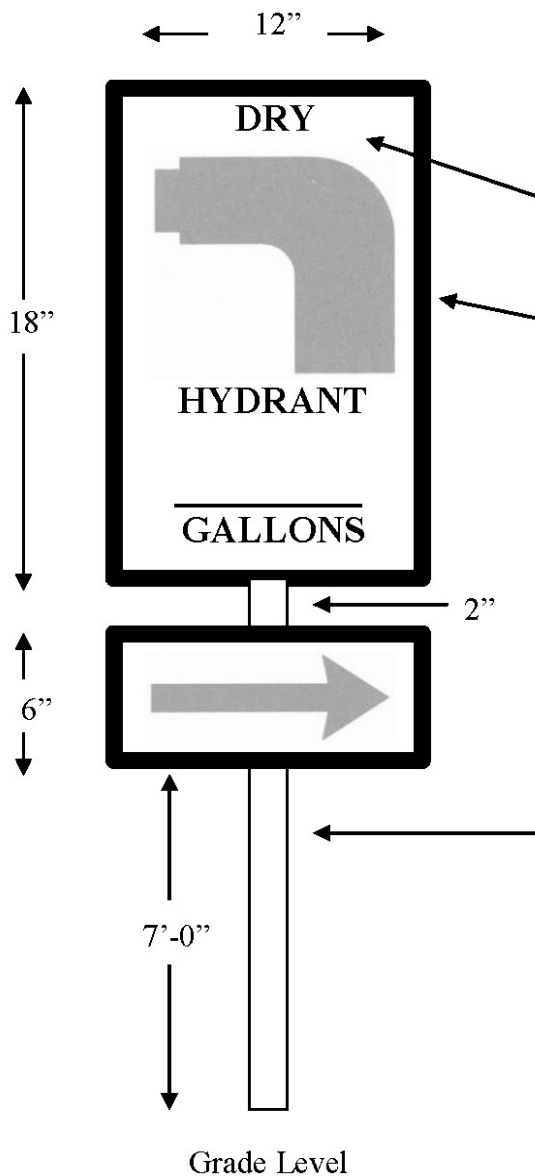
Figure 1 – Dry Drafting Hydrant Fire Tank Detail (Public ROW)
Effective Date: 07/01/2013



DRY DRAFTING HYDRANT
FIRE TANK DETAIL
(PRIVATE ACCESS ESMT)
NOT TO SCALE

Figure 2

Dry Hydrant Sign Type and Specifications



(1) Each such sign shall be of reflective metal construction, with dimensions of at least twelve by eighteen inches.

(2) Each such sign shall show red letters on a white background,

with a three-eighths inch red trim strip around the entire outer edge of the sign,

the lettering shall state "Dry Hydrant" in at least three-inch high letters, and

if a tank is present, the storage capacity of the tank in gallons shall also be shown in at least three-inch high letters.

(3) If the sign is not mounted on the drafting pipe, a red arrow sign with dimensions of at least six by twelve inches shall containing a red arrow shall also be included and point to and indicate the location of the dry hydrant.

(4) Signs not mounted on a bollard or the drafting pipe shall be securely mounted on a post seven feet from grade level to the bottom of the sign and must be within seven feet of the parking curb or curb line.

FIGURE 3

CHAPTER 3.000

WASTE COLLECTION AND DISPOSAL SYSTEMS

3.100 GENERAL

3.200 DESIGN AND CONSTRUCTION STANDARDS (SANITARY SEWER SYSTEMS)

3.210 ON SITE SEWAGE HANDLING AND DISPOSAL

3.300 SOLID WASTE DISPOSAL FACILITIES

CHAPTER 3.000

WASTE COLLECTION AND DISPOSAL SYSTEMS

3.100 GENERAL

There are several alternatives for providing domestic sewage disposal to properties within Loudoun County. Adopted policies and long-term practice, however, generally favor extensions of existing systems in urban areas and the construction of private, individual systems in rural areas. Applicants are referred to the Comprehensive Plan for statements as to current policy and to the Zoning Ordinance for statutory limitations on options in certain zoning districts.

Applicants are reminded that, in all cases, the applicable requirements of the State and County codes and Health Department regulations, and where applicable, Town design and construction standards must be met. The applicant is referred to the Codified Ordinances of Loudoun County for local permitting requirements.

A. The most common domestic sewer systems in Loudoun County are:

Central Sewer Systems: The Loudoun County Sanitation Authority (Loudoun Water) is chartered to provide water and sewer service throughout the county. Loudoun Water's rights to provide service, however, are not exclusive and connection is not mandatory except as mandated under the provisions of the Zoning Ordinance. While Loudoun Water is under no obligation to provide service, new services will be accepted in accordance with Loudoun Water policy. Loudoun Water's Policy is to require that new facilities be designed and constructed by the applicant, and dedicated to Loudoun Water for operation and maintenance. Loudoun Water currently provides sanitary sewer service in most of the Eastern Loudoun and Dulles North areas and has detailed design and construction standards for urban sewer systems in these areas.

Municipal Sewer Systems: Most incorporated towns of western Loudoun County own and operate municipal sanitary sewer systems. The Comprehensive Plan encourages the extension of these facilities to serve adjoining areas, particularly those designated as Urban Growth Areas. The Towns, however, are not obligated to permit or provide such extensions, and in most cases the extension must be approved at the option of elected officials in both the subject town and the County. The Town of Leesburg has established policies and for such extensions in accordance with the annexation agreement.

Communal Sewer Systems: The Comprehensive Plan designates Loudoun Water as the agency to own and operate communal sanitary sewer systems. Loudoun Water has not adopted standards for rural sanitary sewage disposal systems to govern villages, hamlets, and other low-density developments. Therefore,

applications for rural services will be guided by Virginia Department of Health standards, and the [Codified Ordinances](#) of Loudoun County and shall be handled on a case-by-case basis.

Private Sewer Systems: These are separate stand-alone systems permitted by the Health Department to service individual users. These systems are generally utilized to serve residential development in rural areas and isolated areas. Sewer systems routinely serving more than 25 employees or the public-at-large (restaurants, etc.) may be subject to more stringent state and federal regulations for non-community sanitary sewage systems.

3.200 DESIGN AND CONSTRUCTION STANDARDS (SANITARY SEWER SYSTEMS)

The design and construction of all central and communal sanitary sewer systems shall be in strict compliance with the [Loudoun Water Engineering Design Manual](#). Municipal sanitary sewage systems to be operated and maintained by incorporated towns shall be designed and constructed in conformance with the standards and requirements of the town having responsibility for the system. Where such final jurisdiction does not have its own design standards, the applicant will meet the requirements as directed by the Director of Health.

3.210 ON SITE SEWAGE HANDLING AND DISPOSAL

New onsite sewage disposal systems shall be constructed in accordance with the Loudoun County [Codified Ordinances](#).

3.300 SOLID WASTE DISPOSAL FACILITIES

The design and operation of all solid waste facilities shall be in conformance with the requirements of the Loudoun County [Codified Ordinances](#), Chapter 6, of this manual and applicable State and Federal regulations.

CHAPTER 4.000

TRANSPORTATION

4.100 GENERAL

4.200 TRANSPORTATION PLANNING

4.300 DESIGN AND CONSTRUCTION STANDARDS

4.310 GENERAL DESIGN REQUIREMENTS

Table: Criteria for cul-de-sacs or turn-arounds

4.320 PUBLIC ROADWAY STANDARDS

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CHAPTER 4.000

TRANSPORTATION

4.100 GENERAL

The purpose and intent of this chapter is to establish minimum standards for the planning, design, and construction of both public and private roadways, certain associated facilities and pedestrian and bicycle accommodations within the County. The chapter is divided into five sections establishing guidelines and criteria for Transportation Planning, Design and Construction Standards, Pedestrian and Bicycle Accommodations, Street Name and Addressing Standards and Signs. It is the intent of the County of Loudoun that all roads be dedicated for public use and maintained by the [Virginia Department of Transportation \(VDOT\)](#), except as may be permitted under the provisions of the Zoning Ordinance or the [Land Subdivision and Development Ordinance](#) (LSDO).

4.200 TRANSPORTATION PLANNING

A. General Requirements

1. Roadway Classifications

Public roads constructed in conjunction with subdivision construction plans and profiles and site plans shall be designed to comply with the standards of the Virginia Department of Transportation (VDOT) and this chapter of the Loudoun County Facilities Standards Manual (FSM).

For purposes of this chapter, private roadways shall include: private roads, pipestem driveways, townhouse and multi-family accessways, private lanes, private access easement roads, Class III roadways, private rural village through roads and neighborhood roads as referenced within the Zoning Ordinance and LSDO. Private roadways shall be designed to comply with the standards outlined in this chapter for the appropriate roadway category as described below.

- a. Category A: Includes Private Roads for residential and non-residential applications, Private Rural Village Through Roads; Private Rural Village Neighborhood Road; Class III Roads serving more than 25 lots.
- b. Category B: Includes Townhouse, and Multi-Family Accessways (which includes condominiums).
- c. Category C: Includes Class III Roads serving 25 lots or less; Pipestem Driveways; Residential Private Access Easement Roads; Private Lanes; Alleys.

2. Facility Planning Guidelines

- a. The streets within and contiguous to any development shall be designed and constructed so as to ensure coordination with other existing or planned streets within the general area as to width, grade, location, and drainage. Existing and planned streets shall be deemed to include, without limitation, streets depicted in the Countywide Transportation Plan and existing or planned streets in existing or future adjacent or contiguous to adjacent subdivisions. For purposes of this paragraph 2.a, "Streets" includes "Roadways" as described in this Chapter 4.
- b. When a subdivision or other development site abuts one side of any public road in the State highway system, the subdivider shall be required to dedicate one-half of the total right-of-way or easements

necessary to make such road conform to VDOT and County standards, including accommodations for pedestrians and bicycles. The subdivider may be required to dedicate more or less right-of-way or easement to make appropriate horizontal and vertical adjustments to such road.

- c. Vehicular access from off road parking and service areas shall be so combined, limited, located, designed, and controlled so as to channel traffic from and to such areas conveniently, safely, and in a manner that minimizes traffic friction and promotes free traffic flow on roads without excessive interruption.
- d. Whenever a proposed development contains or is adjacent to an arterial or major collector road, direct access shall be evaluated and the Director may require that provisions be made for the future elimination or reduction of direct access through methods such as the creation of a parallel road system, combined lot access, and other methodologies as determined appropriate.
- e. Shoulder and ditch section roadways are encouraged and may be provided as a low-impact design measure, as defined in Chapter 5 of this manual. Curb and gutter roadway sections shall be provided for developments within the Route 28 Taxing District and within the following zoning districts: PD (excluding PD-RV and PD-CV), R and CLI. The low-impact drainage design within residential developments shall also meet the swale and open channel specifications, as set forth in Chapter 5. Shared-use trails shall be provided in conjunction with shoulder and ditch roadway sections in developments in the Suburban Policy Area, the Transition Policy Area, the Joint Land Management Area, and in Rural Villages. In developments where lot sizes of one acre or less are proposed, sidewalks may be provided in lieu of shared-use trails.
- f. Reserve strips (spite strips) controlling access to public roads shall be prohibited as defined in the VDOT Road Design Manual.
- g. Per the Zoning Ordinance, in Planned Development Housing Districts only, eighty (80) or more dwelling units shall require more than a single point of access directly to publicly maintained roadways or indirectly to a publicly maintained roadway via an appropriate access easement. If the travelway is deemed a Fire Apparatus Access Road, Section 4.810 shall apply.
- h. The transportation system proposed for subdivision or other development shall safely accommodate non-motorized users. Design shall address both internal circulation as well as connections

to existing and planned contiguous roads and bike and pedestrian facilities. In the absence of existing and planned contiguous bike and pedestrian facilities, reservations are encouraged to the most logical access points for adjacent parcels.

- i. Where required by the Zoning Ordinance, interparcel connections for both vehicular and non-motorized users shall be provided.

3. Traffic Calming

The County promotes the use of traffic calming measures to improve safety for non-motorized street users and pedestrians in accordance with VDOT's adopted policies and standards. During street layout and design, the issue of traffic calming should be considered. Early consideration can minimize future speeding problems and improve the livability of the neighborhood. If the street layout cannot be designed to encourage target speeds, traffic calming treatments may be appropriate. The type of treatment chosen for incorporation in the design depends on the function and traffic volume of the roadway segment. When traffic-calming measures are proposed, such measures may be shown on the preliminary subdivision plat, and shall be shown on construction plans and profiles and site plan submissions. If desired, a comprehensive traffic calming design, designating proposed measures such as but not limited to signage, striping, narrower roadways, chokers, raised crosswalks and roundabouts, can be submitted for review and approval for the entire development with the first preliminary subdivision application. In such cases, subsequent applications shall make reference to the approved comprehensive traffic calming design and the traffic calming measures should be appropriately provided on the current application.

B. Traffic Studies

1. General

- a. Traffic studies required for legislative land development applications (e.g., zoning map amendments and special exceptions), site plans for public schools subject to Section 5-666 of the Zoning Ordinance that are not associated with an active or previously-approved legislative land development application or as otherwise required by VDOT shall be used to determine the site specific and regional impact to the existing or planned roads within the County.
- b. The standards for traffic studies contained within this chapter are intended to be a general guideline. However, the specific details, methodologies, and study requirements shall be confirmed and agreed upon by the County and the applicant in the FSM Traffic

Study Scoping Agreement (Scoping Document) prior to the formal submission of the traffic study. Additional requirements may be imposed by VDOT.

- c. All traffic data, including, but not limited to, turning movement counts and average daily traffic volumes needed to prepare the traffic study shall be collected/provided by the County and forwarded to the applicant within six (6) weeks after the date the Scoping Document is finalized. This traffic data shall be used by the applicant to prepare the traffic study.
- d. Scoping Documents may be submitted and finalized at any time during the calendar year. Traffic counts will not be conducted in the summer when public schools are not in session. If the Scoping Document is not finalized at least six weeks prior to the end of the public school year, then traffic counts will be collected after the start of the following school year.

2. Pre-Submission Requirements, Policies, and Procedures

- a. Prior to submitting a traffic study, the applicant shall submit a written request to the Department of Transportation and Capital Infrastructure for a traffic study "scoping" meeting and/or a request to modify the requirements of a traffic study. Such Traffic Study Scoping Meeting (Scoping Meeting) shall be held after any required Pre-Application Conference (PRAP) has been held with the Department of Planning and Zoning. The County shall hold a Scoping Meeting, or respond in writing that further traffic study information is not required, within ten (10) working days of receipt of a written request, but no sooner than one (1) week after any required PRAP with the Department of Planning and Zoning. The [requests for the PRAP and the Scoping Meeting](#) may be submitted concurrently. The County may invite VDOT, other County departments, or other public agencies to the meeting, as necessary. Upon notification of the date and time for the Scoping Meeting, the County will advise the applicant of additional materials that would facilitate an effective and resourceful meeting. The applicant shall submit a completed draft Scoping Document to the Department of Transportation and Capital Infrastructure at least three (3) working days in advance of the Scoping Meeting date.
- b. The intent of this Scoping Meeting is to identify elements of the traffic study and resolve issues associated with the traffic study to promote a complete and effective submittal by the applicant and a timely review by the County. The County shall coordinate with the applicant and VDOT to determine if the proposed development

program exceeds the trip thresholds for further scoping with VDOT and shall meet the requirements of the VDOT Traffic Impact Analysis (TIA). This Scoping Meeting request shall include the following information and details:

- i. A vicinity map and parcel identification number of the subject site, and if available, a conceptual development plan should also be provided.
 - ii. A description of the proposed development program and application type, including the existing and proposed land use(s) and square footage or equivalent trip rate variable (e.g., number of residential units, number of hotel rooms, number of students, etc.) for the subject site.
 - iii. Identification of the points of ingress/egress for the subject site.
 - iv. Proposed study intersections and data collection periods.
 - v. Proposed percentage distribution of site-generated trips.
 - vi. Trip generation comparison of existing and currently approved uses with the uses proposed in the land development application, including proposed trip reduction factors, if applicable.
 - vii. A list of traffic issues and considerations associated with the subject site and application.
 - viii. Where appropriate, justification of reduced study standards or a waiver of further study requirements.
- c. The Scoping Document, reflecting the standards of this Section 4.200.B, shall be used to identify and clarify the specific traffic study requirements. The Scoping Document shall also document the agreements made during the course of the Scoping Meeting. After completion of the Scoping Meeting, the participants shall sign the Scoping Document in confirmation of the meeting discussion and results. Copies of this Scoping Document shall be provided to the applicant and the County for future reference. Unless a Scoping Meeting is not required, a copy of this signed Scoping Document must be submitted with the traffic study to aid in the acceptance of an application and the review of the traffic study.

- d. If during the traffic study scoping process, it is determined that certain standards and requirements as provided in this chapter are not applicable to the requested land use, this decision shall be so documented in the Scoping Document as a modification of the traffic study standards and requirements set forth in this section.
- e. Once the Scoping Document is finalized, all traffic data needed to prepare the traffic study shall be collected/provided by the County and forwarded to the applicant pursuant to Subsection 4.c below.

3. Post-Submission Requirements, Policies, and Procedures

- a. Upon receipt of the traffic study, the County shall use the FSM Traffic Study Checklist Acceptance Form (County Checklist) to verify that the agreed upon components of the traffic study have been provided. This verification shall be limited to confirmation that the provided traffic study includes the materials noted on the County Checklist. If the traffic study is found to be incomplete due to non-compliance with the Scoping Document, it shall be rejected and returned to the applicant.
- b. Upon acceptance of the traffic study, the County shall provide the applicant with written comments in accordance with the timelines consistent with the type of application, e.g., within thirty (30) calendar days for SPEX, sixty (60) calendar days for ZMAP and ZCPA. If necessary, a post-submission meeting(s) shall be scheduled by the County to discuss and clarify outstanding issues.
- c. When applicable, the applicant should respond to outstanding comments and issues generated by the County in accordance with the timelines consistent with the type of application, but usually within thirty (30) calendar days.
- d. Once major outstanding issues with respect to the review of the traffic study have been resolved, the County shall review and evaluate any associated draft proffer statements, conditions of approval, and Site Plan applications for public schools subject to Section 5-666 of the Zoning Ordinance to confirm that the infrastructure improvements and associated access requirements are consistent with the Countywide Transportation Plan and the traffic study.

4. Standards for Traffic Studies

- a. Project Description: A description of the existing and proposed uses, as well as the size of the proposed development (i.e., square

footage, acreage, etc.), shall be included in the traffic study. Additionally, the type of application (i.e., ZMAP, SPEX, ZCPA, STPL (Public Schools only), etc.), relevant previous site approvals, relevant previously approved proffers, and proposed project phasing shall be discussed. The proposed development program analyzed in the traffic study shall match the land development application being proposed at time of submittal, or as agreed to at the Scoping Meeting.

- b. Traffic Study Area and Traffic Count Locations: Roadways and intersections internal or adjacent to the development site shall be included in the traffic study. The traffic study area shall be defined at the Scoping Meeting in consultation with staff and as a guideline traffic count locations should include intersections adjacent to the project's frontage and other external roads to the extent that the project's generated traffic is anticipated to exceed 10 percent of the road's current/existing traffic volumes (at the time of application). Refer to the VDOT Updated Administrative Guidelines for the Traffic Impact Analysis Regulations (VDOT Traffic Study Regulations) for additional guidance regarding traffic study area limits.
- c. Data Collection: All traffic data, including, but not limited to, peak period traffic counts at study intersections and twenty-four hour weekday traffic counts adjacent to the project that are needed to prepare the traffic study shall be collected/provided by the County and forwarded to the applicant within six (6) weeks after the date the Scoping Document is finalized. Upon receiving the traffic data from the County, the applicant shall review it and notify the County of any data discrepancy within five (5) working days. The County will re-collect the traffic data at locations where any data discrepancy is identified and send it to the applicant within two (2) weeks of notification of such data discrepancy (weather permitting). This traffic data shall be used by the applicant to prepare the traffic study. For other external roads and segments, the average daily traffic estimates (based on the application of historical VDOT 'k' factors to peak hour traffic volumes) shall be provided in the report. In the event that during an active land development application process, there is a change to the proposed development program that triggers the need for additional traffic counts, additional data collection shall be required. In the event that the County cannot provide the data within these timelines, the applicant may use their own data to prepare the study. The traffic counts shall not be more than twelve (12) months old at the time of the application submission.

- d. Trip Generation, Internal Capture, and Pass-By Trips: As a general guide to vehicle trip generation, rates or equations published in the latest editions of the [Institute of Transportation Engineer's \(I.T.E.\) Trip Generation Manual and the ITE Trip Generation Handbook](#) shall be used to estimate the trips generated from the proposed development. In determining which trip generation process (equation or rate) may be used, refer to the VDOT Traffic Study Regulations and the ITE Trip Generation Handbook. If the applicant and the County agree to use an alternate trip generation methodology, such as using a local rate from a local trip generation count at a similar facility, such trip generation methodology shall be documented in the Scoping Document prior to being used in the traffic study. The County shall collect the local trip generation data and the applicant will estimate the local trip generation rate and send it to the County for review and approval prior to using it in the traffic study. Methodologies for trip reductions associated with pass-by trips and internal capture shall be discussed and agreed upon at the Scoping Meeting. Refer to the VDOT Traffic Study Regulations and the ITE Trip Generation Handbook for appropriate pass-by and internal trip reduction methodologies. The traffic study shall include a comparison of trip generation for existing and approved uses with trips generated by the proposed development program.
- e. Traffic/Trip Distribution: Directional trip distribution information shall be provided for project entrances and intersections on collector and arterial roads within the traffic study area for each phase and category (e.g., residential, office, retail, industrial, institutional, etc.) of the proposed development.
- f. Traffic Volume Projections: The traffic study shall provide existing and projected traffic volumes, with and without the subject project, for Average Daily Traffic, as well as AM and PM peak hours and weekend peak periods, if necessary, for the agreed upon phasing program and build-out years. For sites generating less than 500 peak hour trips, traffic volume projections shall be made for each expected phase and build-out year. For sites generating 500 or more peak hour trips, traffic volume projections shall be made for each expected phase, build-out year, and six (6) years after build-out or to an agreed upon forecast year. The peak hour of the project/individual land use(s) (as given in the ITE Trip Generation Manual) should be added to the corresponding AM/PM existing peak hour of the adjacent roadway traffic volumes to show the 'worst case' scenario. The existing peak hour of traffic on the roads adjacent to the subject project site shall be identified. These traffic volumes shall be provided at roadway intersections and commercial or private accessways/entrances within the traffic study area.

- g. LOS Analyses: Level of Service (LOS) calculations, including vehicular delay, for existing and projected conditions, with and without the subject project, for highway segments, intersection legs, and entrances shall be provided. Calculations shall be in accordance with the latest edition of the [Highway Capacity Manual](#) (HCM). Traffic analysis software, including the Highway Capacity Software (HCS), Synchro plus SimTraffic, SIDRA, VISSIM, CORSIM, and PC-Warrants, may be used as agreed at the Scoping Meeting. Traffic volumes and level of service information shall be provided for each phase of development, to include conditions at date of project completion. Traffic counts and LOS worksheets and projected traffic volume LOS analyses, using agreed upon analysis techniques, including existing AM/PM peak hour signal timing, shall be included as a part of the traffic study. Electronic files associated with the LOS worksheets shall be provided to the County with traffic study submission.
- h. Minimum Roadway/Intersection LOS Standards: Recommendations for phased improvements to the road network links in order to maintain an acceptable level of service (minimum LOS "D," where applicable per the Countywide Transportation Plan (CTP)), shall be provided. For each phase up to and including build-out, a minimum approach and overall LOS "D" (where applicable per the CTP) at intersections shall apply. Levels of service, including vehicular delay, at study intersections shall be presented by lane group in traffic study tables and graphics.
- i. Background Traffic and Roadway Assumptions: Assumptions which determine projected background traffic, including through traffic growth rate to be applied on roadway links, shall be confirmed at the Scoping Meeting. The sources for determining future traffic projections will include one or more of the following:
- [Loudoun County Demographic Estimates & Forecasts](#) or similar documents from Loudoun County.
 - The Loudoun County transportation model which incorporates COG's Cooperative Forecasts for Loudoun County.
 - Historical daily traffic counts published annually by VDOT or compiled through other approved traffic studies and sources.
 - Approved developments in the vicinity of the proposed development.

Specific other approved development names and respective development square footage or residential units used in the study shall be provided. Assumptions for the anticipated roadway

network at each phase of development shall be discussed and agreed upon at the Scoping Meeting.

- j. Safety Locations: Road safety hazards as identified at the Scoping Meeting, within the traffic study area, shall be analyzed for all roadway links and intersections in the traffic study. Analyses requested by the County in the traffic study could include discussion of sight distances, three-year summary of crash data at potential problem intersections, vertical and horizontal roadway alignments, signal warrants, turn lane warrants, speed studies, and/or queuing studies.
 - k. Trip Reduction Factors: If vehicle trip reduction factors are used in the traffic study based on transit access from a proposed development and/or Transportation Demand Management (TDM) measures, factors necessary at each phase of development to implement the vehicle reduction shall be specified, and supporting documentation (e.g., Loudoun County CTP, COG model, WMATA, VDOT, USDOT, ULI, ITE, etc.) and studies of similar cases shall be provided.
 - l. Bicycle, Pedestrian, and Transit Facilities: When bicycle and pedestrian accommodations are used to reduce anticipated traffic volume, a description of the physical and functional characteristics of the existing and proposed bicycle and pedestrian facilities shall be provided. If such separate bicycle accommodations (e.g., striped lanes or multi-purpose trails) are anticipated, they shall also be identified. A description of the functional characteristics shall be provided to identify the transportation options that these accommodations provide (e.g., pedestrian access to retail center, safe bicycle route to elementary school, inter-parcel connections to adjacent neighborhoods, access to W&OD trail, etc.). Existing and future transit facilities, including, but not limited to, bus stops, service, and routes; park and ride lots; and Metrorail stations proximate to the study area should be documented in the traffic study.
 - m. Access Management and Circulation: VDOT requirements, including access management, intersection spacing, inter-parcel connections, and internal circulation shall be provided, as necessary, in the traffic study.
- C. When required by the Zoning Ordinance, Average Daily Trips in VPD shall be calculated using the latest version of the [ITE Trip Generation Manual or ITE Trip Generation Handbook](#) unless otherwise specified by the County.

4.300 DESIGN AND CONSTRUCTION STANDARDS

The following standards are intended to protect the public health, safety and welfare in addition to enhancing transportation efficiency.

4.310 GENERAL DESIGN REQUIREMENTS

- A. Roads shall be configured to avoid floodplain unless no other alternative alignment is feasible, and to limit stream crossings.
- B. Roads shall be laid out in such a manner as to intersect as nearly as possible at right angles. No roadway shall intersect a public roadway or Category A private roadway at less than 80 degrees except as may be permitted by the Director, where existing topographic conditions and/or design constraints prohibit meeting this requirement.
- C. Road jogs with center lines offsets of less than 225 feet shall not be allowed in Category A private roadways, except as may be permitted by the Director. A road jog is defined as a through traffic movement in an urban or high volume road situation which may make two changes of directions at successive intersections. See Figure 1 at the end of this chapter. Public street intersection spacing shall be accordance with VDOT standards.
- D. Public roadways and Category A private roadway intersections shall be designed to align with existing or planned roadway intersections.
- E. A road which permanently ends with a cul-de-sac or turn-around (not including dead end roads which end at a temporary turn-around) shall not exceed the lengths set forth below. Measurement of the length shall be taken along the centerline from the road's intersection with an existing or proposed through road, or an accessway for emergency vehicles only in accordance with Section 4.810, to the center of the cul-de-sac or turn around or the improved portion of any private access easement serving more than two lots.

Development Type	Allowable Maximum Length
Commercial, retail, industrial, office	1500 feet
Rural Non-residential	3500 feet
Multi-family residential	1000 feet
Single family residential	
Townhouse	1500 feet
Detached	
Zoned 1 unit per acre or greater density	2500 feet
Zoned less than 1 unit or lot per acre	3500 feet

Table: Criteria for cul-de-sacs or turn-arounds

Additional criteria for cul-de-sacs or turn-arounds include:

1. Grades for cul-de-sac turnarounds shall not exceed 6 percent measured along face of curb or edge of pavement.
 2. The geometry for a cul-de-sac shall have a radius of no less than 40 feet at the property line and no less than 30 feet at the face of curb or edge of pavement. The geometry for a Fire Apparatus Access Road cul-de-sac shall have a radius of no less than 45 feet at the face of curb or edge of pavement. Other types of turn arounds may be considered.
 3. Multi-phased developments, with an approved concept development plan or preliminary plat showing more than one ultimate point of access, shall not be required to meet this requirement for individual phases, sections or plats, on ultimately planned through roads.
 4. Length criteria as contained within this section shall not be applicable for divided roadways with medians and the above criteria shall apply beyond the point where the divided section ends.
 5. Landscaped islands within cul-de-sacs shall accommodate the turning radius of an SU-40 design vehicle.
 6. Additional points of access may also be required pursuant to Section 4.810.
- F. Landings shall be provided for public roadways and Category A private roadways at intersections to ensure adequate grade and sight distance at intersections. The maximum grade along the landing for Category A private roadways shall not exceed 3% or the cross slope of the intersecting road, whichever is greater.

Breakover shall not exceed 6%. The minimum length of landing shall be 50 feet. Landings for public streets shall meet VDOT standards.

Landings shall be provided for Category B private roadways at intersections. The maximum grade along the landing shall not exceed 6% for 25 feet.

Landing shall be defined as that section of a roadway which is adjacent to an intersection and utilized for vehicle stacking.

Breakover is the difference between the centerline grade of an intersection roadway and the cross slope of the intersecting roadway.

- G. Excepting driveway access to single residential lots, roadways intersecting with a public or Category A private roadway shall have a minimum length of 50 feet between curb returns and/or curb cuts. See Figure 2 at the end of this chapter.
- H. On curb and gutter sections, except for Category B and C private roadways, the roadway right-of-way, or easement where applicable, shall extend a minimum of six feet beyond the face of curb so that drainage structures can be accommodated.
- I. Signage and fire lane identification shall be in accordance with Section 4.800 of this Chapter.
- J. Pavement designs will be done in accordance with Section 4.340.
- K. Residential driveway entrances in curb and gutter road sections shall be constructed in accordance with the figures located at the end of this chapter.
- L. On segments of proposed roadways with ultimate projected traffic counts of more than 2000 Vehicles Per Day (VPD), there shall be no direct access from any driveway or pipestem that serves three (3) or fewer dwelling units unless traffic calming measures approved by the Director are employed. On segments of proposed roadways with ultimate projected traffic counts of more than 4000 Vehicles Per Day (VPD), there shall be no direct access from any driveway or pipestem that serves three (3) or fewer dwelling units.
- M. Vehicles Per Day (VPD) shall be calculated in accordance with the latest version of the ITE Trip Generation Manual.

4.320 PUBLIC ROADWAY STANDARDS

- A. Public roadways shall be designed to conform to the requirements of the applicable Virginia Department of Transportation (VDOT) standards and this manual, except as specifically modified in writing by the Director and VDOT.

- B. Where this Ordinance and the standards of VDOT may differ, the more restrictive requirements shall apply.
- C. Public roadway construction plans and profiles require review and recommendation by VDOT.

4.330 PRIVATE ROADWAY STANDARDS

A. General

The following shall apply to the categories of private roadways, except as noted herein:

1. Traffic control signage and lane markings provided on private roadways shall be in accordance with the [Manual on Uniform Traffic Control Devices](#) (MUTCD). When a signal is warranted, signalization shall meet VDOT standards.
2. Private roadways may be designed with a curb and gutter section or a shoulder section. Shoulder sections shall have stabilized shoulders which may be a paved, gravel, or sodded grass surface. Shoulders shall meet VDOT slope requirements.
3. Private roadways shall be designed to accommodate an SU-30 design vehicle (AASHTO) in accordance with the design criteria contained within Tables I, II and III of this chapter. The travelway inside radius at an intersection shall be a minimum of 25 feet, except for alleys. If the roadway is deemed a Fire Apparatus Access Road, Section 4.810 shall apply.
4. Where parking is provided on the roadway, pavement width shall be increased appropriately. Parking geometry designs shall meet the requirements of this chapter.
5. An entrance permit shall be secured from the Virginia Department of Transportation in order to tie into an existing VDOT maintained road.
6. Sidewalks shall be placed within the public access easements. Handicap accessible ramps and provisions, in accordance with State and Federal requirements, shall be provided at roadway intersections with curb gutter.
7. Roadway design details which are not standard designs used by VDOT, such as CG-6R or YI-1 components, shall be submitted as detailed drawings to the Director for approval.
8. All private roadways and access easements identified in this chapter that serve 3 or more lots, require construction plans and profiles and an approved

Performance Bond prior to record plat approval for the subdivision the roadways or access easements are to serve.

B. Category A Roadways

1. Category A private roads may be utilized in locations as permitted in the Zoning Ordinance, LSDO, and in locations where private roads have been permitted through a Zoning Ordinance Modification for residential and/or non-residential applications.
2. The width of the access easement within which a private roadway is located shall extend to the property lines and along the entire length of the property lines along the frontage of the individual lots to which it provides access. However, this requirement does not always require the construction of the frontage improvements along the entire property line. The following minimum criteria shall apply:

Roadway Cross Section Easement Limit

Curb and Gutter - Six feet behind the face of curb.

Shoulder Section - The edge of shoulder and as necessary to accommodate roadside drainage.
3. Category A private roadways shall have a paved surface. For minimum standards regarding pavement section, widths, etc., refer to Table I. Please note that a roadway built to these standards may not meet Fire Apparatus Access Road Requirements. If such roadway is deemed to be a Fire Apparatus Access Road, Section 4.810 shall apply, and additional travelway width may be required.
4. Utility easements shall be provided, as necessary.
5. Category A roadways shall require construction plans and profiles for review and approval.

Type	Average Daily Traffic (in VPD)	Lane Width *	One-Way Width *	Shoulder Width	Curve Radius (Min.)	Stopping Sight Distance	Maximum Grade	Vertical Curve Design	Minimum Intersection Sight Distance
A1	1-250	9 ft	16 ft	2 ft **	110 ft	150 ft	12%	20 mph	200 ft
A2	251-999	10 ft	N/A	4 ft	165 ft	150 ft	12%	25 mph	250 ft
A3	1000-3000	11 ft	N/A	6 ft	165 ft	150 ft	10%	25 mph	250 ft
A4	3001-5500	12 ft	N/A	6 ft	338 ft	200 ft	10%	30 mph	300 ft
A5	5500+	12 ft	N/A	6 ft	478 ft	275 ft	8%	35 mph	350 ft

Table I: Minimum Standards for Category A Roadways

* Does not include gutter pan.

** Shoulders shall be compacted/treated to support emergency vehicles.

Notes:

1. Minimum travelway width from face of curb to face of curb shall be 20 feet.
2. Turn lanes shall be required at entrance locations with Average Daily Traffic in excess of 5500 VPD, if warranted based on the peak hour traffic volumes, per Appendix C of the [VDOT Road Design Manual](#). Such turn lanes may be required on both the public and private legs of an intersection, if applicable.
3. Roadways in excess of 3,000 VPD shall be superelevated in accordance with the [VDOT Road Design Manual](#).
4. Required thickness of subbase, base course, and top or surface course for private roads shall be determined based on projected Average Daily Traffic volumes for the roadway or segment, using the [VDOT Road Design Manual](#), if Average Daily Traffic exceeds 250 VPD.
5. The minimum pavement section for private roadways with a projected Average Daily Traffic of less than or equal to 250 VPD shall consist of 6 inch aggregate base course and a 2 inch bituminous surface course on a properly compacted subgrade.

C. Category B Roadways

Locations permitting Category B facilities shall include townhouse and multi-family uses. Category B facilities are defined as private vehicular facilities in residential townhouse and multi-family areas (including condominiums) which serve the following functions: 1) provide individual lot frontage or access, 2) provide for parking, and 3) carry predominantly on-site traffic. Category B roadways shall be used only where a volume of less than 1,000 VPD is anticipated. Where 1,000 VPD or greater are anticipated, use design standards specified for Category A roadways. Design of Category B roadways shall meet the minimum standards as defined for Type B1, B2 and B3 below and shall require construction plans and profiles or site plan submissions, whichever is applicable. Please note that a roadway built to these standards may not meet Fire Apparatus Access Road Requirements. If such roadway is deemed to be a Fire Apparatus Access Road, Section 4.810 shall apply, and additional travelway width may be required.

Type	Average Daily Traffic (in VPD)	Travelway Width (2-way)	Travelway Width for Fire Apparatus Access Road (2-way)	Travelway Width (1-way)	Centerline Curve Radius	Stopping Sight Distance	Maximum Grade
B1	1-250	22 ft.	25 ft.	20 ft.	36 ft.	90 ft.	8%
B2	251-750	22 ft.	25 ft.	20 ft.	60 ft.	120 ft.	8%
B3*	751-1000	22 ft.	25 ft.	20 ft.	60 ft.	120 ft.	8%

Table II: Minimum Standards for Category B Roadways

*Angle (ie. “head-in”) parking is not allowed on Type B3 roadways. Parallel parking is allowed on Category B private roadways with additional pavement in accordance with the standards established in this chapter.

Notes:

1. Roadways and parking areas shall have a curb section and shall be contained within an access easement. The width of the access easement in which a Category B private roadway is located shall extend to the property lines and along the entire frontage of the individual lots to which it provides legal access. However, this requirement does not always require the construction of the frontage improvements along the entire property line. On sections of the roadway where this requirement is not applicable, the easement shall be

established one foot behind the face of curb or six inches behind the sidewalk.

2. For Type B2 and B3 roadways, intersections shall be spaced at least 50 feet apart, measured from the flow line of the gutter pan. See Figure 3 at the end of this chapter.
3. An intersection is defined as the juncture of at least three segments of roadways at a common point.
4. Category B private roadway intersections onto a public or Category "A" private roadway shall not be placed closer than 100' at centerline. See Figure 4 at the end of this chapter.
5. No parking shall occur for a minimum distance of 30 feet from an intersection, measured from the flow line of the gutter pan. For 3-segment intersections, parking is allowed along the through roadway opposite the intersecting roadway. See Figure 5 at the end of this chapter.
6. Category B private roadways shall not have a posted speed in excess of 15 mph.
7. Travelway widths excluding parking shall be measured from face of curb to face of curb.
8. The minimum pavement section for Category B private roadways and parking areas shall be based on the projected Average Daily Traffic volumes using the VDOT Road Design Manual if the Average Daily Traffic exceeds 250 VPD.
9. The minimum pavement section for Category B private roadways and parking areas with a projected Average Daily Traffic of less than 250 VPD shall consist of 6 inch aggregate base course and a 2 inch bituminous surface course.
10. If a roadway is not deemed a Fire Apparatus Access Road, a permanent turn-around shall be required when a dead-end roadway exceeds five hundred (500) feet in length, measured along the centerline from the last intersection with a public or private roadway to the end of the roadway.

D. Category C Roadways

1. Category C private roadways shall be provided for the following:
 - a. Private access easement roads as permitted by the Land Subdivision Development Ordinance (LSDO) and the Zoning Ordinance (ZO).

- b. Class III roads serving 25 or less lots, as permitted by the LSDO and ZO.
 - c. Pipestem drives as permitted by modification of the ZO. For the purposes of this manual, pipestem drives are defined as a means of access to a lot or several lots which do not have direct access to an abutting roadway other than by the pipestem driveway.
 - d. Alleys as permitted in the ZO.
2. Category C private roadways shall be designed to meet the minimum standards as defined for each Roadway Type C1, C2, C3 and C4 below including the referenced supplemental design criteria. Please note that a roadway built to these standards may not meet Fire Apparatus Access Road Requirements. If such roadway is deemed to be a Fire Apparatus Access Road, Section 4.810 shall apply, and additional travelway width may be required.

Subdivision Size	Easement Width *1	Travel-Way Width	Shoulder Width *7	Materials		Maximum Grade *4 *5	Centerline Curve Radius
				Paved	Gravel		
C1 (up to 2 lots)	24'	12'	4' grass	2" over 4" base (opt.) *3	6"	10%	30'
C2 (3-7 lots)	30'	14'	3' grass	2" over 4" base *3	6"	10%	75'
C3 (8 or more lots)	40'	18' *2	2' gravel	2" over 6" base	6"	10%	110'
C4 (alley) *8	20'	14'	2' grass	2" over 6" base	N/A	12%	N/A
C4 (Curb and Gutter alley) *8	20'	14' (One-Way) *6 18' (Two-Way) *6	N/A	2" over 6" base	N/A	12%	N/A

Table III: Minimum Standards for Category C Roadways

Footnotes:

- *1 Additional easement width may be required at specific locations to accommodate slope maintenance, drainage, sight distance, etc.

- *2 Travelway widths are permitted to step-down to a Type C1 facility, where the number of lots served is 2 or less.
- *3 All pipestem drives shall be paved and shall be limited to serving 7 lots. Refer to Figure 7 for Pipestem Driveway Entrance Standards.
- *4 12 percent for pipestems or Category C roads that require paving.
- *5 Steeper grades may be considered where there are topographic or environmental constraints which prohibit the maintenance of the 10% grade criteria.
- *6 Measured from face of curb to face of curb.
- *7 Shoulders shall be compacted/treated to support emergency vehicles.
- *8 Refer to Figure 15 for alley entrance to public street.

3. Supplemental Criteria

- a. If a Type C3 or C4 roadway is not deemed a Fire Apparatus Access Road, a permanent turn-around shall be required when a dead-end roadway exceeds four hundred (400) feet in length, measured along the centerline from the last intersection with a public or private roadway to the end of the roadway.
- b. Type C3 and C4 roadways located within Class III and Class IV soils, as identified by the Interpretive Guide to Soils Maps, Loudoun County, Virginia; shall provide a field determination of CBR values based on actual sub-grade conditions. Quantities of borings required shall be in accordance with Chapter 6 of this manual.
- c. Type C3 roadways constructed of gravel must include a fifty (50) foot paved apron only when accessing an existing paved road.
- d. Type C3 and C4 roadways shall include signage for roadway names, private road identification, and traffic control, as may be appropriate.
- e. The following criteria shall be applicable to the design of Type C1 and C2 roadways constructed as pipestem drives:
 - i. Lots which share a pipestem driveway shall provide a minimum of three parking spaces per residential dwelling outside of the travelway. In addition, these driveways shall

be clearly labeled or noted "no parking along driveway" on all plats and plans submitted.

- ii. The design for pipestems which are to serve more than one lot shall be shown in typical section and on the grading plan of the construction plans, together with turnaround and required utilities, and shall be included in the performance bond for the project.
 - iii. Each pipestem shall be clearly identified as a private drive. A single sign, not to exceed two square feet in area, shall be posted at the entrance of each such driveway, displaying only the words "Private Drive" and the addresses of any residences utilizing the common driveway.
 - iv. No pipestem shall extend a distance of more than 400 feet from the public road to the property which the pipestem serves, or exceed a total length of 800 feet if a loop configuration, measured along the center line between the two intersections with a public or private road.
- f. Alleys are a means of secondary access, and properties served by an alley shall have separate frontage on a public or private roadway.

4.340 PAVEMENT THICKNESS DESIGN STANDARDS

- A. The methods and materials used in the construction of all roads shall conform to the current VDOT Road and Bridge Specification, unless herein modified.
- B. Required thicknesses of subbase, base course, and top or surface course for public roads shall be in accordance with current VDOT standards.
- C. Preliminary subbase depth and pavement design shall be based on an assumed design CBR value of 4, if soil tests have not been performed. For private roadways with an Average Daily Traffic in excess of 750 VPD, soil tests of the as-constructed subgrade shall be performed for the actual determination of CBR value. The required subbase thickness and pavement design may be modified prior to the placement of the subbase.
- D. Pavement thickness referenced for Category A, B, and C private roadways are minimum requirements and shall be increased to account for site specific conditions.
- E. Pavement design assumes that the number of Heavy Commercial Vehicles (HCV), consisting of Trucks, Buses, etc., with 4 tires or greater, will not exceed 5 percent of the total projected traffic. If the total projected traffic includes more than 5

percent of such vehicles, an equivalent projected traffic shall be equal to (Average Daily Traffic (in VPD)) + (20 X Number of HCV over 5 percent).

- F. The minimum pavement section for privately owned and maintained parking areas (including driveways aisles within parking areas) serving individual commercial parking lots with a projected Average Daily Traffic of less than 400 VPD shall consist of a 6 inch aggregate subbase course and a 3 inch bituminous base course, and a 1.5 inch bituminous surface course.
- G. Pavement in commercial areas shall be of a heavy duty design in the major cartways and loading areas, and at dumpster pads to accommodate the anticipated vehicle loads. This design shall be subject to approval of the Director. A minimum 6 inch depth 3000 psi concrete section with steel reinforcement over 4 inches of aggregate shall be used for loading areas and dumpster pad areas.
- H. Alternate equivalent pavement designs may be approved by the Director. When using an alternative equivalent pavement design, the following thickness layers shall apply for roadways in excess of 100 vehicles per day (VPD):
 - 1. Minimum thickness of the aggregate layer used as a subbase is four inches.
 - 2. Minimum thickness of the soil stabilized layer (cement, lime etc.) is six inches.
- I. Alternative pavement design sections shall be encouraged. A request for approval of such designs shall be submitted with the site plan or construction plans and profiles and shall include the basis of design, calculations in accordance with current accepted engineering procedures and a justification for the exception to these standards. Technical information regarding the characteristics of the alternative materials of construction (e.g., brick or concrete pavers, pavement admixtures, pervious pavement, etc.) shall be provided as part of the request. The request may be submitted either as an integral part of the construction plans and profiles or site plans or separately for consideration.

4.400 PARKING GEOMETRIC STANDARDS

A. General Criteria

1. There shall be three types of passenger vehicle parking spaces which can be used in parking facilities for automobiles.
 - a. Standard car head-in parking.
 - b. Handicap accessible head-in parking.
 - c. Parallel parking.
2. Where four or more spaces are required by the Zoning Ordinance, parking areas shall be graded, well drained and provided with a surface of bituminous concrete or equivalent paving materials. All parking spaces shall be delineated and striped in accordance with this chapter.
3. Gravel, grasscrete, reinforced grass or gravel systems, or other suitable materials may be used for access and parking areas for agricultural and rural economy uses. Elsewhere, such materials may be used for temporary and overflow parking areas, low volume access ways and, when site conditions warrant, standard parking areas. The parking areas shall be well drained with defined travel aisles and designated parking bays. If, due to the rural nature of the facility, it is not feasible or practical to provide defined travel aisles and designated parking bays, the land development application shall provide a note explaining how this requirement shall be met (i.e., parking attendants, signs, etc.).
4. The County permits and encourages the use of pervious materials.
5. Rain gardens and other low-impact design options, in accordance with Chapter 5 of this manual, may be used to satisfy the landscaping requirements for parking areas, such as landscaped islands and peripheral parking lot landscaping, as set forth in this section and the Zoning Ordinance.

B. Geometrics

1. The following table shall represent the minimum size requirements for automobile parking spaces, except as specifically modified herein. (See the Zoning Ordinance for the required number of parking spaces per use.)

	<u>Width</u>	<u>Length</u>
Standard Head-In Parking	9'	18'
Parallel Parking	8'	22'

Geometrics for angle parking shall be measured as shown in Figure 14.

2. Travelway aisle widths for standard car parking lots shall be provided in accordance with the following: 90 degrees - 22 feet; 60 degrees - 20 feet; and 45 degrees - 18 feet. The minimum travelway aisle width is 18 feet. Travelway aisle width shall be measured from the face of curb where there is no parking and from the back of the parking space where there is parking. If the travelway is deemed a Fire Apparatus Access Road, Section 4.810 shall apply.
3. The stall width for standard parking spaces when measured between stall striping may be reduced to 8 feet when spaces are separated by double line stripes set one foot apart. (i.e., the pavement area of each space shall remain 9 feet.)
4. Where wheel stops or curbing are provided for parking spaces, a 1 foot reduction in the stall length will be allowed, providing the resulting overhang does not encroach on the required open space areas and/or pedestrian access system.
5. Parking spaces for handicapped persons and related access aisles, accessibility routes and signage for physically handicapped persons shall be provided in accordance with State and Federal requirements.
6. Parking lots shall provide for safe and functional traffic circulation.
 - a. Entrances to parking bays shall be located along the site accessway to avoid blockage of the public right of way by vehicles entering the site. No parking shall be allowed within 30 feet of the entrance, measured from the flow line of the gutter pan. See Figure 5 at the end of this chapter.
 - b. The major site accessways shall be clearly defined, with no direct angle parking allowed where anticipated Average Daily Traffic exceeds 1500 VPD. Major site accessways shall accommodate SU-30 and WB-40 design vehicle movements without requiring change of direction. A hierarchy of onsite travelways shall be maintained. If the travelway is deemed a Fire Apparatus Access Road, Section 4.810 shall apply.

- c. Retaining walls, screen, landscaping and building walls shall be protected from vehicle contact.
 - d. "Overhang" areas which are a part of the required parking space must be graded no higher than 2 inches above the top of the curb, and must not be encroached upon by landscape plantings, signs or other obstructions.
 - e. Loading spaces and dumpster pads shall be accessible by the design vehicle with all parking spaces occupied.
 - f. Where drive-through facilities are proposed, the travelway width shall be a minimum of 10 feet and shall be designed to address safe vehicle stacking.
- 7. Parking areas shall provide for safe pedestrian travel.
 - 8. A permanent turn-around shall be required when the dead-end aisle exceeds 500 feet, measured along the centerline of the dead-end aisle, from the last aisle or public roadway.

C. Loading Spaces

Commercial building sites shall provide for loading space in accordance with the Zoning Ordinance. An AASHTO-WB-50 design vehicle shall be accommodated on all commercial sites where the proposed use warrants the same except as may be permitted by the Director where the applicant can show just cause for modification.

1. Single Unit Loading Space

- a. A single unit loading space shall be a minimum of 15 feet in width and 30 feet in length and provide a minimum horizontal clearance of 15 feet; provided, however, that when loading spaces are located alongside each other, additional loading spaces need only be a minimum of 12 feet in width.
- b. Uses which are required to provide a single unit loading space shall provide an entrance and circulation system which can accommodate an American Association of State Highway and Transportation Officials (AASHTO) SU-30 Design Vehicle.

2. Semi-Trailer Standard Loading Space
 - a. Semi-trailer loading spaces shall be a minimum of 15 feet in width and 55 feet in length and provide a minimum horizontal clearance of 15 feet.
 - b. Uses which are required to provide a standard or semi-trailer loading space shall utilize an AASHTO WB-50 design vehicle for planning the entrance and on-site circulation system.
3. Loading spaces shall be accessible to the design vehicle with no more than two backing movements. The circulation pattern for the design vehicle should provide for forward movement only and shall discourage backing movements.
4. Per the Zoning Ordinance, no off-roadway loading area shall be located within any required front yard. Furthermore, no off-roadway loading area shall be used to satisfy the requirements for parking or stacking spaces. Loading areas shall be designed and located in a manner which does not interfere with the free circulation of vehicles within parking or stacking areas.
5. In accordance with the Zoning Ordinance, loading spaces may be provided cooperatively for two or more uses, subject to the approval of the Director, where it is demonstrated that adjacent land uses can be adequately served by a shared loading facility and legal instruments ensuring the permanent availability of off-roadway loading for all such uses are recorded in the land records of Loudoun County.

4.500 DRIVEWAYS

A. General Requirements

1. Driveways serving individual residential units shall conform to the design requirements contained in this Chapter and as demonstrated by the Figures at the end of this Chapter to achieve acceptable driveway geometry.

B. Design Criteria

1. Driveway slopes shall be 12 percent or less. The slope shall be measured along the driveway centerline from the edge of the right-of-way or private access easement to the garage slab.
2. Driveways located within the Mountainside Development Overlay District or in areas of Steep Slopes may, subject to the approval of the Director, have up to a 16 percent grade.
3. The driveway should maintain the full width of the garage doors to the property line or for a distance of 18 feet outside of the garage, whichever is less.
4. Skewed driveways cannot exceed a 10:1 angle with the driveway apron or the garage. Skews greater than 10:1 must be handled with a curved driveway.
5. Curved driveways must be designed with a 10 foot minimum inside radius and a 24 foot outside radius.
6. Tapered driveways cannot exceed a 10:1 angle of taper. When tapering greater than 10:1, minimum curves specified in Item 5 above shall be utilized.
7. The length of the driveway is measured from the back of the apron to the center of the garage door.
8. The use of roll top curb shall not be allowed as driveway entrances.

4.600 PEDESTRIAN AND BICYCLE ACCOMMODATIONS

A. Facility Planning

1. A Non-Motorized User Circulation System (NUCS) composed of sidewalks, shared use trails and/or on-street bicycle facilities shall be provided in non-residential zoning districts in accordance with the Zoning Ordinance and Land Subdivision Development Ordinance and in residential zoning districts as set forth in this section 4.600.
2. Facilities for non-motorized users may include the following:
 - a. Sidewalks
 - b. shared used trails
 - c. on-street bicycle facilities: signed, shared roadway and striped bike lanes
 - d. nature or recreational trails
3. The following specific provisions for NUCS shall be made in residential, office, commercial and industrial areas and activity centers:
 - a. The NUCS shall provide access to destinations such as recreation, school, retail and commercial locations within the subdivision.
 - b. The NUCS shall be required to extend to the property boundaries of the project, shall tie into existing and previously approved planned systems, and shall provide for future additions to ensure continuity of the bicycle and pedestrian system. When a sidewalk or trail is located outside of the VDOT right of way, it shall be contained within a public access easement that extends at least one (1) foot beyond the outside of the sidewalk or trail on both sides.
 - c. Single Family Detached: Sidewalk on both sides of curb and gutter roadways, and where required by the Zoning Ordinance.
 - d. Townhouse, Multi-Family: Sidewalk in front of the units and to parking areas.
 - e. Activity Centers (Playgrounds, pools, tot lots, recreation centers): Sidewalk or trail leading to the facility and/or crosswalks for safe pedestrian movement.

- f. Office and Commercial Areas: Sidewalk leading to facility and/or crosswalks for safe pedestrian movement.
- g. Along road frontages to provide safe and reasonable pedestrian inter-parcel access between developments and uses, where such access is set forth in the Zoning Ordinance as a performance standard.
- h. Sidewalks shall be provided on both sides of the roadway where such accommodation conforms with VDOT standards and allowances.
- i. Shared-use trails shall be provided in conjunction with shoulder and ditch roadway sections in developments in the Suburban Policy Area, the Transition Policy Area, the Joint Land Management Area, and in Rural Villages. In developments where lot sizes of one acre or less are proposed, sidewalks may be provided in lieu of shared-use trails.

B. General Design

Where sidewalks or trails are required, the following design requirements shall apply:

1. Sidewalks

- a. Sidewalks shall be constructed on a subgrade compacted to 95 percent density at optimum moisture content.
- b. Sidewalks shall be constructed to one of the following minimum cross-sections:
 - i. VDOT Type A-3 concrete to a minimum depth of four inches.
 - ii. Crushed stone, 4 inches thick, topped with 1.5 inches of asphalt.
 - iii. On well-drained soils only as defined in the Interpretative Guide to Soils in Loudoun County, 4 inches of asphalt.
 - iv. Alternate sections may be approved by the Director and, if applicable, VDOT.
- c. The maximum cross slope allowed for sidewalks shall be 1/4 inch per foot.

- d. Sidewalks within VDOT right-of-way shall be constructed to the standards of VDOT and as provided in this section.
- e. The sidewalk longitudinal slope shall be consistent with the adjacent roadway.
- f. VDOT standards for CG-12 handicap accessible ramps shall be provided at pedestrian roadway crossings on curb and gutter roadway sections.
- g. Sidewalks outside of the VDOT right-of-way shall have a minimum unobstructed width of (a) 5 feet for non-residential development, for development adjacent to roads depicted in the Countywide Transportation Plan, and for residential development sections where the average density exceeds ten (10) units per acre and (b) a 4-foot minimum unobstructed width for other applications.
- h. Pervious-surface sidewalks are a desired option for non-VDOT maintained sidewalks.

2. Shared-Use Trails

- a. Shared-use trails are generally asphalt and are intended to accommodate both bicyclists and pedestrians comfortably.
- b. Shared use trails shall comply with the General Design requirements set forth in subparagraphs 1.a, b, f and h above.
- c. Shared-use trails within VDOT right-of-way shall comply with VDOT standards.
- d. Shared-use trails outside of VDOT right-of-way shall be designed and constructed to conform to AASHTO standards, provided, however, that the minimum width shall be six (6) feet.

3. On-Street Bicycle Facilities

- a. On-Street Bicycle Facilities are bicycle lanes constructed as an integral portion of the roadway and may or may not be delineated by means of striping.
- b. If bicycle accommodations are provided on street, separate sidewalks or trails for pedestrians must be provided outside of the roadway.

- c. The design and construction of On-Street bicycle accommodations shall conform to AASHTO standards.
 - d. On-Street bicycle accommodations shall be identified on all plats for applications proposing such accommodations as an element of the internal circulation for bicycles.
 - e. Streets containing On-Street Bicycle Facilities shall have signage that adequately advises motorized vehicle operators that such streets contain such Facilities.
4. Nature or Recreational Trails
- a. To provide pathways for recreational or fitness use, for access to open space or for pedestrian connections to the NUCS, subdivisions may incorporate nature or recreational trails designed and constructed in accordance with the following subparagraphs. Such trails shall not substitute for sidewalks or trails that are part of the NUCS.
 - b. Such trails that are designed exclusively as nature or recreational trails and are not part of the NUCS are not required to comply with minimum standards for sidewalks and trails set forth in sections 1 through 3 above. Trails should be constructed using pervious surface materials.
 - c. Such trails should follow the natural topography as nearly as possible.
 - d. Trails developed within a park site to be dedicated to the County shall comply with the guidelines set forth in the Loudoun County Department of Parks, Recreation and Community Services Construction and Design Guidelines in effect at the time construction commences.

4.700 NAMING OF STREETS

Reference is made to the [Loudoun County Codified Ordinances](#) for information on the naming of street, street-type designations, and the process for street name reservations.

4.710 ADDRESS PLAT AND ADDRESSING PREMISES

Reference is made to the [Loudoun County Codified Ordinances](#) and the [Loudoun County Land Subdivision and Development Ordinance](#) for information on the determination of addresses, developing and obtaining addresses, display and posting of addresses, and address plat documentation requirements.

4.800 FIRE APPARATUS ACCESS ROADS AND SIGNS

4.810 FIRE APPARATUS ACCESS ROAD REQUIREMENTS

Pursuant to the Loudoun County Fire Prevention Code (the “LCFPC”), as adopted in Chapter 1602 of the [Codified Ordinances of Loudoun County](#), Loudoun County has adopted the following written policy to designate public and private Fire Apparatus Access Roads for the efficient and effective operation of fire and/or rescue apparatus. This written policy is intended to supplement, and does not replace, the separate requirements of Chapter 5 of the LCFPC. In case of conflict between this section and standards of another applicable regulation, ordinance, code or law, the more stringent standards shall prevail. The Fire Marshal administers the LCFPC and is the designated official charged with the administration of the standards and requirements contained in this section, including approval of modifications to the standards in this section.

A. Definitions

For purposes of this Section:

1. “Fire Apparatus Access Road” shall mean a travelway that provides primary fire apparatus access from a fire station to a facility, building, or portion thereof, where “travelway” shall be construed to generally include public roads, private roadways regulated under Chapter 4 of this Manual, certain parking lot accessways, certain driveways, and other accessways for emergency vehicles only. Driveways serving one single family detached residence are typically not classified as Fire Apparatus Access Roads unless a change in use under the Zoning Ordinance or the Uniform Statewide Building Code is proposed.
2. “Aerial Fire Apparatus Access Road” shall mean a section of a Fire Apparatus Access Road located adjacent to a building 50 feet in height or greater. For the purposes of this definition, height shall be measured from the average finished grade at the face of the building located adjacent to a Fire Apparatus Access Road to the highest eave of a pitched roof, intersection of the roof to an exterior wall, or top of a parapet wall, whichever is greater.

B. Fire Apparatus Access Road Standards

1. Minimum Specifications
 - a. Fire Apparatus Access Roads shall have a minimum unobstructed width of 20 feet, inclusive of shoulders that are compacted/treated to support emergency vehicles. [Fire Marshal Code Modification for Fire Service Features, Specifications, Dimensions, Section 503.2.1 of the Loudoun County Fire Prevention Code, 2015 Edition]

- i. Exception: The Fire Marshal may reduce this width to 18 feet for travelways exclusively serving certain sprinklered single family detached and single family attached dwellings.
 - ii. Exception: The Fire Marshal may approve the installation of security gate(s) across a Fire Apparatus Access Road in accordance with section 4.810.D.
- b. Fire Apparatus Access Roads shall have a minimum unobstructed vertical clearance of 13 feet 6 inches.
- c. Fire Apparatus Access Roads shall extend to within 150 feet of all portions of the facility and all portions of the exterior walls of the first story of the building as measured by an approved route around the exterior of the building or facility.
 - i. Exception: The Fire Marshal may allow up to an 80-foot wide continuous portion of the exterior wall to be located beyond 150 feet of the Fire Apparatus Access Road where sprinklers are provided as required by the Uniform Statewide Building Code.
 - ii. Exception: The Fire Marshal also may increase the dimension of 150 feet where:
 - a) Sprinklers are provided that exceed the minimum requirements of the Uniform Statewide Building Code or type of construction warrants such increase; or
 - b) Topography, waterways, and/or non-negotiable grades warrant such increase and an approved alternative means of fire protection is provided.
- d. Additional requirements for Aerial Fire Apparatus Access Roads:
 - i. Shall have a minimum unobstructed width of 26 feet, exclusive of shoulders.
 - ii. Shall be located a minimum of 15 feet from the building and positioned along one entire side of the building. The side of the building on which the aerial fire apparatus access road is positioned shall be approved by the Fire Marshal, with a preference for the addressed side of the building.
 - iii. Shall only be required on one side of the building.

- iv. Shall extend 30 feet beyond each end of the building, unless otherwise approved by the Fire Marshal.
- v. Overhead utility and power lines shall not be located over an Aerial Fire Apparatus Access Road or between the Aerial Fire Apparatus Access Road and the building.
- e. Additional requirements for Fire Apparatus Access Roads designated as accessways for emergency vehicles only:
 - i. Shall be located within a minimum 22-foot wide easement, which shall encompass the accessway and demarcation measures.
 - ii. A typical section of the proposed accessway shall be included in the associated land development application.

2. Parking

Fire Apparatus Access Road Width	Aerial Fire Apparatus Access Road Width	On-Street Parking	Fire Lane Identification
<28 feet	< 34 feet	No parking allowed on either side.	Both sides identified as fire lanes in accordance with Section 4.810.C.
≥ 28 feet and < 36 feet	≥ 34 feet and < 42 feet	Parallel parking allowed on one side.	One side identified as a fire lane in accordance with Section 4.810.C.
≥ 36 feet	≥ 42 feet	Parallel parking allowed on both sides.	No fire lane identification required. Exception: Fire lane identification shall be provided for access to pools in accordance with Section 4.810.C.

Table IV: Parking and Fire Lane Identification

3. Load Bearing Capacity

- a. Emergency access, and shoulders included in Fire Apparatus Access Road width measurements, shall be compacted/treated to support emergency vehicles.
- b. Compacted/treated to support emergency vehicles shall mean capable of supporting H-20 loading in all weather conditions. Travelways with a minimum of six inches aggregate subbase or a minimum of four inches aggregate subbase and two inches of bituminous surface course over a compacted subgrade shall be deemed to meet load bearing requirements.

4. Number of Access Points

- a. The following development types shall have more than one Fire Apparatus Access Road into the development:
 - i. Residential Developments: More than one point of access is required for the following development types:
 - a) Single family detached and single family attached dwelling units, including townhomes, with greater than 50 dwelling units.
 - b) Multi-family developments greater than 100 units (not sprinklered).
 - c) Multi-family developments greater than 200 units (sprinklered).
 - ii. Commercial and Industrial Developments: More than one point of access is required for the following development types:
 - a) Any building in the development exceeds 30 feet or three stories in height. Building Height shall be as defined in the Revised 1993 Zoning Ordinance.
 - b) The gross building area of all buildings in the development is greater than 62,000 square feet (if any building is not sprinklered) or 124,000 square feet (all buildings shall be sprinklered).
 - c) Institutional uses are considered to be commercial and industrial development.

iii. Mixed Use Developments: The number of points of access shall be determined based on the following equivalent values. When the total value for a development is greater than 200, more than one point of access shall be required.

- Each single family detached/attached dwelling unit, including townhome = 4
- Each multi-family dwelling unit (not sprinklered) = 2
- Each multi-family dwelling unit (sprinklered) = 1
- Each building exceeding 30 feet or three stories in height, containing commercial or industrial uses (with or without dwelling units) = 200. Building Height shall be as defined in the Revised 1993 Zoning Ordinance.
- Every 620 square feet of building containing commercial or industrial uses (if any building is not sprinklered) = 2
- Every 620 square feet of building containing commercial or industrial uses (if all buildings are sprinklered) = 1

iv. The Fire Marshal may also require more than one Fire Apparatus Access Road into the development if there is the potential for impairment of such Fire Apparatus Access Road by vehicle congestion, condition of terrain, climatic conditions or other factors that could limit access.

b. Where more than one fire apparatus access road is required, distance between the access points also will be evaluated. Considerations shall include, without limitation, median divided roadways, sprinkler systems, and non-combustible construction materials.

5. Turn Arounds

a. Dead end fire apparatus access roads in excess of 150 feet in length, as measured along the center line from the curb line to the end of the fire apparatus access road, shall be provided with an approved turn around for fire apparatus within 150 feet of the end of the fire apparatus access road, unless otherwise approved by the Fire Marshal.

b. Approved turn arounds in Figure 18 depict minimum dimensions and do not require any further analysis. Other turn around geometry

that can accommodate an SU-40 design vehicle (AASHTO) may be approved by the Fire Marshal.

- c. Approved turn arounds depicted in Figure 18 require fire lane identification.

6. Geometric Standards

- a. Turning radii shall be designed to accommodate an SU-40 design vehicle (AASHTO).
- b. The grade or slope shall not exceed 14 percent along the centerline of the Fire Apparatus Access Road.

C. Fire Lane Identification

1. Timing:

- a. Prior to the issuance of an occupancy permit for any facility, building, or portion of a building hereafter constructed, Fire Lane Identification shall be provided along any Fire Apparatus Access Road serving such facility, building, or portion of a building.

2. Specifications:

- a. Fire Lane signs required by Chapter 486 of the [Codified Ordinances of Loudoun County](#) shall meet the design and installation standards set forth in Figure 16.
- b. Fire Lane Identification shall be provided as follows:

Type	Signage	Curb/Edge of Pavement Painting
Length of Curb or Shoulder \leq 30 feet	One D sign installed on center.	In lieu of the D sign, curbing or edge of pavement may be painted with a 6-inch yellow stripe with "FIRE LANE" stenciled in black in 4 inch letters on center.
Length of Curb or Shoulder > 30 feet	One A sign installed at one end and one C sign installed at the other end with directional arrows pointing in. and Where the space between the A and the C sign exceeds eighty (80) feet, intermediate B sign(s) shall be installed. Spacing between signs shall not exceed eighty (80) feet.	In lieu of intermediate B signs, curbing or edge of pavement may be painted with a 6-inch yellow stripe with "FIRE LANE" stenciled in black every 50 feet in 4 inch letters.
Any entrance for emergency access to public pools	One A sign and one C sign on each side of the entrance with directional arrows pointing in.	As approved by the Fire Marshal.
Accessways for emergency vehicles only	One sign installed on the barrier securing the accessway that states "No Parking Emergency Vehicles Only." In lieu of signage along the accessway, the edges of the accessway shall be demarcated by shrubs, boulders, fencing, or other measures approved by the Fire Marshal located within the easement. The typical section of the proposed accessway shall include demarcation.	

Table V: Fire Lane Signage and Painting

3. Exceptions:

- a. Spacing between signs may be increased in Non-Suburban Zoning Districts, subject to approval by the Fire Marshal.
- b. Fire Lane Identification shall not be required if the travelway is part of a residential development where all proposed lots are three (3) acres in size or greater.

D. Fire Apparatus Access Road Gates or Barriers

- 1. Gates securing fire apparatus access roads shall comply with all of the following criteria:
 - a. For a two-way travelway, the minimum unobstructed gate opening width shall be 20 feet. For a one-way travelway, the minimum unobstructed gate opening width shall be 12 feet.
 - b. Construction of gates shall be of materials that allow manual operation by one person.
 - c. Electric gates shall be equipped with a means of opening the gate by public safety personnel for emergency access. Emergency opening devices shall be approved by the Fire Marshal.
 - d. Manual opening gates shall not be locked with a padlock or chain and padlock unless they are capable of being opened by means of forcible entry tools or when a key box containing the key(s) to the lock is installed at the gate location.
 - e. Locking device specifications shall be submitted for approval by the Fire Marshal.
 - f. Electric gate operators, where provided, shall be listed in accordance with UL 325.
 - g. Gates intended for automatic operation shall be designed, constructed and installed to comply with the requirements of ASTM F 2200.
- 2. Barriers securing accessways for emergency vehicles only shall comply with all of the following criteria:
 - a. Shall be constructed out of high-visibility plastic chain, delineators, or materials as approved by the Fire Marshal.

- b. Shall not be locked with a padlock or chain and padlock unless they are capable of being opened by means of forcible entry tools or when a key box containing the key(s) to the lock is installed at the location.
- E. Traffic Signal – VDOT and Loudoun County Fire and Rescue (LCFR) Preemption Control Devices

New traffic signals and modifications to existing signalized intersections shall include preemption control devices that are approved by both VDOT and LCFR pursuant to Chapter 424 of the [Codified Ordinances of Loudoun County](#).

4.820 STREET NAME SIGNS

Permanent street name signs shall be installed and maintained in accordance with the specifications contained within the [Loudoun County Codified Ordinances](#).

Temporary street names signs are required and shall be installed within 24 hours of completion of clearing and in close proximity to each intersection location. Temporary street name signs shall meet the specifications contained within the [Loudoun County Codified Ordinances](#) (Chapter 1021) with the exception that a temporary post may be used in lieu of the 2" x 2" square galvanized steel post required by the Ordinance. Temporary signs shall be maintained until permanent signs are installed.

If the construction entrance for a work site is not at the location of a future street, it shall be marked with a street name sign for the nearest future street no later than the day of the preconstruction conference.

All new or modified mast arm traffic signal structures shall incorporate mast arm-mounted street name signage and all required regulatory signage. The street name signage shall be capable of properly identifying all intersection legs.

4.821 STREET EXTENSION SIGNS

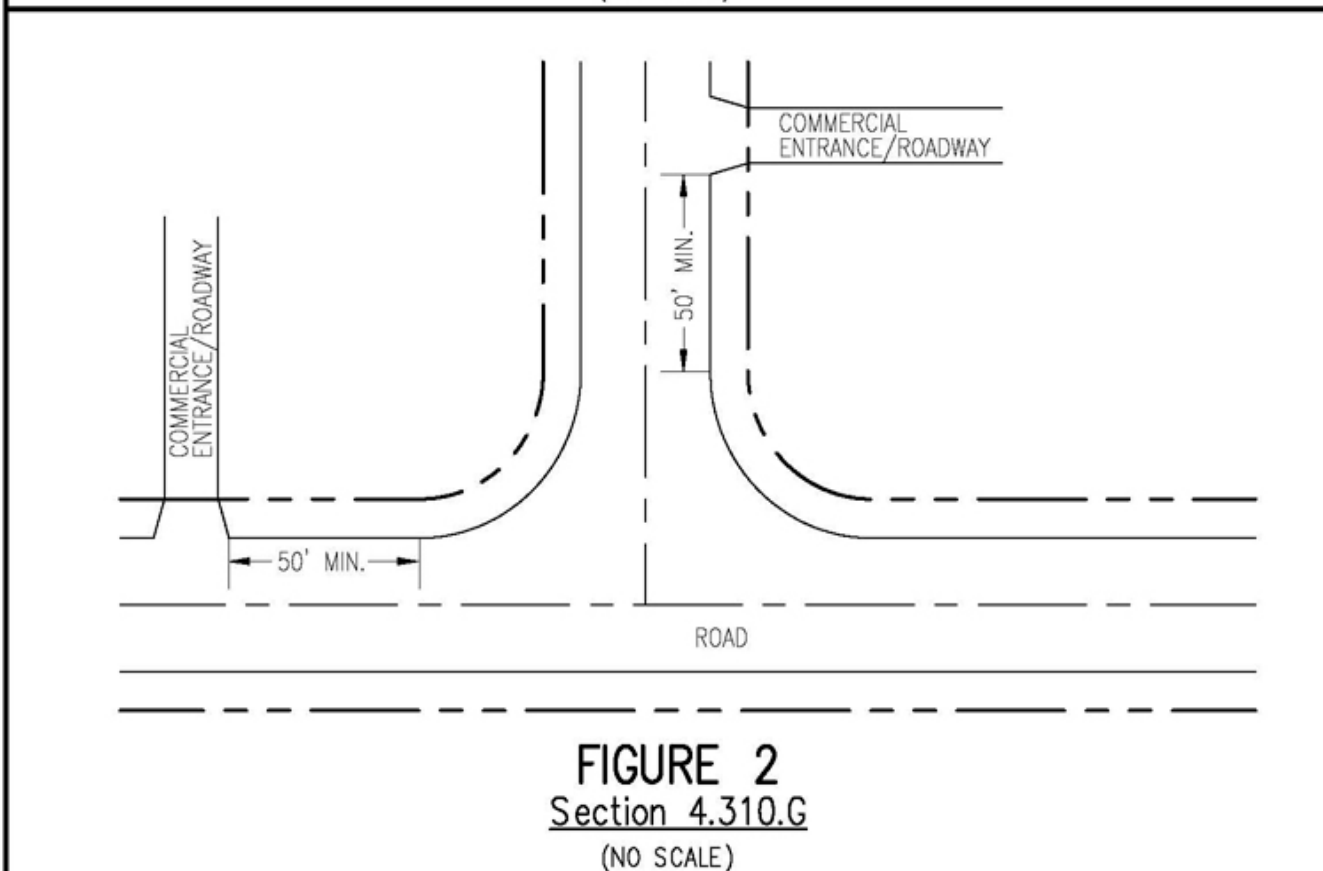
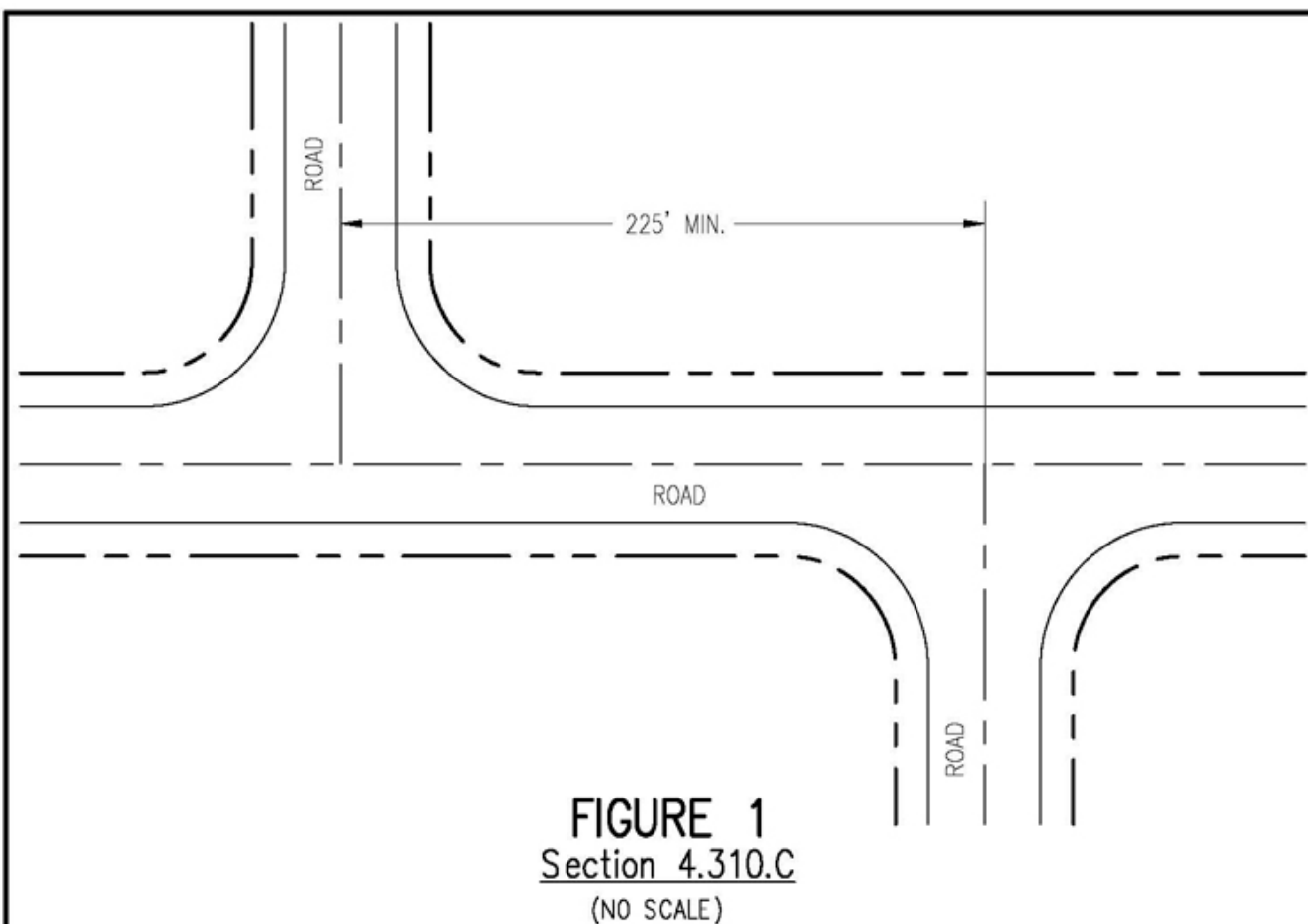
Where a future street extension is anticipated to provide access to adjacent property, a sign shall be installed indicating possible extension of the street. The sign shall be installed at the terminus of the street or temporary cul-de-sac anticipated to be extended. The sign shall be installed prior to installation of the base asphalt. The sign shall be in conformance with Figure 17.

4.830 HANDICAP SIGNS

Handicap signs shall be provided on the plans in accordance with the specifications set forth in the Americans With Disabilities Act of 1990, as amended.

4.900 PUBLIC TRANSIT BUS SHELTER STANDARDS

When a public transit bus shelter is proffered or otherwise provided, the shelter shall be designed consistent with the policies in the [Countywide Transportation Plan](#).



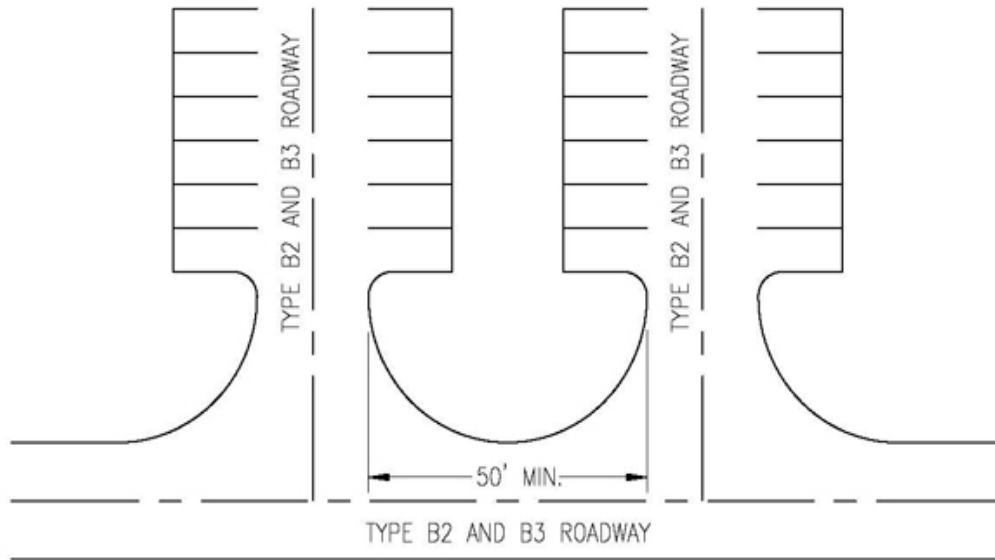


FIGURE 3
Section 4.330.C.2
 (NO SCALE)

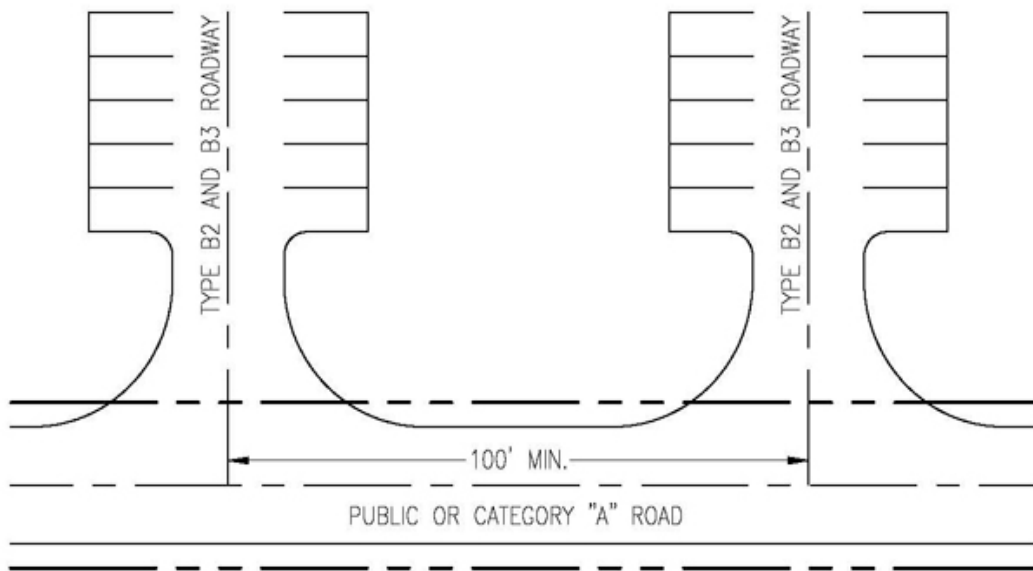


FIGURE 4
Section 4.330.C.4
 (NO SCALE)

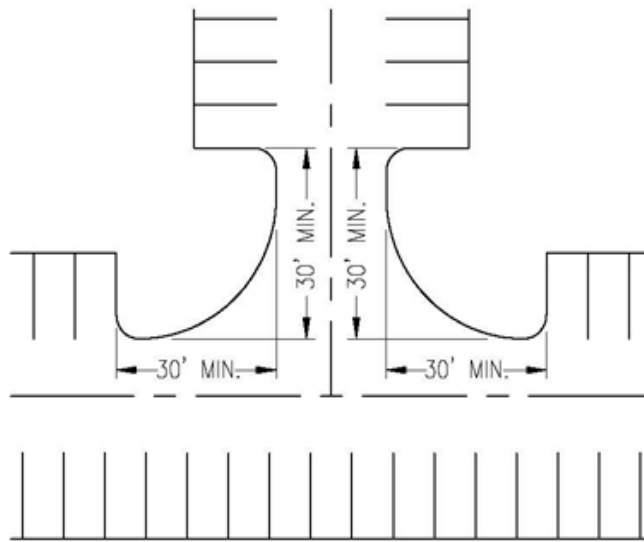
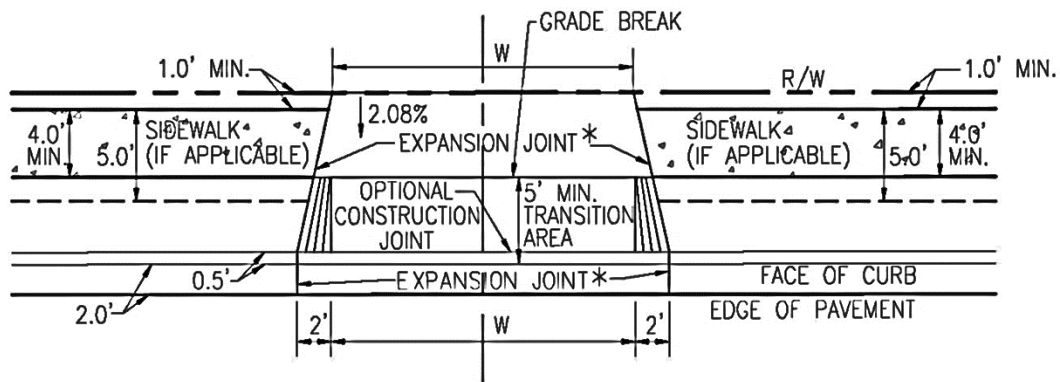
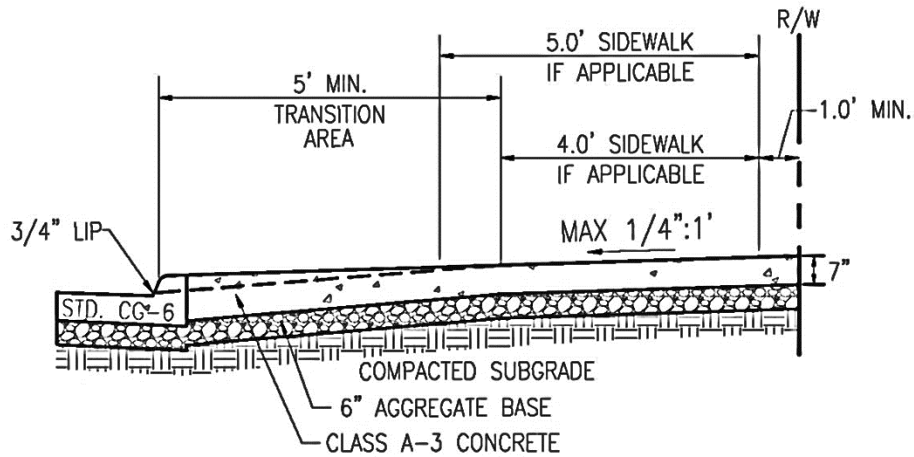


FIGURE 5
Section 4.330.C.5
(NO SCALE)



* NOTE: CONTROL JOINTS MAY BE USED IN PLACE OF EXPANSION JOINTS ON PRIVATE STREETS.



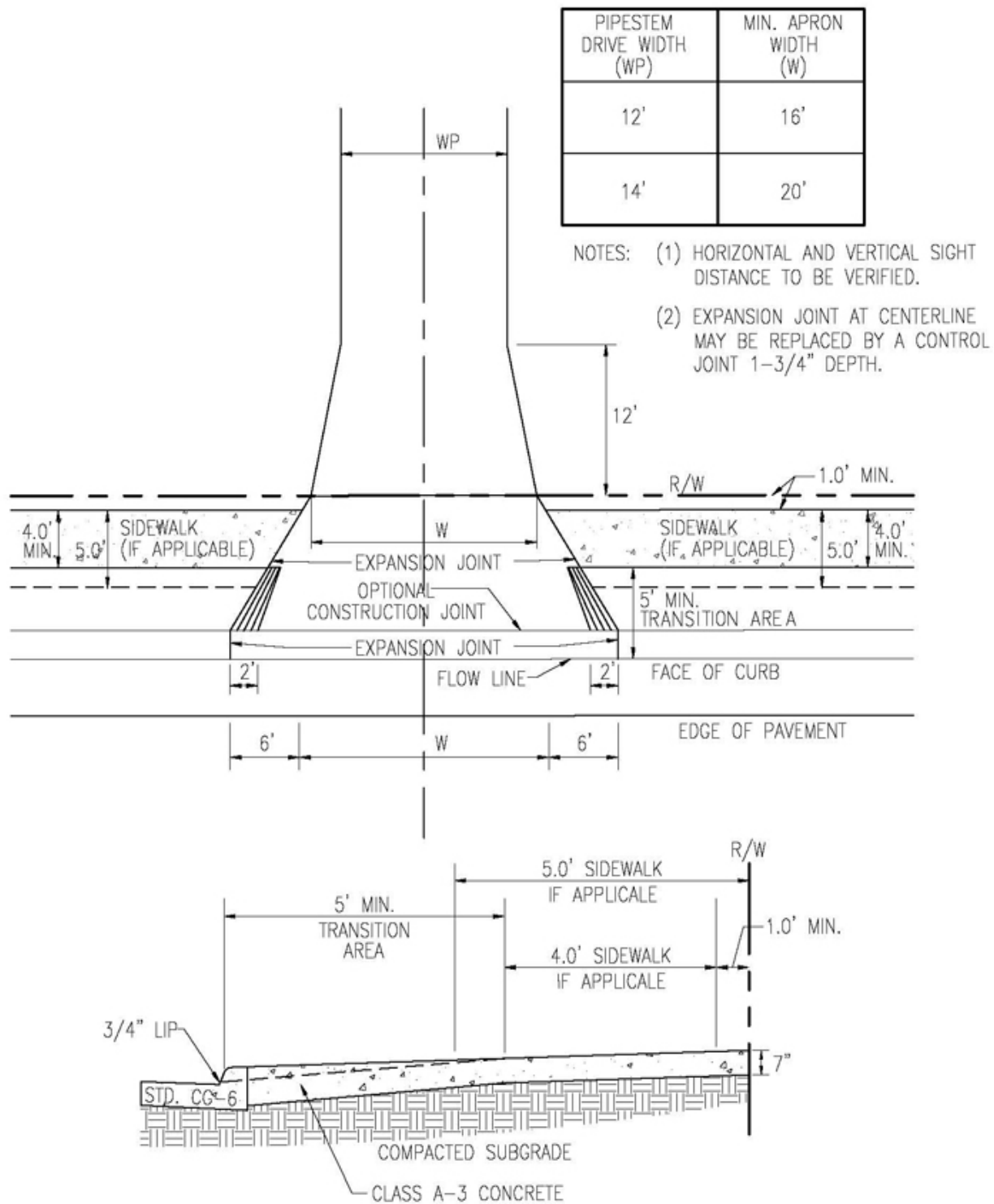
ENTRANCE TYPE	MINIMUM APRON WIDTH (W)
TOWNHOUSE DRIVEWAY ENTRANCE	10'
SINGLE CAR GARAGE DRIVEWAY ENTRANCE	12'
MULTICAR GARAGE DRIVEWAY ENTRANCE (1) GREATER THAN 35' IN LENGTH	12'
MULTICAR GARAGE DRIVEWAY ENTRANCE (1) 35' OR LESS IN LENGTH	18' (2)

- NOTE: (1) DRIVEWAY LENGTH IS MEASURED FROM THE CENTER OF THE BACK OF THE CONCRETE APRON TO THE CENTER OF THE GARAGE FACE WHERE THE DOOR(S) ARE LOCATED.
- (2) MINIMUM WIDTH SHALL BE THE GREATER OF 18' OR THE WIDTH ACHIEVED BY NECKING THE DRIVEWAY AT A 10:1 ANGLE STARTING 18' OUTSIDE THE GARAGE DOOR.
- (3) SIDEWALK AND PROPERTY LINE LOCATIONS MAY VARY FOR TOWNHOUSE DRIVEWAYS.

STANDARD CURB AND GUTTER INDIVIDUAL DRIVEWAY ENTRANCE

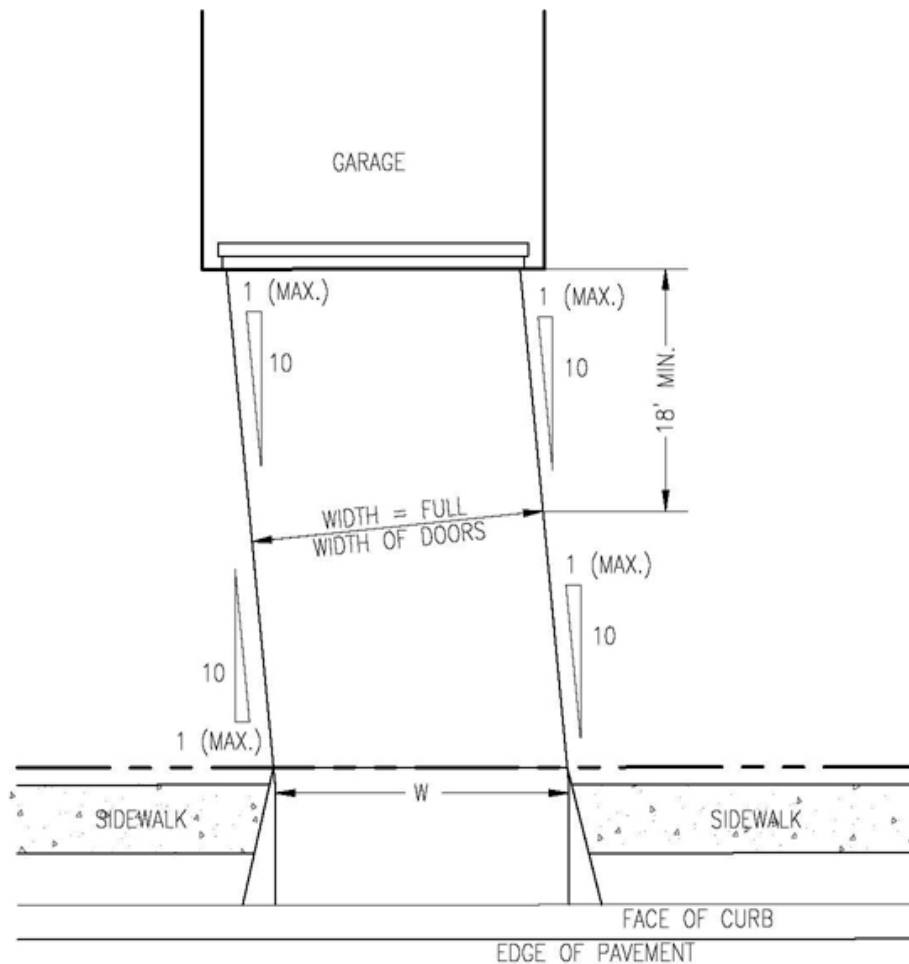
(NO SCALE)

FIGURE 6



**STANDARD PIPESTEM
DRIVEWAY ENTRANCE**
(NO SCALE)

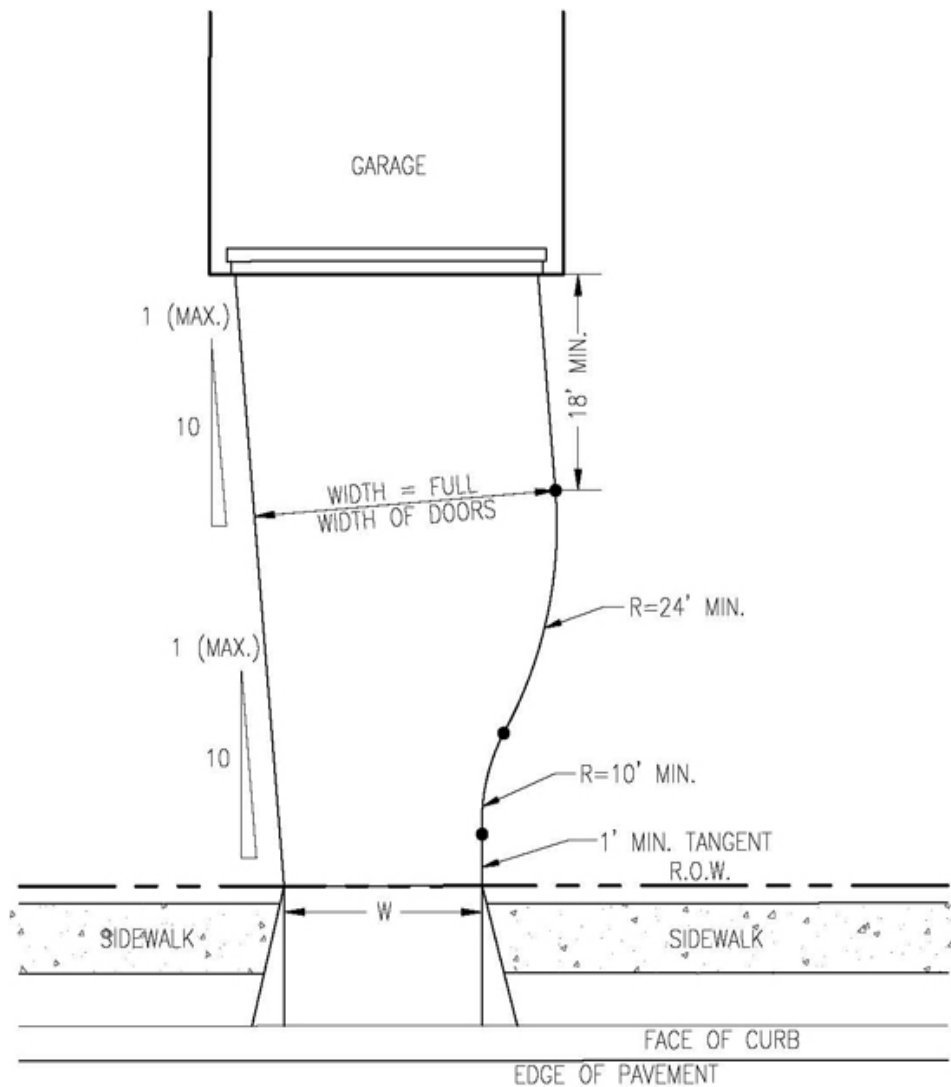
FIGURE 7



- NOTES: (1) SKEW ANGLE CANNOT EXCEED A 10:1 ANGLE WITH THE GARAGE FACE OR STREET.
- (2) DRIVEWAY TO MAINTAIN FULL WIDTH OF DOORS FOR A DISTANCE OF 18' FROM GARAGE.
- (3) SEE FIGURE 6 FOR APRON WIDTH.

STANDARD DRIVEWAY DETAIL
(DRIVEWAY LENGTH SHORTER THAN 35')
 (NO SCALE)

FIGURE 8

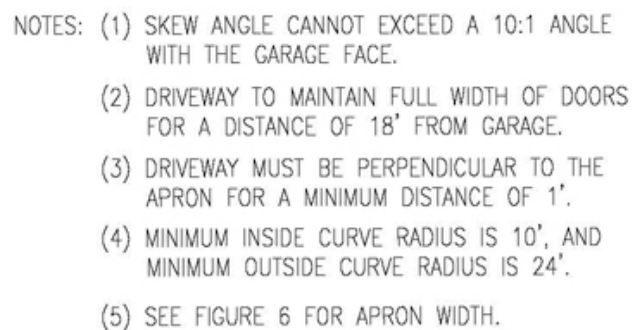


- NOTES: (1) SKEW ANGLE CANNOT EXCEED A 10:1 ANGLE WITH THE GARAGE FACE OR STREET.
- (2) DRIVEWAY TO MAINTAIN FULL WIDTH OF DOORS FOR A DISTANCE OF 18' FROM GARAGE.
- (3) MINIMUM INSIDE CURVE RADIUS IS 10' AND MINIMUM OUTSIDE CURVE RADIUS IS 24'.
- (4) SEE FIGURE 6 FOR APRON WIDTH.

STANDARD DRIVEWAY DETAIL (DRIVEWAY LONGER THAN 35')

(NO SCALE)

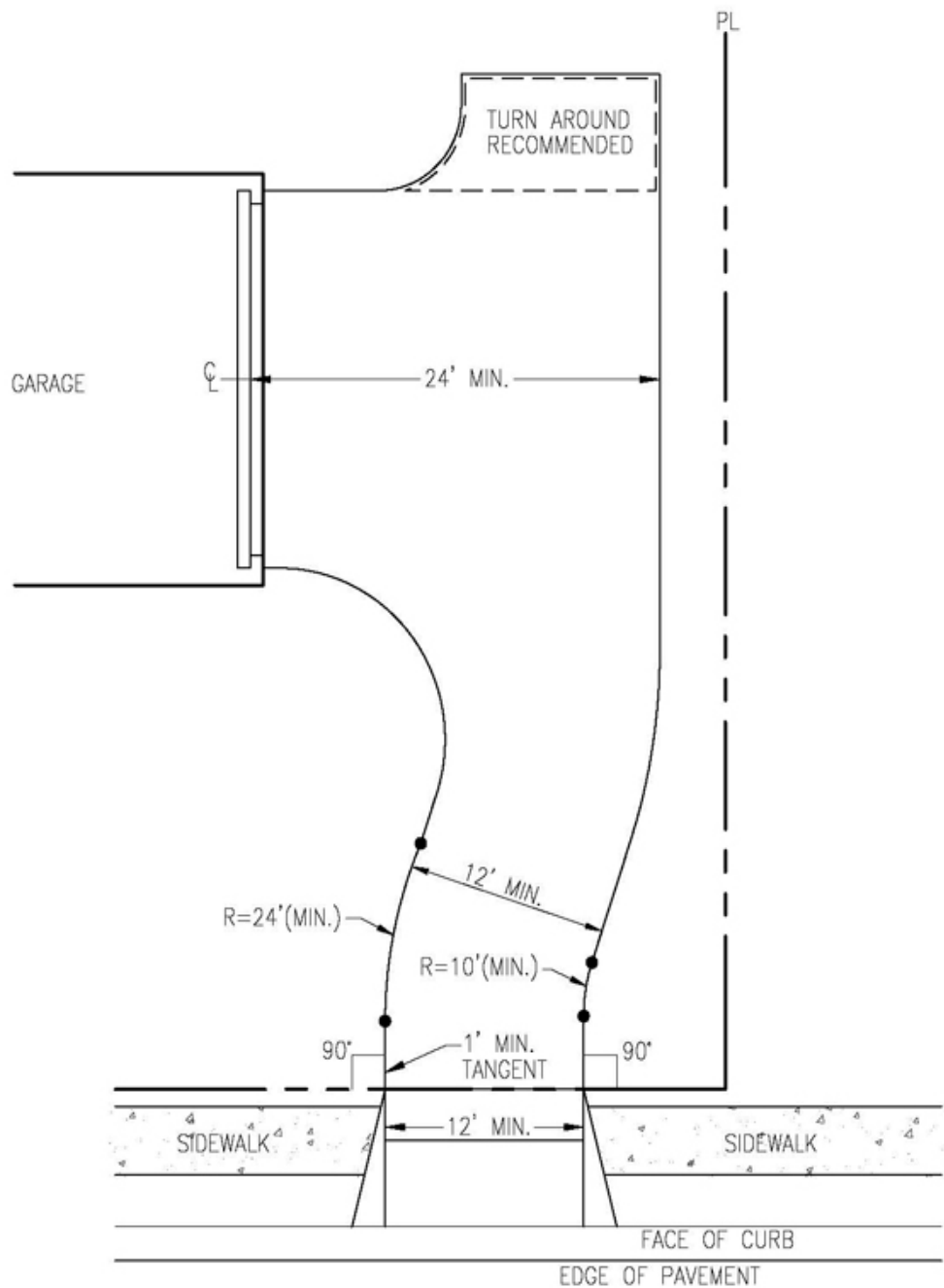
FIGURE 9



(NO SCALE)

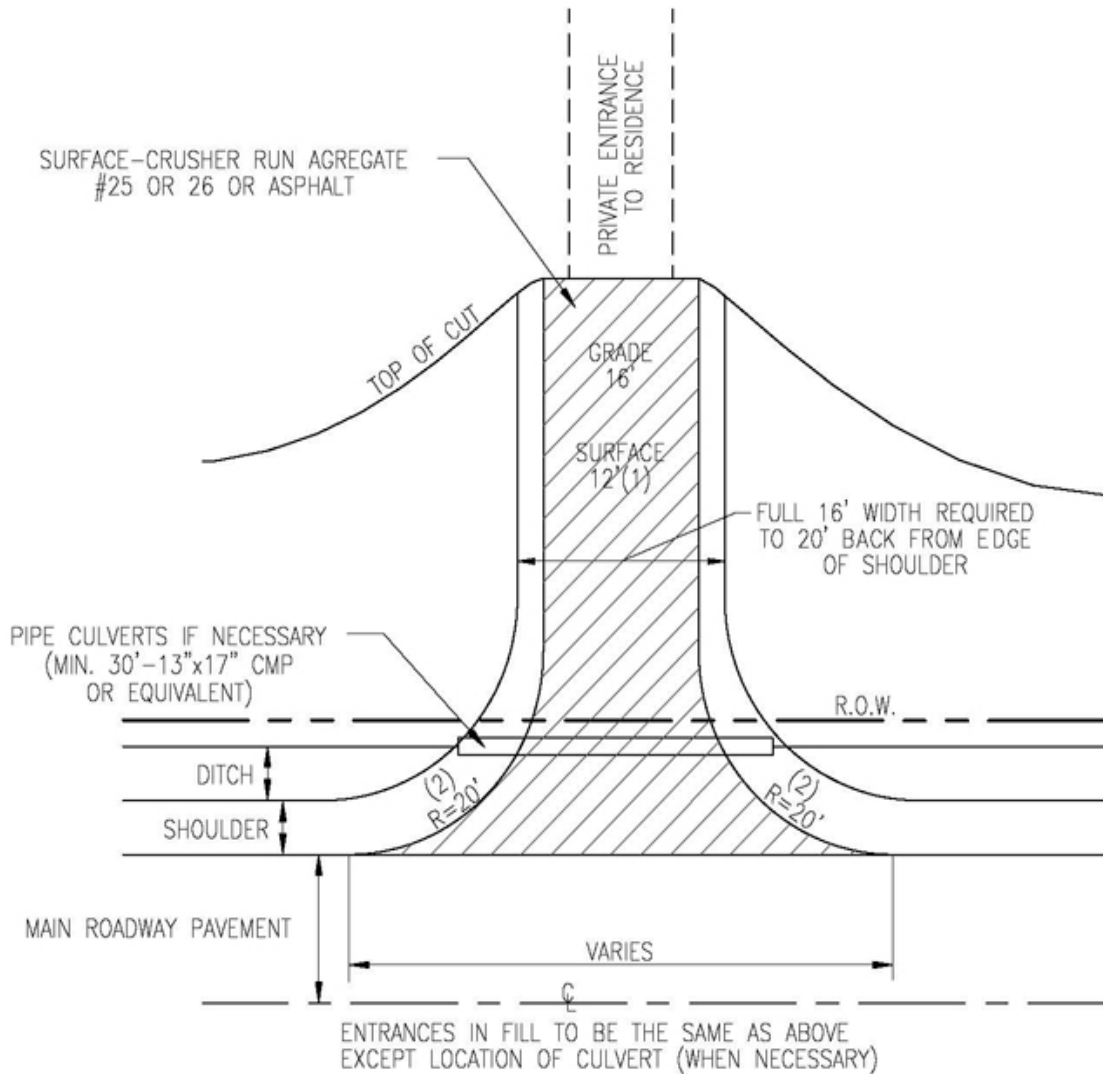
FIGURE 10

Figure 10 - Standard Curved Driveway Detail
Effective Date: 07/01/2022



STANDARD SIDE LOAD DRIVEWAY DETAIL
(DRIVEWAY LONGER THAN 35')
 (NO SCALE)

FIGURE 11



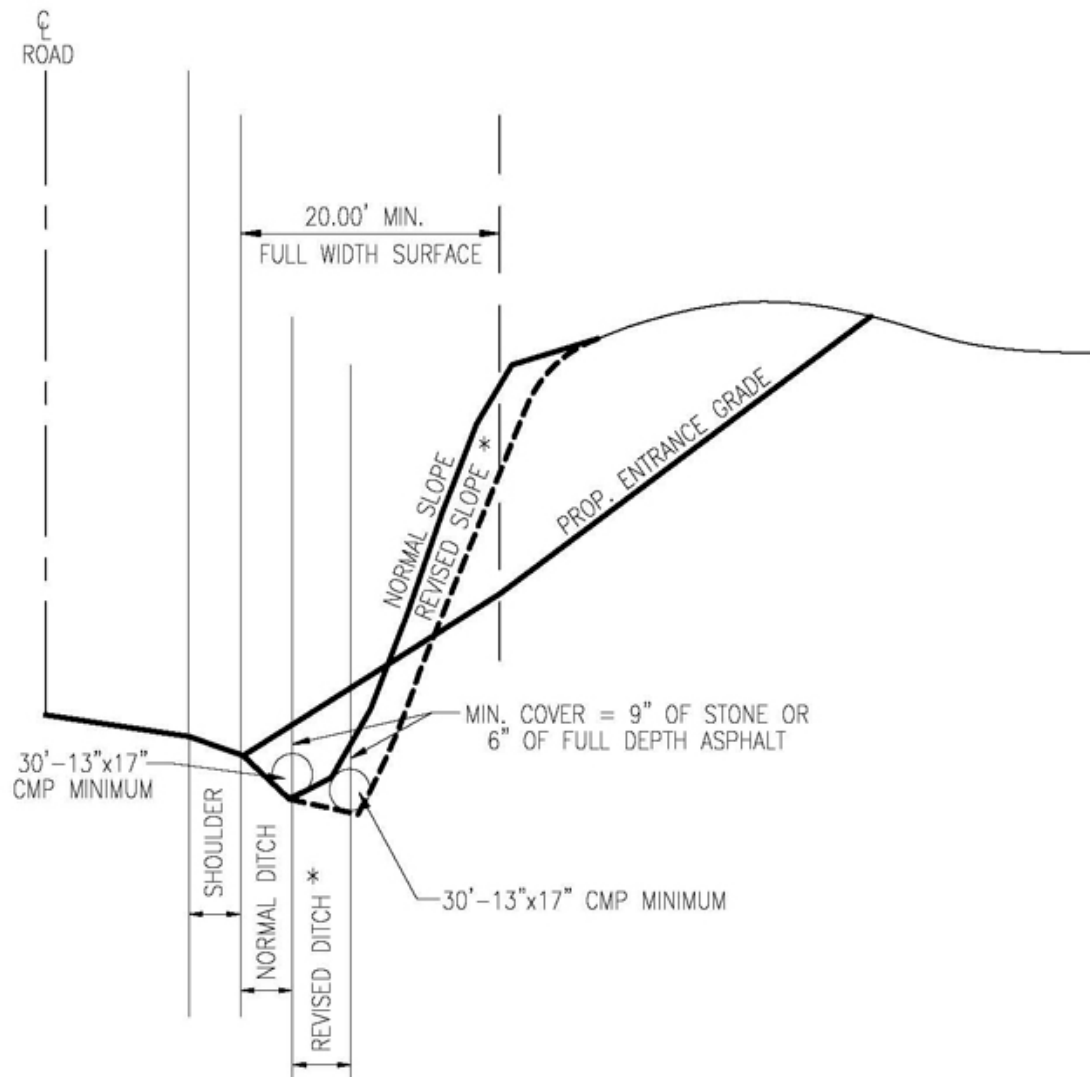
NOTE: ALL ENTRANCE GRADES SHALL START BACK OF THE SHOULDER LINE. IF DRAINAGE IS NECESSARY, THE DITCH LINE MAY BE MOVED BACK TO PROVIDE AT LEAST 9" OF GRAVEL OR 6" FULL DEPTH ASPHALT OVER PIPE.

- (1) 12' OR EXISTING WIDTH WHICHEVER IS GREATER
- (2) RADIUS MAY BE REDUCED TO 15' IF APPROVED BY V.D.O.T. .

STANDARD PRIVATE DRIVEWAY ENTRANCE FOR SHOULDER SECTIONS VDOT ROADS

(NO SCALE)

FIGURE 12



**CROSS SECTION FOR
STANDARD PRIVATE DRIVEWAY ENTRANCE
FOR SHOULDER SECTIONS VDOT ROADS**
(NO SCALE)

FIGURE 13

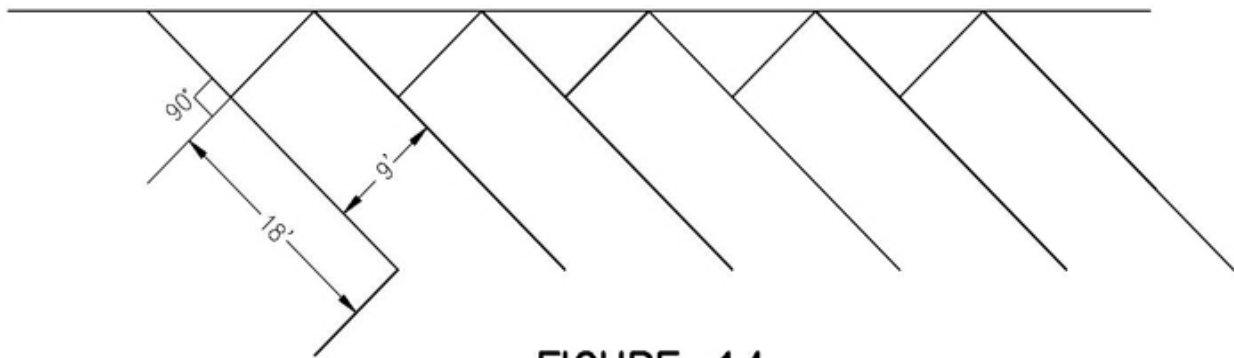
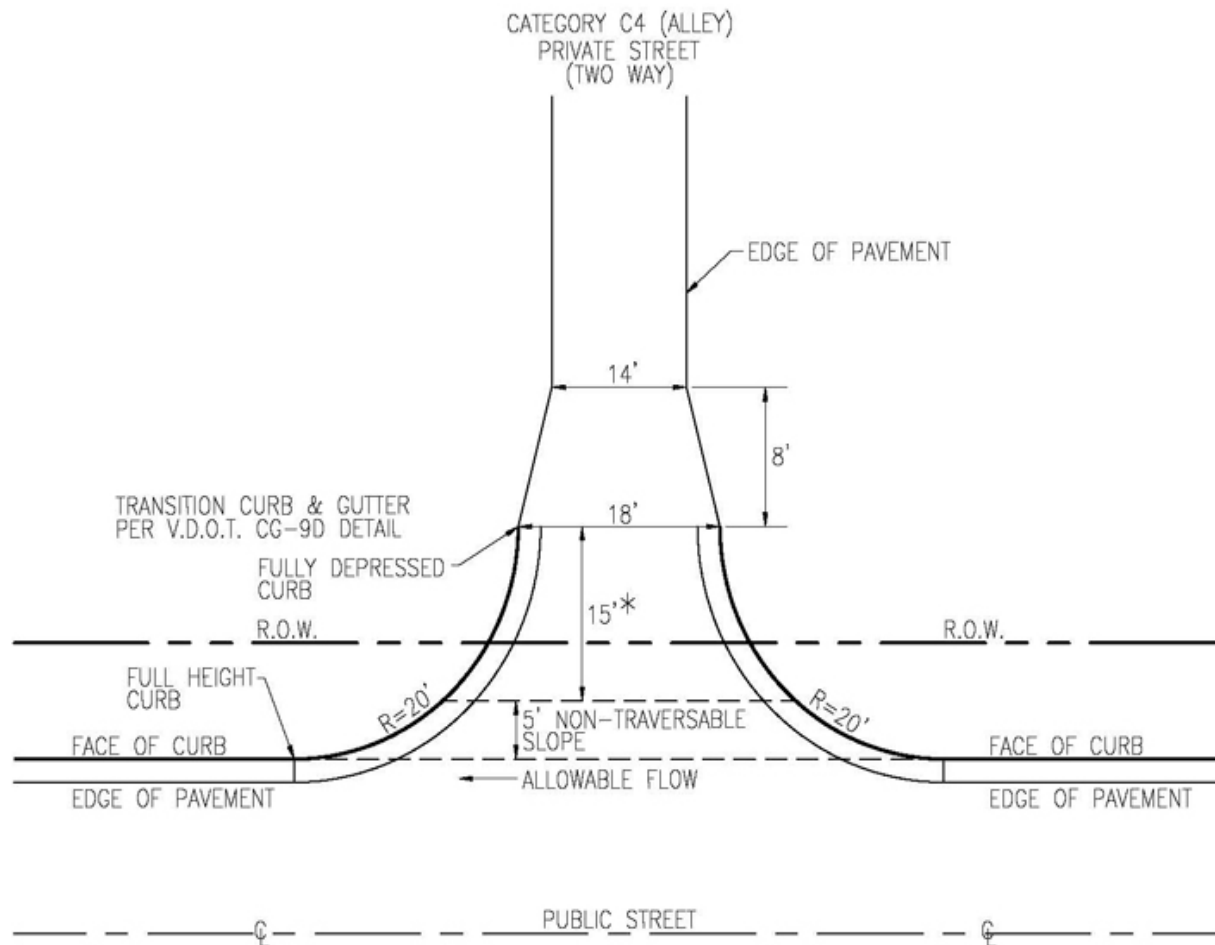


FIGURE 14
Section 4.400.B.1
(NO SCALE)



* IF ACCESSIBLE ROUTES ARE BEING PROVIDED,
A MINIMUM 4' TRAVERSABLE WIDTH IS
REQUIRED WITH A MAX. 2% CROSS SLOPE.
ACCESSIBLE ROUTE TO BE PROVIDED IN
THIS AREA. NO CG-12 IS REQUIRED.

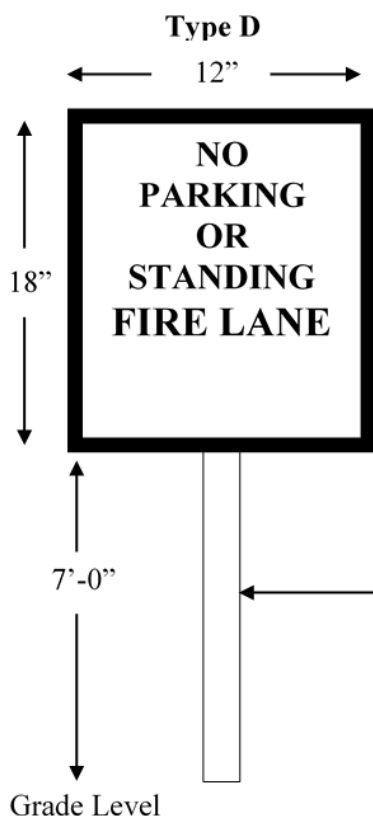
ALLEY ENTRANCE TO PUBLIC STREET (NO SCALE)

FIGURE 15

Fire Lane Sign Type and Specifications



SPECIFICATIONS (Section 486.02(b) of the Codified Ordinances):



(1) Each such sign shall be of metal construction, with dimensions of at least twelve by eighteen inches.

(2) Each such sign shall show red letters on a white background,

with a three-eighths inch red trim strip around the entire outer edge of the sign,

the lettering to be "No Parking or Standing" in at least two-inch high letters

and "Fire Lane" in at least two and one-half inch high letters

and containing red arrows on such signs to point to and indicate the fire lane area.

(3) Posts for such signs, where required by the Fire Marshal, shall be securely mounted.

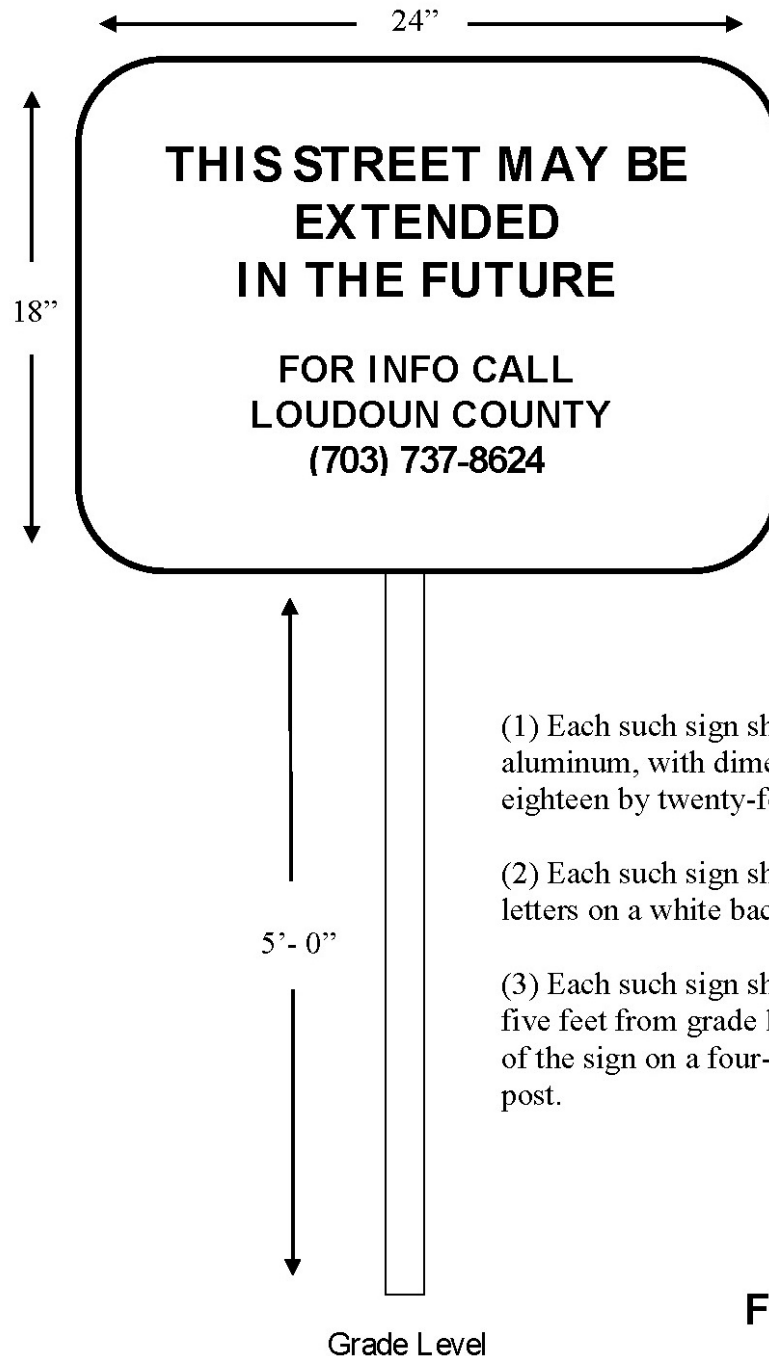
(4) (Intentionally omitted)

(5) Each sign shall be mounted seven feet from grade level to the bottom of the sign and must be within seven feet of the parking curb or curb line.

**NO
PARKING
OR
STANDING
FIRE LANE**

FIGURE 16

Street Extension Sign Type and Specifications



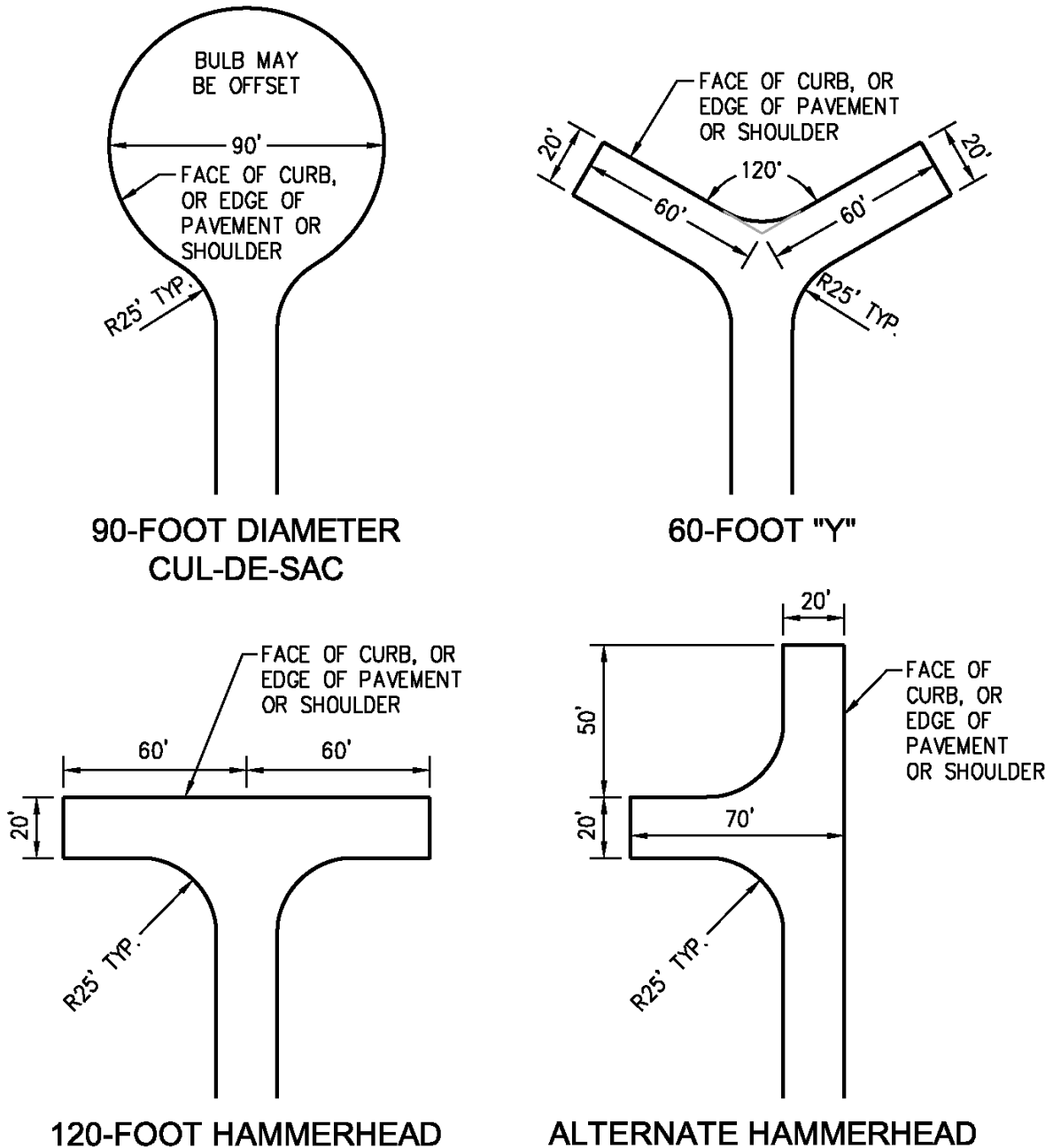
(1) Each such sign shall be made of aluminum, with dimensions of at least eighteen by twenty-four inches.

(2) Each such sign shall show black letters on a white background.

(3) Each such sign shall be mounted five feet from grade level to the bottom of the sign on a four-inch by four-inch post.

FIGURE 17

LOUDOUN COUNTY FIRE APPARATUS ACCESS ROAD TURN AROUND GEOMETRY (NO SCALE)



NOTE:
THESE TURN AROUNDS REQUIRE FIRE
LANE IDENTIFICATION

FIGURE 18

CHAPTER 5.000
WATER RESOURCE MANAGEMENT

5.100 PURPOSE/OBJECTIVES

5.200 DESIGN STANDARDS

Table 1 – Preferred Design Reference

5.201 EASEMENTS

Table 2 – Easements

5.210 HYDROLOGIC DESIGN

Table 3 – Runoff Coefficient (C)

Table 4 – Correction Factor

5.220 HYDRAULIC DESIGN

Table 5 – Safety Factor

Table 6 – Frequently Used Hydraulic Design Criteria

Table 7 – Open Channel Flow

Table 8 – Miscellaneous Grading Criteria

5.225 STORMWATER MANAGEMENT - GENERAL CRITERIA

“SAMPLE” STORMWATER FACILITY TABLE

5.230 STORMWATER MANAGEMENT - TECHNICAL CRITERIA

Table 9 – Stormwater Hotspot Uses and Design Parameters

Table 10 – Acceptable BMP Measures – Petroleum Products and Hazardous Substances

5.300 RESERVED

5.400 FLOODPLAINS

5.410 FLOODPLAIN INFORMATION TO BE SUBMITTED WITH LAND DEVELOPMENT APPLICATIONS

5.411 FLOODPLAIN STUDIES

5.420 RESERVED

5.430 RESERVED

5.440 DEVELOPMENT IN FLOODPLAINS

5.441 DECLARATION OF NO IMPACT TO FLOODPLAIN

5.442 FLOODPLAIN ALTERATIONS

Figure 1 - Level Spreader with Plunge Pool

Figure 2 - Loading Plane of a Building Foundation

Figure 3 - Stack Trash Protection for Low Flow Orifice

Figure 4 - Typical Floodplain Application Process

CHAPTER 5.000

WATER RESOURCE MANAGEMENT

5.100 PURPOSE/OBJECTIVES

- A. The purpose of this chapter is to establish minimum acceptable design criteria necessary to promote adequate drainage and limit adverse impacts upon the health, safety, and welfare of the general public and the County's water resources that may result from unregulated stormwater runoff and to set forth design criteria. An additional purpose is to ensure compliance with relevant state and federal laws and regulations related to water resource management which address pollution control and prevention, runoff volume reduction, stormwater treatment, stream channel protection, and flood protection. To meet these objectives, it is necessary to perform a detailed assessment of a given drainage area, stream geometry, and the natural drainage shed hydrology prior to the development of a stormwater management plan required as part of a land development application. The use of Environmental Site Design (ESD), described in Section 5.200.B, is a recommended technique for addressing these water resource management issues associated with development.
- B. The design of an adequate drainage system must (a) account for both off-site and on-site stormwater runoff; (b) honor natural drainage divides; and (c) adequately convey stormwater runoff in compliance with this chapter. Adequate drainage must also include provisions for overland relief to accommodate stormwater runoff in excess of the design storms without damaging or endangering adjacent structures or properties.
- C. Stormwater management shall be provided in conjunction with proposed development, in accordance with the criteria contained in this chapter. Stormwater management serving single or multiple properties, sites or drainage areas may be incorporated within proposed developments. Regional stormwater management provisions shall be followed in accordance with any County approved drainage districts.
- D. An objective of the County is to promote water quality by implementing Best Management Practices (BMP) measures that address water quality impacts of development on the surface and groundwater resources of the County.
- E. The floodplain management criteria specified within the Zoning Ordinance are based on a formal determination of the regulatory flood elevations. Detailed floodplain studies shall be prepared in accordance with the criteria contained within this chapter.

5.200 DESIGN STANDARDS

- A. Except where specifically supplemented herein, the design provisions of the most current adopted [VDOT Drainage Manual](#), [Virginia Erosion and Sediment Control Handbook](#), [Virginia Stormwater Management Handbook](#), and all other reference documents referred to herein, at the time of application acceptance shall apply in all cases.

Table 1 – Preferred Design Reference– to be utilized when more than one approved reference may address the same design item.

Design Item	Reference
Storm Sewer & Culvert Outlet Protection - Dimensions	Std. & Spec. 3.18 in the Virginia Erosion and Sediment Control Handbook (VESCH)
Riprap Channel Design – Side Slopes $\leq 3:1$	Std. & Spec.'s 3.17 & 3.19 in the VESCH
Riprap Channel Design – Side Slopes $> 3:1$ (Tractive Force Analysis)	Appendix 3.19-a in Std. & Spec. 3.19 in the VESCH
Required Depth of Stone in Riprap Channel Design	Std. & Spec. 3.19 in the VESCH
“Applicable Area” Boundary for Performance-Based Water Quality Calculations	Section 2-3.3 in Chapter 2 of the Virginia Stormwater Management Handbook
Runoff Coefficient (C) for Rational Method Calculations	Appendix 6E-1 in Chapter 6 of the VDOT Drainage Manual
Curve Number, “CN,” for NRCS Calculation Methods	Table 5-5 in Chapter 5 of the VESCH
Roughness Coefficient for Various Man-made and Natural Channels, and Floodplains	Appendix 7D-1 in Chapter 7 of the VDOT Drainage Manual
Maximum Allowable Velocity for Natural Channels – Based on Soil Types & Rockiness	Appendices 7D-2 & 7D-6 in Chapter 7 of the VDOT Drainage Manual
Correction Factor for Maximum Permissible Velocities for Sinuous Natural Channels	Table 5-23 in Chapter 5 of the VESCH
Floodplain Modeling with HEC-RAS – Cross Section Establishment (location, order, orientation, etc.)	Chapter 3 & 5 in the HEC-RAS User’s Manual

B. Environmental Site Design (ESD) techniques as referred to in the Virginia Stormwater Management Handbook may be incorporated into drainage designs in order to meet local and State goals for stormwater management. ESD integrates small-scale stormwater management practices, Low-Impact Development (LID) techniques, non-structural techniques, and better site planning to mimic natural hydrologic runoff characteristics and minimize the impact of land development on water resources. This includes:

1. Optimizing conservation of natural features (e.g., drainage patterns, soils, vegetation, etc.);
2. Minimizing impervious surfaces;
3. Utilizing BMPs located close the pollutant source that reduce stormwater runoff volume such as bioretention facilities, infiltration basins, wet and dry swales, etc.;
4. Slowing down runoff to maintain pre-development stormwater discharge timing and to increase infiltration and evapotranspiration on the development site;
5. Using other non-structural practices or innovative technologies approved by the Director; and,
6. Concurrently planning for stormwater management, density, parking, fire and rescue, tree conservation, and other local requirements.

When designed, constructed, and maintained effectively, ESD achieves numerous stormwater management goals as well as other complimentary ecological, social, and economic benefits, which include the following:

7. Reducing or eliminating stormwater runoff from a site to adjacent impervious surfaces or conveyance systems benefits the watershed as a whole by reducing pollutant loading and erosion from uncontrolled runoff into waterways;
8. The use of infiltration-type BMPs may be used to satisfy both quality and quantity control requirements.
9. ESD practices that preserve existing trees and other vegetation protect and provide habitat and may be used to satisfy both quality and quantity control requirements, as well as Zoning Ordinance requirements.
10. Replacing impervious surfaces with trees and other vegetation can also reduce urban heat island effects, in turn saving energy and improving human comfort.

11. The aesthetic appeal of adding vegetated areas to an urban environment has been shown in multiple studies to benefit human health and well-being as well as increase property values and attractiveness to business patrons.

5.201 EASEMENTS

Floodplain, storm drainage/stormwater conveyance systems, and stormwater management facilities shall be located within an easement dedicated to Loudoun County in accordance with the following table:

Table 2 – Easements

Easement Type	Applicability	Length	Width
Floodplain	All major or minor floodplain on the subject property.	Defined by 100-year floodplain limit.	Defined by 100-year floodplain limit.
Storm Drainage	Overland relief at sump locations on public roads with curb and gutter.	Easement shall extend from the public street to the rear property line of lots abutting the street.	10 feet
Storm Drainage	Overland relief paths located on single-family detached and single-family attached dwelling lots.	Easement shall extend the length of the overland relief path on the lot.	10 feet
Storm Drainage	<u>Manmade open channels:</u> 1) that convey concentrated offsite runoff; or 2) that convey greater than 2 cubic feet per second for the 10-year storm across a residential lot/parcel; or 3) that drains runoff across more than two full residential lots, beginning where the channel enters the third lot.	Easement shall extend the length of the manmade open channel. An easement shall not be required for commercial or multi-family sites that solely convey on-site drainage.	Design flow width, plus 5 feet on each side (15-foot minimum).

Easement Type	Applicability	Length	Width										
Storm Drainage	Storm sewers/culverts.	<p>Easement shall extend the length of the storm sewer and culvert, including outlet protection.</p> <p>An easement shall not be required for 1) on-lot, private driveway or trail culverts, or 2) commercial or multi-family sites that solely convey on-site drainage.</p>	<p>The minimum easement widths are depicted below:</p> <table><tr><th>Pipe Size</th><th>Minimum Easement Width</th></tr><tr><td>Up to 18 inches</td><td>10 feet*</td></tr><tr><td>21 to 33 inches</td><td>15 feet*</td></tr><tr><td>36 to 48 inches</td><td>20 feet</td></tr><tr><td>54 to 72 inches</td><td>24 feet</td></tr></table> <p>*The minimum easement width shall be 20 feet on single-family detached and single-family attached lots less than or equal to 40,000 sf where: 1) storm sewers/culverts are located between the sides of adjacent residential structures and 2) the depth to the pipe invert (bottom of pipe) is 10 feet or greater. The expanded width for this easement shall extend to the lot line or the edge of the dedicated right-of-way or private/public access easement.</p>	Pipe Size	Minimum Easement Width	Up to 18 inches	10 feet*	21 to 33 inches	15 feet*	36 to 48 inches	20 feet	54 to 72 inches	24 feet
Pipe Size	Minimum Easement Width												
Up to 18 inches	10 feet*												
21 to 33 inches	15 feet*												
36 to 48 inches	20 feet												
54 to 72 inches	24 feet												

Easement Type	Applicability	Length	Width
Storm Drainage	Ponding areas at culverts and inlets that are located within or adjacent to a storm drainage easement.	Easement shall completely encompass the 10-year ponding area.	Easement shall completely encompass the 10-year ponding area.
Storm Drainage	Ponding areas at existing culverts and inlets on property not owned or controlled by the applicant.	N/A	No easement required.
Storm Drainage	On-site preserved (natural) open channels that convey greater than 2 cubic feet per second.	Easement shall extend on-site to the floodplain, property line, or the point the conveyance system becomes jurisdictional (intermittent stream, perennial stream, or wetland).	Design flow width, plus 5 feet on each side (15-foot minimum).
Storm Drainage	Stormwater management facilities: above ground structures, including ponds, bioretention areas, etc.	N/A	10 feet beyond embankment toe and the 100-year water surface elevation.
Storm Drainage	Stormwater management facilities: vegetative filter strip used as water quality BMP below a level spreader.	To the end of the filter strip.	Width of level spreader rigid lip.
Storm Drainage	Stormwater management facilities: underground stormwater management structures (e.g., Stormfilter, Filterra, oil/water separators).	N/A	10 feet beyond periphery of the structure.
Storm Drainage	Access roadways for stormwater management facilities.	Length of the access road.	1 foot on each side of the roadway.
VRRM Land Cover Easement	Forest/open space used to meet VRRM requirements.	Defined by the limits of the forest/open space.	Defined by the limits of the forest/open space.

5.210 HYDROLOGIC DESIGN

Unless otherwise specified, all hydrologic analyses shall be based on the existing watershed characteristics and how the ultimate development condition of the subject project will be addressed. The following hydrologic methods and values are acceptable:

- A. The hydrologic methodologies provided by the [Virginia Stormwater Management Handbook](#). The use of the Rational and the Modified Rational Methods shall be limited by the following:
1. In the calculation of the peak discharge for storm sewer and culvert design, the maximum drainage area shall be 200 acres.
 2. In the calculation of the peak discharge and runoff volume for conveyance system protection and flood protection as defined in Section 5.230, the drainage area shall be less than 20 acres and the maximum time of concentration shall be less than 20 minutes.
 3. The Runoff Coefficient (C) shall be consistent with the following table. Values under “Miscellaneous” in the table may be used in a composite calculation. A drainage area map showing individual and cumulative drainage areas contributing to each point of concentration, slope, underlying hydrologic soil group, and cover type shall be provided.

Table 3 – Runoff Coefficient (C)

AREA DESCRIPTION	HYDROLOGIC SOIL GROUP A/B			HYDROLOGIC SOIL GROUP C/D		
	SLOPE RANGE			SLOPE RANGE		
	<2%	2-6%	>6%	<2%	2-6%	>6%
RESIDENTIAL - SINGLE-FAMILY DETACHED (sf = square feet)						
• Single-Family Lots – 40,000 sf or greater	0.29	0.32	0.36	0.34	0.37	0.42
• Single-Family Lots – 20,000 - 39,999 sf	0.32	0.35	0.39	0.37	0.40	0.45
• Single-Family Lots – 15,000 – 19,999 sf	0.36	0.39	0.43	0.41	0.44	0.49
• Single-Family Lots – Under 15,000 sf	0.39	0.42	0.46	0.44	0.47	0.52
SINGLE-FAMILY ATTACHED/MULTI-FAMILY						
• Townhouses and Stacked Multi-Family	0.65	0.67	0.70	0.69	0.71	0.75
• Attached Multi-Family	0.68	0.71	0.74	0.71	0.74	0.78
NON-RESIDENTIAL						
• Industrial, Commercial, and Institutional	0.75	0.78	0.82	0.80	0.83	0.88
MISCELLANEOUS						
• Impervious ^{*1}	0.90	0.90	0.90	0.90	0.90	0.90
• Unimproved Areas ^{*2}	0.50	0.55	0.65	0.50	0.55	0.65

AREA DESCRIPTION	HYDROLOGIC SOIL GROUP A/B			HYDROLOGIC SOIL GROUP C/D		
	SLOPE RANGE			SLOPE RANGE		
	<2%	2-6%	>6%	<2%	2-6%	>6%
• Open Space, Lawns	0.10	0.14	0.18	0.17	0.22	0.26
• Orchard, Vineyard, Pasture or Meadow	0.26	0.30	0.36	0.35	0.40	0.48
• Wooded/Forest	0.13	0.18	0.23	0.22	0.27	0.34
AGRICULTURAL						
• Fallow ^{*3}	0.71	0.76	0.81	0.80	0.85	0.92
• Cultivation with Crops	0.58	0.63	0.68	0.67	0.72	0.79

*¹ includes compacted gravel

*² cleared and graded, but not yet developed

*³ previously cultivated, no crops

4. The Runoff Coefficient (C) shall be multiplied by the frequency-of-event Correction Factor (C_f) below to produce an adjusted Runoff Coefficient to compensate for the reduced effect of infiltration and other hydrologic abstractions during less frequent, higher intensity storms.

Table 4 – Correction Factor

Design Storm	Correction Factor (C_f)
< 25-Year	1.00
25-Year	1.10
50-Year	1.20
100-Year	1.25

Note: $C_f \times C$ shall not exceed 1.0

- B. HEC-1 Model or HEC-HMS Model utilizing Natural Resources Conservation Service rainfall runoff relationships.
- C. Other methods are subject to approval by the Director.
- D. Rainfall intensity and rainfall depth values for Loudoun County are based upon National Oceanic and Atmospheric Administration and VDOT standards that are found at the following County website address: www.loudoun.gov/fsm-rainfall.

5.220 HYDRAULIC DESIGN

This section identifies specific criteria for the design of all drainage systems including sizing, hydraulic performance, easement requirements, pipe materials, etc. Design flows will be determined utilizing methods discussed in this chapter and the drainage system will be sized to collect and/or convey the design flow at all points along the system.

A. General Design Criteria

1. Proposed storm drainage systems shall be designed to convey the runoff from a 10-year rainfall when its intended use is to function as the primary drainage system. The primary drainage system consists of storm sewers, culverts, and open drainageways designed to convey concentrated runoff to adequate channels. The primary system does not include overlot grading and other minor conveyance swales.
2. Drainage systems shall not be terminated at the project boundary unless an adequate channel exists at that point, as defined in this chapter.
3. Drainage systems shall be designed to provide, as a minimum, overland relief for the 100-year rainfall without increasing the flood potential for nearby buildings. All plans shall indicate at least a minimum of 1 foot of overland relief being provided between the relief point and the lowest entry point of any building or an analysis shall be provided to verify that the 100-year water surface elevation will be below the lowest entry point of any building assuming the storm sewer system is 100 percent clogged.
 - a. For residential lots less than one acre in size where the overland relief flow path for a drainage area greater than 0.5 acre is located between the sides of residential structures, both the 1 foot of overland relief and the analysis referenced above shall be provided.
 - b. Construction Plans and Profiles and Site Plans shall depict overland relief drainage paths, proposed topography, the storm sewer system, and any required storm drainage easements for overland relief.
4. The allowable headwater for open end culverts entering a storm sewer system accepting greater than 0.5 acre of drainage in subdivisions with residential lots of 40,000 square feet or less shall be limited to the following:
 - a. Headwater depth for the 10-year design storm shall not exceed 1.5 times the height of the culvert. The controlling headwater depth shall be the greater of the inlet control elevation based on the safety factor or the hydraulic grade line elevation. Headwater depth based on inlet control elevation shall be calculated using the peak

discharge increased by the following safety factor to account for normal culvert obstructions:

Table 5 – Safety Factor

Culvert Height	Safety Factor
Less than 21"	25%
21" – 24"	20%
Greater than 24" or less than 36"	15%
36" – 60"	10%

- b. During a design storm event, the water surface shall be a minimum of 18 inches below the lowest entry point of any building.
5. Culverts, storm sewers, man-made channels and other conveyance systems discharging into open channels shall be designed so as to minimize the skew angle with such open channel. If the skew angle with the centerline of the receiving channel is greater than 45 degrees, install or extend a non-erodible lining so that it encompasses 1.5 times the 10-year flow depth at least 15 feet upstream and downstream of the channel bend.

Table 6 – Frequently Used Hydraulic Design Criteria

Design Item	Design Criteria			Reference
Roughness Coefficients, n , & Maximum Allowable Velocity, v , in feet per second (fps), for Various Sizes of Riprap.	Size	n	v*1	Roughness -Appendix 7D-1 in Chapter 7 of the VDOT Drainage Manual Velocity - Ishbash Equation/Curve
	Class I	0.040	10 fps	
	Class II	0.042	13 fps	
	Class III	0.045	15 fps	
	Type I	0.047	20 fps	
	Type II	0.050	20+ fps	
	*1 Use this criteria when channel side slopes are ≤ 3:1			
Roughness Coefficients, n , & Maximum Allowable Velocity, v , for Vegetative Linings With & Without Erosion-Resistant Matting	Lining	n	v	VDOT Drainage Manual & Virginia Erosion and Sediment Control Handbook (VESCH)
	Grass -maintained	0.035	4 fps*2	
	Grass - not maintained	0.050	4 fps*2	
	Sod -installed per VESCH	0.040	5 fps	
	EC-2 - temporary lining	See Grass	See Grass	
	EC-3 - permanent lining			
	Type A	0.050	7 fps*3	
Type B	0.050	10 fps*3		

Design Item	Design Criteria	Reference										
	<p>*² Lower by 25% for highly erodible soils & 5% - 22% for sinuous channels</p> <p>*³ Use in absence of manufacturer’s information</p>											
Storm Sewer & Culvert Outlet Protection – Velocity, v , vs. Type of Protection	<table><tr><th>v</th><th>Type of Protection</th></tr><tr><td>2 fps to 5 fps</td><td>Sod*⁴ or Class I Riprap*⁵</td></tr><tr><td>5 fps to 8 fps</td><td>Class I Riprap</td></tr><tr><td>8 fps to 18 fps</td><td>Class II Riprap</td></tr><tr><td>v > 18 fps</td><td>Special design energy dissipaters, must meet approval of County and/or VDOT</td></tr></table> <p>*⁴ Sod installed per Std. & Spec. 3.33 in the <u>VESCH</u></p> <p>*⁵ Use “dry” riprap; also, use of natural rock on-site is encouraged when equivalency requirements can be met</p>	v	Type of Protection	2 fps to 5 fps	Sod* ⁴ or Class I Riprap* ⁵	5 fps to 8 fps	Class I Riprap	8 fps to 18 fps	Class II Riprap	v > 18 fps	Special design energy dissipaters, must meet approval of County and/or VDOT	<p>VDOT Drainage Manual &</p> <p>Virginia Erosion and Sediment Control Handbook (VESCH)</p>
v	Type of Protection											
2 fps to 5 fps	Sod* ⁴ or Class I Riprap* ⁵											
5 fps to 8 fps	Class I Riprap											
8 fps to 18 fps	Class II Riprap											
v > 18 fps	Special design energy dissipaters, must meet approval of County and/or VDOT											

B. Storm Sewers/Culverts

1. Drainage design computations, as required by the [VDOT Drainage Manual](#), will be submitted with all Construction Plans and Profiles and/or Site Plans containing storm sewer or culvert drainage systems.
2. The storm sewer and culvert designs shall include the following:
 - a. Construction information, including invert elevations, in and out; size; type of pipe; gauge or class; length and percent of slope.
 - b. Storm sewer appurtenances shall be identified by type and number (i.e., #00, MH-1, or MH-1 #2), including number and length of throats and locations.
3. Culvert pipe sizes shall be determined in accordance with Hydraulic Design Series No. 5, Federal Highway Administration, Department of Transportation, or other VDOT-approved method.

4. Minimum pipe size to be used outside of the public right-of-way shall be 12 inches in diameter, where the distance between access openings is less than 50 feet. The minimum pipe size permitted within the public right-of-way shall be 15 inches, unless otherwise specified in the VDOT Drainage Manual.
5. There may be no reduction in pipe size greater than one standard increment along the direction of flow within a storm sewer system.
6. The minimum cover for all drainage pipes within public or private Category A and B roadways (street) rights-of-way shall be 2 feet, or one-half the diameter of the pipe, whichever is larger. When the storm sewer pipe is laid outside the street right-of-way or within Category C roadways, a minimum of 2 feet of cover shall be required. For Low Impact Design in non-load bearing conditions, a minimum of 1 foot of cover may be provided. If the minimum cover requirements as set forth in this section cannot be met, then stronger pipe classifications may be submitted for approval. Minimum cover for single residential lot driveways shall conform to VDOT standards.
7. Storm sewers shall be designed to provide a minimum velocity of no less than 3 feet per second for design flows of one cubic foot per second or greater. Pipe velocities shall not exceed 18 feet per second to avoid abrasion.
8. Except where noted otherwise, the maximum length between access openings shall be 300 feet for pipes less than 36 inches in diameter or 500 feet for pipes 36 inches in diameter or greater. An access opening may be an inlet, manhole, junction box, or other approved appurtenance.
9. The minimum slope of each segment of the storm sewer lines shall be 0.5 percent.
10. The need for concrete anchors must be investigated on storm sewer lines with slopes of 16 percent or greater. If anchors are required, the design engineer will show a detail on the plans with spacing requirements.
11. Storm sewer pipes larger than 15 inches in size shall not outfall in the front yard of a single family detached lot less than or equal to 20,000 square feet, but should be extended at least to the rear property line. Storm sewer outfalls located in single family attached developments shall extend at least to the rear lot line. If the storm sewer outfalls on a lot, or adjacent to a lot, on which an existing building will remain, sufficient topographic information shall be provided to verify overland relief.

12. The ends, entry or exit, of any storm sewer system and/or culvert shall be provided with a standard end wall, head wall, curb inlet, yard inlet, flared end section, or other appurtenance or structure suitable for the intended use of the facility.
13. In addition to providing a water quality benefit, level spreaders may be used to promote sheet flow across vegetated areas in lieu of channelization. Level spreaders may also be utilized to diffuse flow before it enters a riparian buffer or wetland. The following design criteria shall be followed when utilizing level spreaders for these water quantity control purposes:
 - a. The criteria found at the [Virginia Stormwater BMP Clearinghouse](#), shall be used for design of level spreaders. The maximum allowable design flow to a level spreader shall be 10 cubic feet per second calculated using the Rational Method with a pre-determined rainfall intensity of 1 inch per hour.
 - b. When a level spreader is located within 50 feet of riparian buffers, jurisdictional wetlands, and/or floodplains, additional energy dissipation shall be provided by the addition of a stilling basin. Please see Figure 1 for minimum design parameters for a level spreader with a stilling basin.
 - c. The rigid lip of a level spreader may be constructed of timber for discharges up to 5 cubic feet per second and shall be constructed of concrete for discharges over 5 cubic feet per second.
 - d. Alternate designs which can be shown to promote non-erosive sheet flow shall be subject to approval by the Director.
 - e. In order to apply stormwater pollutant removal credit to the vegetated area below the level spreader, such area must meet the requirements for “Sheet Flow to a Vegetated Filter Strip or Conserved Open Space” found at the [Virginia Stormwater Management BMP Clearinghouse](#).
 - f. The maximum distance that discharge from a level spreader may be considered to remain in sheet flow before reaching a stable outlet is 150 feet. To inhibit the re-concentration of flows, the average slope over the entire length of the sheet flow shall be no greater than 8 percent.
 - g. Level Spreaders adjacent to storm sewer pipe outfalls shall not be located any closer to the invert out of the pipe than the length of required outlet protection.

- h. A level spreader that receives discharge from storm sewer within the VDOT right-of-way is subject to these additional constraints:
 - i. An effort shall be made to provide a minimum 1-foot vertical clearance between the invert out of the storm sewer and the top of the level spreader.
 - ii. If a 1-foot vertical clearance between the invert out of the storm sewer and the top of the level spreader cannot be achieved due to topographic or other site constraints, evidence of positive relief for the 10-year storm without restriction to the hydraulic function of the storm sewer shall be provided.

- 14. No storm sewer shall be located within 5 feet of the loading plane of a building foundation as depicted in Figure 2.

C. Open Channel Flow

- 1. An open channel is defined as a natural or manmade open drainageway. All open channels shall comply with the following table:

Table 7 – Open Channel Flow

Design Parameter	<u>On Lots ≤20,000 sq. ft.</u>	<u>On Lots > 20,000 sq. ft.</u>	<u>On Non-Residential and Common Areas</u>
Max. allowable flow*	2 cubic feet per second	No max., but if > 2 cubic feet per second, open channel should be 50 feet from rear of house and 10 feet from side of house.	No Requirement (NR)
Max. velocity*	4 feet per second	4 feet per second if armor is not provided.	4 feet per second if armor is not provided.
Min. average slope*	2 percent	2 percent	1 percent
Max. width of flow*	10 feet	NR	NR
Max. depth of flow*	12 inches	NR	NR
Preserved natural open channel > 2 cubic feet per second.	Allowed within easement	Allowed within easement	Allowed within easement

* in manmade open channels only.

Modifications may be approved by the Director to achieve ESD.

2. Open channels located inside the public right-of-way shall be designed and constructed in accordance with the [VDOT Drainage Manual](#). The computations and the ditch cross-section shall be submitted with the plan and profile sheets.
3. Open channels conveying over 2 cubic feet per second should be designed for stable, subcritical flow. Local depressions or flat slopes may be allowed along the flow path as part of ESD as long as they are designed to dissipate within 48 hours, unless designed for water retention.

D. Grading Criteria

Overall grading on residential lots less than one acre in size shall meet the following criteria:

1. In addition to the Individual Lot Grading Plan requirements of Chapter 8, overall grading shall illustrate how the proposed house and lot grading will be integrated into the overall drainage system proposed for a particular section of development and shall honor drainage divides used for the storm drainage design.
2. A building footprint shall be illustrated on the individual lots specifying the proposed finished floor elevations for a given lot. The footprint should accommodate the various potential home models without significant alteration of the proposed drainage design and patterns.
3. Miscellaneous grading criteria:

Table 8 – Miscellaneous Grading Criteria

Design Issue	Criteria
Yard slopes \leq 3:1	Stabilize with grass
Yard slopes > 3:1	Use ground cover that does not require regular mowing
Surface drainage over curbs	Yard overlot surface drainage in excess of 2 cubic feet per second (10-year design) should not be directed to overtop the curb and gutter of public or Category A private roads.
Yard grading	To insure positive drainage away from the foundation, provide 6 inches of fall for the first 10 feet and a minimum 2 percent * average grade

Design Issue	Criteria
	thereafter. Local depressions or flat slopes may be allowed along the flow path as part of a low impact development measure as long as they are designed to dissipate within 48 hours, unless designed for water retention.

* The minimum grade may be reduced to decrease disturbed area and to promote tree conservation if positive drainage can otherwise be achieved on the lot.

E. Pipe Materials

1. All pipe used for the construction of drainage systems and/or stormwater management facilities shall be concrete, High Density Polyethylene (HDPE), or Polypropylene, as specified below. Alternate materials can be utilized where specifically permitted below or in accordance with variations (WAIV) granted by the Director of Building and Development pursuant to FSM Section 1.200.A.
 - a. All concrete pipe shall be a minimum Class III. All HDPE and Polypropylene pipe shall meet the most recently published VDOT specifications. Alternate materials, where permitted, shall meet the current VDOT requirements.
 - b. Metal and/or other plastic pipe may be designated for use on-site where the facility is not located within an easement. All construction and use of these materials must be accomplished in accordance with manufacturer's recommendations.
 - c. Corrugated Metal Pipe used for Category C private roadway culverts shall meet current VDOT specifications.
 - d. HDPE and Polypropylene pipe shall not be permitted in pond embankments.

5.225 STORMWATER MANAGEMENT - GENERAL CRITERIA

A. General Criteria

1. Stormwater management facilities may consist of either above grade or underground facilities; however, underground facilities are permitted only within non-residential areas or high-density residential zones. Above grade stormwater management facilities may be designed as either wet or dry facilities.
2. Stormwater management facilities serving single or multiple properties, sites, or drainage areas may be incorporated within proposed developments.
3. Regional stormwater management is defined as facilities and/or design criteria identified in a County approved drainage district study to control increases in runoff from developed sites within the established district. Stormwater management requirements identified with these studies must be met in conjunction with any applicable land development activity.
4. All stormwater management facilities shall be located within an easement dedicated to Loudoun County. Such facilities shall be maintained by the landowner, an owners or homeowners association, or other legal entity approved by the Board of Supervisors, to the extent not maintained by the County pursuant to Chapter 1096 of the [Codified Ordinances of Loudoun County](#) (C.O.). Maintenance responsibilities shall be established in the required Deed of Dedication, in a form acceptable to the County Attorney.
5. ESD techniques may be incorporated into stormwater management designs.
6. Regular maintenance is vital to the proper functioning of stormwater management facilities. Designs shall consider and address the future operation and maintenance requirements of stormwater management facilities.
 - a. All required access-ways and easements shall be designated on plans and cleared, graded, or constructed with the facility construction.
 - b. Proximity of facilities to the public right-of-way shall be considered in order to minimize the length of the access-way.
 - c. Multiple access paths to major facilities should be provided.
 - d. Specifically delineated access easements may be required where stormwater management facilities are surrounded by residential lots.

7. All stormwater management retention ponds (wet ponds) that are not subject to a separate negotiated stormwater maintenance agreement with the County pursuant to Chapter 1096 of the C.O. must be periodically maintained and inspected by the property owner or HOA in accordance with the [Virginia Stormwater Management Handbook](#). Such maintenance may include removal of silt, litter and other debris from all catch basins, inlets and drainage pipes, grass cutting and vegetation removal, and necessary replacement of landscape vegetation and any repair or replacement of structural features. The legal documents recorded to grant the easement for the stormwater management facilities must provide for an annual inspection and report in accordance with Chapter 1096 of the C.O.
8. When outfalls from stormwater management facilities are discharged to a receiving channel, energy dissipators shall be placed at the outfall as necessary to provide a stabilized transition from the facility to the receiving channel.

B. Facility Design Standards

1. Where required by previous approvals, Preliminary Stormwater Management Plans prepared in conjunction with proposed development shall include the following information:
 - a. General location of proposed centralized stormwater management facilities shown on available topographic mapping.
 - b. Drainage area delineation and computations for each facility.
 - c. Preliminary calculations to identify sizing criteria.
 - d. Proposed phasing of facility construction in conjunction with development phasing.
2. A narrative and table shall be provided with all stormwater management designs which includes the following information:
 - a. A description of pre- and post-development site conditions.
 - b. An explanation of the stormwater management strategies used to meet both the water quantity and water quality technical requirements of this Chapter.
 - c. A tabular description of the stormwater management facilities employed which includes:

- i. Type of facility and County-assigned Facility Identification Number (FCTID).
- ii. Location of facility, to include geographic coordinates. This information may be shown on the plans in lieu of the narrative.
- iii. Acres treated.
- iv. Description of the discharge point.

“SAMPLE” STORMWATER FACILITY TABLE

SWM/BMP Facility name	FCTID Number*	Type of Facility	Impervious Acres Treated/Total Acres Treated	Latitude	Longitude	Description of Discharge Point
Ex. Pond 1	WP0095	Level 2 Wet Pond	14.25/32.50	39.1139	-77.5620	Proposed riprap outlet protection apron discharges directly to well-defined, stable natural channel approximately 150' upstream of the property line.

*Assigned by the County.

- d. The mechanism thorough which the facilities will be operated and maintained after construction is complete.
3. Computations submitted with detailed designs for proposed stormwater management facilities to demonstrate the attenuation of stormwater runoff (e.g., wet ponds, extended-detention ponds, oversized stormwater pipes or vaults, etc.) shall include the following information:
 - a. Stage - storage relationship for the facility.
 - b. Stage - discharge relationship for the proposed outfall structure(s) including computations.
 - c. Routing program utilized (may not be applicable in conjunction with facilities designed using previously approved graphical and/or short cut methodologies).

- d. Hydrologic computations as provided in this chapter.
- 4. The minimum low flow orifice diameter to be used for facilities which provide extended detention is 2.5 inches with open grill trash protection. If the “stack” filtering system (see Figure 3) is utilized for trash protection, the orifice diameter may be reduced to 1.75 inches.
- 5. All dry stormwater management facilities shall incorporate appropriate provisions for low flow conveyance without using concrete trickle ditches.
- 6. Underground Stormwater Management Facilities – Design of Underground Stormwater Management Facilities including water quality inlets shall include the following information:
 - a. For structures that rely on soil suitability, a geotechnical report shall be provided which addresses the soil suitability, compatibility with materials to be used, and pH and corrosiveness of the soil and water runoff from the drainage area.
 - b. Demonstrate that the facility will meet all stormwater management regulations of this chapter.
 - c. Detailed description and specifications of the facility, how the facility will be constructed or installed, and the manufacturer’s and/or designer’s recommendations for maintenance and maintenance schedule shall be provided.
- 7. Stormwater Management Facilities with Infiltration – Design of measures that rely on infiltration (through either engineered media, stone, or in situ soils) shall include the following:
 - a. Verification that the Seasonal High Water Table (SHWT), to include the “perched” condition, is at least 2 feet below the bottom of the facility, which shall be accomplished by one of the following methods:
 - i. Observation of ground water monitoring wells over a 12-month period. Testing duration may be reduced if testing is only performed from November 1 through May 31. Months June through October shall not be included unless the value of the Palmer Drought Severity Index (PDSI) is equal to or greater than 2.0 (i.e. wet).
 - ii. Site-specific evaluation of the redoximorphic features within the soil profile by a Virginia Licensed Soil Scientist (C.P.S.S), Certified Professional Geologist (C.P.G.),

Professional Wetland Delineator (PWD), or Licensed Professional Engineer (P.E.) who has completed a soil morphology training class offered through Northern Virginia Soil and Water Conservation District (NVSWCD) or equivalent as determined by the Director.

- a) The evaluation shall include a soil description that includes all soil horizons and are described per ASTM D-2488 (Description and Identification of Soils Visual-Manual Procedure) or National Cooperative Soil Survey standards as set forth in the [National Soil Survey Handbook](#). Colors shall be identified using the Munsell System of Color Notation.
 - b) Fieldwork shall be documented as being performed by the professional who meets the certification requirements in subsection ii above.
 - c) All fieldwork shall be subject to review and confirmation by the County.
- iii. Use of data from the USDA Soil Data Mart.
- iv. However, if the 2-foot separation between the bottom of the facility and the SHWT cannot be achieved, the incorporation of an underdrain system and an impermeable clay ($K_{sat} \leq 1 \times 10^{-6}$ cm/s) or geotextile liner (minimum 30 mil thickness) is acceptable.
- b. A geotechnical report that demonstrates that the depth to bedrock is at least 2 feet below the bottom of the facility. If the minimum 2-foot separation between the bottom of the facility and bedrock cannot be achieved, the incorporation of an underdrain system and an impermeable geotextile (minimum 30 mil thickness) or impermeable clay liner ($K_{sat} \leq 1 \times 10^{-6}$ cm/s) is acceptable.
8. The following information shall be included with designs for dam embankments related to stormwater management or recreational water impoundments.
- a. A geotechnical report shall be provided which addresses the soil seepage through the embankment and body of the pond, contains an embankment design, and addresses the soil and water pH and erosiveness related to the principle spillway pipe materials.

- b. No landscape plantings other than grass or groundcover shall be proposed on the dam embankment.
 - c. The pond outfall shall be far enough from the property line to achieve an adequate transition in accordance with the [Virginia Stormwater Management Handbook](#) and the [Virginia Erosion and Sediment Control Handbook](#).
 - d. Low-level drains shall be provided for wet ponds to facilitate maintenance and sediment removal where a gravity outfall is available.
 - e. Pond structures shall be engineered to assure structural integrity during the 100-year storm event.
9. The Virginia Soil and Water Conservation Board regulates certain impounding structures defined therein (see Virginia Dam Safety Act, Section 10.1-604 et seq.). The design criteria presented below apply to impounding structures (wet ponds) which have a height greater than or equal to 6 feet and are governed by the Virginia Dam Safety Act. These impounding structures shall also conform to all design criteria listed in the [State Impounding Structure Regulations](#) (4VAC50-20-10 et seq.). In addition, the design criteria presented below apply to all impounding structures which have a height greater than or equal to 15 feet.
- a. The height of the dam (H_d) shall be defined as the vertical distance from the natural bed of the stream or watercourse measured at the downstream toe of the impounding structure to the top of the impounding structure.
 - b. A slope stability analysis shall be performed to address seepage through the structure, pore water pressure within the structure, slope pressure, and slope protection.
 - c. Emergency spillways shall be designed to pass at minimum a 100-year storm with the primary spillway assumed to be 100 percent clogged without endangering the integrity of the impounding structure.
 - d. A maintenance program shall be provided to the Department of Building and Development and implemented in conformance to "Safety Evaluation of Small Earth Dams", 2nd Ed., Natural Resources Conservation Service, Virginia Department of Conservation and Historic Resources.

- e. An Emergency Action Plan, as defined in the Act, shall be submitted and maintained by the owner of the dam. The owner shall be responsible for notifying the 24 Hour Dispatch Center at "911".

5.230 STORMWATER MANAGEMENT - TECHNICAL CRITERIA

Adherence to the technical criteria in the Virginia Stormwater Management Program Permit Regulations (9VAC25-870-10 et seq.), the [Virginia Stormwater BMP Clearinghouse](#), and in this Chapter shall be required. Variations (WAIV) of the requirements of this section pursuant to FSM Section 1.200.A shall not be permitted. Instead, the Director may grant exceptions to the requirements of this Section in accordance with Chapter 1096 of the C.O.

A. Water Quantity Criteria

1. General Requirements

- a. Concentrated stormwater runoff from development sites shall be discharged directly into a conveyance system, such as a well-defined natural or constructed receiving channel, pipe, or pipe system. A receiving channel shall have a defined bed and bank, verified by either of the following:
 - i. The cross section of the receiving channel has a maximum bottom width to flow depth ratio of 35:1; or,
 - ii. For a receiving channel with a bottom width to flow depth ratio greater than 35:1, photos of the cross-section and overbank areas, along with any pertinent calculations shall be provided to show that channel meandering and erosion will not occur and that flow moving into overbank sections will not adversely impact the adjacent property.
- b. Conveyance system protection and flood protection analyses shall be provided at every discharge point of concentrated flow originating from site improvements.
- c. Increased volumes of sheet flow originating from site improvements that may cause erosion or flooding on down-gradient property shall be identified and diverted to a stable outlet or stormwater management facility that provides the required conveyance system protection and flood protection.
- d. Offsite stormwater management facilities may be utilized to meet the requirements of this section where (1) it can be shown that the stormwater management facility was designed to accommodate the subject area, and (2) an approved maintenance agreement with the owner of the stormwater management facility is executed in accordance with Chapter 1096 of the C.O.

2. Conveyance System Protection

Conveyance systems shall meet the following criteria:

- a. When stormwater from a development is discharged to a Manmade Conveyance Systems – Constructed or improved open channels, culverts, and storm sewer.
 - i. The manmade conveyance system shall convey the post-development peak flow rate from the 2-year 24-hour storm event without causing erosion of the system; or
 - ii. The Energy Balance Methodology described in Section 5.230.A.2.c. shall be met.
- b. When stormwater from a development is discharged to a Restored Conveyance Systems – Streams restored using natural channel design techniques which include an analysis of geomorphic processes to create, rehabilitate, restore or stabilize the channel so that it conveys its bankfull storm event within its banks and allows larger flows to access its floodplain.
 - i. The development, in combination with other stormwater runoff to the stream, shall be consistent with the design parameters of the restored conveyance system that is functioning in accordance with the design objectives; or
 - ii. The Energy Balance Methodology described in Section 5.230.A.2.c. shall be met.
- c. When stormwater from a development is discharged to a Natural Conveyance Systems – Natural perennial or intermittent streams, unimproved ephemeral channels, or swales.

The maximum peak flow rate from the post-development 1-year 24-hour storm shall be calculated in accordance with the Energy Balance Methodology below or another methodology that is approved by the Director and the Water Control Board.

Energy Balance Methodology

$$Q_{\text{Developed}} \leq I.F. \times (Q_{\text{Pre-Developed}} \times RV_{\text{Pre-Developed}}) / RV_{\text{Developed}}$$

Under no circumstances shall $Q_{\text{Developed}}$ be greater than $Q_{\text{Pre-Developed}}$ nor shall $Q_{\text{Developed}}$ be required to be less than that calculated in the equation $(Q_{\text{Forest}} \times RV_{\text{Forest}}) / RV_{\text{Developed}}$; where,

$Q_{\text{Developed}}$ = The allowable peak flow rate of runoff from the developed site.

I.F. (Improvement Factor) = 0.8 for sites greater than one acre, or 0.9 for sites less than or equal to one acre.

$RV_{\text{Developed}}$ = The volume of runoff from the site in the developed condition.

$Q_{\text{Pre-Developed}}$ = The peak flow rate of runoff from the site in the pre-developed condition.

$RV_{\text{Pre-Developed}}$ = The volume of runoff from the site in the pre-developed condition.

Q_{Forest} = The peak flow rate of runoff from the site in a forested condition.

RV_{Forest} = The volume of runoff from the site in a forested condition.

d. Limits and Scope of Analysis

i. Unless Section 5.230.A.2.c. is utilized to show compliance with the conveyance system protection criteria, conveyance systems shall be analyzed to a point where either:

- a) Based upon on land area, the site's contributing drainage area is less than or equal to 1 percent of the total watershed area; or,
- b) Based on peak flow rate, the site's peak flow rate from the 1-year 24-hour storm is less than or equal to 1 percent of the existing peak flow rate from the 1-year 24-hour storm prior to the implementation of any quantity control measures.

ii. The following information shall be provided in the conveyance system protection analysis:

- a) Manmade Open Channels:

- 1) At a minimum, for the first 150 feet, field surveyed cross-sections shall be analyzed every 50 feet and wherever there is a reasonably substantial change in stream geometry, roughness coefficient, or slope. Non-uniform sections may require analysis of additional cross-sections, particularly at constrictions or changes in flow characteristics.
 - 2) After the first 150 feet, to the downstream limit of the analysis, a narrative based on visual inspection shall be provided. Any cross-section that requires analysis may be portrayed using the Loudoun County Geographic Information System or approved plan information when available.
- b) Pipe Systems and Pipes: For pipe systems (i.e., storm sewer), segments shall be analyzed and if the potential exists for surcharge of the system, a hydraulic grade line shall be provided. For individual pipes (e.g., culverts), a controlling headwater must be determined from the energy grade line (as depicted in VDOT design form LD-269) or through a stormwater routing calculation (as depicted in U.S. Department of Transportation's HY-8).

3. Flood Protection

- a. Conveyance systems shall meet the following criteria:
- i. Stormwater discharges to conveyance systems that currently do not experience localized flooding during the 10-year 24-hour storm:
 - a) The post-development flow from a 10-year 24-hour storm shall be confined in the conveyance system to avoid the localized flooding.
 - b) Detention of stormwater or downstream improvements may be utilized to meet this criterion.
 - ii. Stormwater discharges to conveyance systems that currently experience localized flooding during the 10-year 24-hour storm:

- a) The post-development flow from the 10-year 24-hour storm shall be confined in the conveyance system to avoid the localized flooding; or
- b) The post-development peak flow rate for the 10-year 24-hour storm shall be released at the pre-development peak flow rate for the 10-year 24-hour storm.
- c) Detention of stormwater or downstream improvements may be utilized to meet these criteria.

b. Limits of Analysis

Conveyance systems shall be analyzed to a point where:

- i. Based upon land area, the site's contributing drainage area is less than or equal to 1 percent of the total watershed area draining to a point of analysis in the downstream conveyance system; or,
 - ii. Based on peak flow rate, the site's peak flow rate from the 10-year 24-hour storm is less than or equal to 1 percent of the existing peak flow rate from the 10-year 24-hour storm prior to the implementation of any quantity control measures; or
 - iii. The stormwater conveyance system enters the floodplain.
4. The specific design storms shall be defined as either a 24-hour storm using the rainfall distribution recommended by the Natural Resources Conservation Service when using these methods or as the storm of critical duration that produces the greatest required storage volume at the site when using a design method such as the Modified Rational Method. Pre-development and post-development runoff characteristics shall be verified by site inspections, topographic mapping or surveys, available soil mapping or studies, and calculations that are consistent with good engineering practices.
5. For purposes of computing runoff, all pervious lands in the site shall be assumed prior to development to be in good condition (if the lands are pastures, lawns or parks), with good cover (if the lands are woods), or with conservation treatment (if the lands are cultivated), regardless of conditions existing at the time of computation, unless an engineered on-site analysis indicates different conditions and is included with the plan submission.

6. Applicants are encouraged to provide photographs portraying the existing condition of natural and manmade stormwater conveyance systems to support the conveyance system protection and flood protection analyses.
7. Engineering information from previously approved plans or record drawings (if available) may be used where it can be demonstrated that the assumptions and flow parameters used to design or analyze the downstream system are still valid.
8. The Department of Environmental Quality's Runoff Reduction Method Development Compliance Spreadsheet and accompanying Virginia Runoff Reduction Method Users Guide found at the [Virginia Stormwater BMP Clearinghouse](#) may be utilized to demonstrate overall compliance with Conveyance System Protection and Flood Protection requirements as follows:
 - a. Bioretention, permeable pavement, or similar BMPs which infiltrate and delay the release of runoff may receive credit for volume reduction through a Curve Number (CN) reduction.
 - b. Actual peak flow reductions by infiltration-type BMPs based upon detailed storage and flow routing calculations may also be utilized to demonstrate compliance.
 - c. CN reduction shall not be accepted for the design of downstream conveyance structures, such as roadway culverts, bridges, etc.

B. Water Quality Criteria

These criteria are based upon the State's runoff reduction methodology, which includes treatment of the whole development site as well as allotting pollutant removal credit for volume reduction and particulate settling and filtering.

For all regulated land-disturbing activities, the following minimum water quality criteria shall be met.

1. Performance Criteria
 - a. New Development: The total phosphorus load from new development shall not exceed 0.41 pounds / acre / year.
 - b. Development on Prior Developed Lands:
 - i. For land-disturbing activities disturbing greater than or equal to one acre resulting in no-net increase in impervious cover from the pre-development condition, the total phosphorus

load shall be reduced at least 20 percent below the pre-development total phosphorus load.

- ii. For land-disturbing activities disturbing less than one acre resulting in no-net increase in impervious cover from the pre-development condition, the total phosphorus load shall be reduced at least 10 percent below the pre-development total phosphorus load.
- iii. For land-disturbing activities that result in a net increase in impervious cover from the pre-development condition, the performance criteria for new development shall be applied to the increased impervious area, and subsections i or ii shall be applied to the remainder of the site.
- iv. In lieu of subsection iii, the total phosphorus load of a linear development project occurring on prior developed lands shall be reduced by 20 percent below the pre-development total phosphorus load.
- v. In no case shall the total phosphorus load be required to be reduced to below the performance criteria for new development.

2. Calculation Procedures to Demonstrate Compliance

- a. The Department of Environmental Quality's Runoff Reduction Method Development Compliance Spreadsheet and accompanying Virginia Runoff Reduction Method Users Guide found at the [Virginia Stormwater BMP Clearinghouse](#) shall be utilized to demonstrate compliance with the performance criteria in Section 5.230.B.1.
- b. In utilizing the Spreadsheet identified in subsection a, compliance with the pollutant load limits in the performance criteria shall be achieved for the entire site. However, if the site has multiple discharge points, the analyses may be completed for individual drainage areas and the sum of the treatment achieved in the individual areas shall meet the required pollutant load reduction for the entire site.
- c. Drainage areas within different Hydrologic Unit Codes, as defined in the most recent version of Virginia's 6th Order National Watershed Boundary Dataset, shall be evaluated individually in the Spreadsheet.

3. Stormwater Management BMP Design

- a. Only BMPs included at the Virginia Stormwater BMP Clearinghouse shall be utilized for pollutant removal credit, unless otherwise approved by the Director and the State Water Control Board.
- b. BMP designs shall be consistent with those found at the Virginia Stormwater BMP Clearinghouse. The Director may approve minor modifications to the Virginia BMP Clearinghouse design, as long as the intended performance of the BMP remains intact.
- c. If available, stormwater offsite compliance options may be utilized to meet phosphorus reductions as set forth in Virginia Stormwater Management Program (VSMP) Regulations (9VAC25-870-69).

4. Reservoir Protection Requirements

- a. All development shall provide a minimum 300-foot separation from the existing or planned shoreline of the impoundment area of any public drinking water reservoir to any land disturbing activity with the exception of the following uses:
 - i. Placement of natural trail material such as leaf litter, mulch, etc. for the creation of pedestrian access without the removal of trees which requires excavation.
 - ii. Planting of native vegetation.
 - iii. Infrastructure related to the operation and maintenance of the reservoir.
 - iv. Variations (WAIV) pursuant to FSM Section 1.200.A may be considered by the Director for other land disturbing activities with appropriate mitigation measures.
- b. All development within the Goose Creek Reservoir Protection Area, as defined as an area within a five (5) mile radius upstream of the dam must adhere to the following standards:
 - i. At the time of submission of the first preliminary plat for a project to be developed in multiple phases or sections, a conceptual stormwater management plan shall be submitted outlining proposed water quantity and water quality facilities. The purpose of the plan is to ensure a

comprehensive approach to managing runoff from the property is achieved.

- ii. The post-development nonpoint source pollutant load shall not exceed the pre-development pollutant load based upon an average land cover condition of 10 percent impervious cover.
- iii. In no event shall less than 75% native plant materials be used for vegetated water quantity and water quality facilities.
- iv. All storm drainage inlet structures shall be marked to indicate that they drain to the drinking water supply and that no dumping into such inlet structures is permitted.
- v. All erosion and sediment control practices must adhere to Chapter 1220 of the [Codified Ordinances of Loudoun County](#), Chapter 7 of this manual, and the latest edition of the [Virginia Erosion and Sediment Control Handbook](#). In addition, the following more protective measures apply:
 - a) Super silt fence will be substituted for silt fence in all perimeter locations.
 - b) Sediment traps and basins will provide double the minimum required volume (286 cubic yards per acre), except that this volume may be reduced to avoid impacts to sensitive environmental features (e.g., streams, wetlands, forest cover, steep slopes).
 - c) The use of stabilization matting will be expanded to aid in establishment of vegetation.
 - d) Development phasing should be utilized to avoid extensive areas of disturbance for extended periods of time.

C. Particular Uses

1. **HOTSPOTS.** A stormwater hotspot is defined as a land use or activity that generates higher concentrations of hydrocarbons, trace metals or toxicants than are found in typical stormwater runoff. A greater level of stormwater treatment may be needed at hotspot sites to prevent pollutant wash off after construction. This may involve preparing and implementing stormwater pollution prevention measures that reduce the generation of pollutants by preventing contact with rainfall.

The following chart includes examples of stormwater hotspot uses/activities along with design parameters and limitations for utilizing oil/water separation and infiltration BMPs in treating hotspot runoff. Hotspot requirements only apply to the portion of the site where the use or activity is located.

Table 9 – Stormwater Hotspot Uses and Design Parameters

LAND USE / ACTIVITY	NOTES	OIL/WATER SEPARATION* REQUIRED?	<u>INFILTRATION</u> R = Restricted** N = Not Allowed***
Vehicle Service and Vehicle Maintenance Facilities		YES	N
Vehicle and Equipment Cleaning Facilities	Examples include car washes and detailing centers	YES	N
Fleet Storage	Examples include trucking companies, municipal fleets (e.g., buses, trash collection vehicles, or rental car companies and car dealerships with 20 or more parking spaces)	YES	N
Construction Business	Examples include paving, heavy equipment storage, and equipment maintenance	YES	N
Parking Lots	Lots with a minimum of 40 spaces	NO However, oil/water separation is required if parking lot is associated with a hydrocarbon hotspot.	R
Convenience Stores and Fast-Food Restaurants		NO However, oil/water separation is required if these uses include dispensing of petroleum products.	R However, infiltration is not allowed if dispensing of petroleum products is part of the use.

LAND USE / ACTIVITY	NOTES	OIL/WATER SEPARATION* REQUIRED?	<u>INFILTRATION</u> R = Restricted** N = Not Allowed***
Outdoor Liquid Container Storage (other than hydrocarbons)		NO	N
Outdoor Loading/Unloading Facilities		YES	R
Facilities that Generate or Store hazardous materials (other than hydrocarbons)		NO	R
Storing and Dispensing of Petroleum Products	See Section 5.230.C.4.d	YES	N
Commercial Container Nursery or Garden Center		NO	R
Golf Courses	See Section 5.320.C.3	NO	R
Chemical Storage (other than petroleum products)		NO	N
Sale or Transfer of Contaminants (other than petroleum products)		NO	N
Dry Cleaning Operations		NO	N
Emergency Generator Fueling Operation	See Section 5.230.C.4.d	NO	N/A
Chemically Treated Water Features	See Section 5.230.C.5	NO	N

*Oil/water separation via hydrodynamic (swirl) or gravity oil-water separators; frequently located upstream of a primary BMP, such as a bioretention facility or wet pond.

**Restricted – a minimum of 50% of the BMP treatment volume (Tv) shall be treated by a bioretention or filtering BMP prior to treatment by an infiltration facility that allows exfiltration into the underlying soil.

***Not Allowed – treatment by an infiltration facility that allows exfiltration into the underlying soil is not allowed.

2. Hotspot locations shall be identified in the Pollution Prevention Plan that is submitted in order to obtain a Virginia Stormwater Management Program (VSMP) Permit.

3. Golf Courses.

Notwithstanding the requirements for a site plan as contained in the Zoning Ordinance and Land Subdivision and Development Ordinance, where no structures are proposed, construction plans and profiles may serve as a site plan. In addition to other BMP measure requirements provided in this section, golf courses shall meet the following performance standards:

- a. Managed turf shall be reduced by including areas of rough devoted to native plants, natural environments and wildlife habitat enhancement
- b. An Integrated Pest Management and nutrient management plan shall be submitted for review and approval
- c. Native or naturalized landscaping shall be used to the extent possible
- d. Natural vegetation and trees along streams shall be retained to the extent possible
- e. Stream crossings shall be minimized
- f. Irrigation, drainage and retention systems shall be designed to provide for efficient use of water and the protection of water quality
- g. Water reuse strategies shall be employed when feasible
- h. Participation in the Audubon Cooperative Sanctuary Program is encouraged; and
- i. Adherence to the “Environmental Principals of Golf Courses in the United States,” published by the Center for Resource Management is encouraged.

4. Petroleum Products and Hazardous Substances

In order to adequately protect surface water and groundwater quality, land uses and activities that propose storing, handling and/or dispensing petroleum products and hazardous substances shall meet the following standards:

- a. Oil/water separation shall be required for all facilities that engage in activities (other than agricultural) that potentially generate oily runoff, including, but not limited to, vehicle maintenance/washing/detailing, fuel storage/dispensing, and machine and paint shops. When runoff is directed to a stormwater conveyance system, oil/water separation shall be utilized. The following BMP measures are acceptable; alternative measures can be utilized in accordance with waivers granted by the Director:

Table 10 – Acceptable BMP Measures – Petroleum Products and Hazardous Substances

BMP/Practice	Design Criteria	Comments
Hydrodynamic Separators	Use Manufacturer's Standards and the Virginia Stormwater BMP Clearinghouse .	These are preferred structural measures because of their efficient separation of oil, sediment, and debris and maintenance considerations. The installation of such BMPs may receive pollutant removal credit.
Traditional 3-Chamber Gravity Separators	Provide a total minimum wet storage volume of 400 cubic feet per acre. Stokes Law shall be used to design the oil separation chamber. Maximum 1-acre drainage area.	Maintenance intensive. No pollutant removal credit shall be received as literature shows poor performance with pollutants other than oil waste.
Coalescing Plate Separators	Design shall be based upon efficiency of the plate or plate system and Stokes Law.	Same as Traditional 3-Chamber Gravity Separator.

BMP/Practice	Design Criteria	Comments
Water Quality (dry) Swale or Bioretention Filter (both with Underdrains)	Reference the Virginia Stormwater BMP Clearinghouse . Provide impermeable fabric on the bottom of facility to prevent groundwater contamination.	Use only with less intense hotspot uses such as vehicle storage (without maintenance facility or fueling operations). The installation of such BMPs may receive pollutant removal credit. Maintenance requirements are low to moderate.

- b. Secondary containment shall be required for activities that propose storing, handling and/or dispensing of petroleum products (except for liquefied petroleum gas) and hazardous substances. The secondary containment shall be designed to provide a means of detecting material loss from the primary container; sufficient/compatible containment of the loss; retrieving the loss; and correcting the deficiency. For groups of tanks/containers, the secondary containment must be able to hold the contents of the largest container plus precipitation (if there is no roof). Temporary secondary containment shall be provided for construction sites that use petroleum products or hazardous substances.
- c. For fuel tanks that contain petroleum products, a “double-walled” fuel tank with a fuel loss sensor is an acceptable method to provide secondary containment.
- d. Dispensing of fuel and fuel storage related to emergency generators may be treated without the installation of a structural measure for oil/water separation. Due to the limited number of times per year that fuel dispensing will occur and the reduced chance for oil-laden runoff from the operation to reach stormwater conveyance systems, the following items are acceptable alternatives:
 - i. Use of a double-walled fuel tank with loss sensor or traditional secondary containment described above in Section 5.230.C.4.b.; and,
 - ii. Placement of a hydrocarbon-type spill kit adjacent to the fuel tank and generator installation; and,
 - iii. Inclusion of an inspection and maintenance narrative in the site notes as part of the water quality narrative in the

associated development plan. The narrative shall portray a regular schedule of inspections and clean-up of oil slicks and/or oily sludge that could build up over time.

- e. The applicant shall provide evidence that an approved Emergency Response Plan has been filed with and approved by the Loudoun County Department of Fire and Rescue Services.

5. Discharge from Chemically Treated Pools, Fountains, and Similar Water Features

- a. Prior to discharge to storm sewer or other manmade or natural stormwater conveyance systems, chemically treated water from pool draining and filtering operations shall be subject to the following:
 - i. Chlorine or bromine from draining operations or from backwash filters shall be removed (e.g., de-chlorinated).
 - ii. Metallic-based algaecides shall be removed or neutralized.
- b. Solids from filtering operations shall be removed from the discharge and stabilized so that they cannot enter the stormwater conveyance system.
- c. Discharge from deck drains surrounding the pool or other water feature is not subject to subsections 5.a and 5.b above. However, it is recommended that deck drain discharge be allowed to flow across a vegetated area prior to entering a stormwater conveyance system.

5.300 RESERVED

5.400 FLOODPLAINS

- A. Definitions. The terms used in this section are defined in Section 4-1503 of the Revised 1993 Zoning Ordinance.
- B. The following shall be used to implement the Floodplain Overlay District Development Procedures of Section 4-1508 of the Revised 1993 Zoning Ordinance. The following information and floodplain applications shall be submitted to the Director. Refer to Chapter 8 of this manual for the specific requirements of each application type. See Figure 4 for typical floodplain application process.
 - 1. Base flood elevation data.
 - 2. Floodplain Study (FPST), Type I.
 - 3. Floodplain Study (FPST), Type II.
 - 4. Declaration of No Impact (note provided on CPAP and STPL).
 - 5. Floodplain Alteration (FPAL), Type I.
 - 6. Floodplain Alteration (FPAL), Type II.
- C. Floodplain Mapping
 - 1. Loudoun County is a participating community in the National Flood Insurance Program (NFIP). The basis for the delineation of the Floodplain Overlay District (FOD) is the Flood Insurance Study (FIS) and Flood Insurance Rate Map (FIRM) for the County of Loudoun prepared by the Federal Emergency Management Agency (FEMA), Federal Insurance Administration, and any subsequent revisions or amendments thereto approved by FEMA. Information submitted to the County for the administration of the FOD is used by FEMA for periodic updates of the FIRM. As a result, when a Floodplain Study or Floodplain Alteration affects the FOD (Major Floodplain), the FEMA-defined Special Flood Hazard Area (SFHA) of the FIRM will be affected. The applicant shall submit information required by this Section for Floodplain Studies or Floodplain Alterations that affect the FOD (Major Floodplain) to FEMA once authorized by the County.

5.410 FLOODPLAIN INFORMATION TO BE SUBMITTED WITH LAND DEVELOPMENT APPLICATIONS

5.411 FLOODPLAIN STUDIES

Floodplain studies shall be required to meet the base flood elevation data requirements of the Floodplain Overlay District (FOD) of the Zoning Ordinance. Floodplain studies shall be approved prior to approval of the associated construction plans and profiles or site plan application, or if such applications are not required, the associated zoning permit, and shall include information required in Chapter 8 of this manual. For floodplain studies that change the boundary of the FOD (Major Floodplain), a Letter of Map Revision (LOMR) is required from FEMA. The LOMR shall be provided to the County prior to bond release for the associated construction plans and profiles or site plan application. Variations (WAIV) of the requirements of this section pursuant to FSM Section 1.200.A shall not be permitted for development within FOD (Major Floodplain).

- A. Floodplain studies shall not be required for a preliminary subdivision plat application.
- B. The Floodplain Administrator may determine that a floodplain study is not required for the specific circumstances listed below.
 - 1. The proposed development or disturbance has sufficient vertical and horizontal separation from the floodplain.
 - 2. If existing base flood elevation data is the result of a study specifically conducted as part of the current FIRM for the County, and any floodplain study approved by the County subsequent to the effective date of the FIRM.
- C. A Floodplain Study, Type I, is for new technical data that causes minor changes to a previously studied floodplain boundary.
 - 1. A Floodplain Study, Type I, may be submitted in lieu of a Floodplain Study, Type II, for the specific circumstances listed below:
 - a. Floodplain elevations and cross-sections are available from a study specifically conducted as part of the current FIRM for the County, or a floodplain study approved by the County subsequent to the effective date of the FIRM; and
 - b. More accurate topographic data is available for the property; and
 - c. Current upstream and downstream conditions are consistent with the study specifically conducted as part of the current FIRM for the County, or a floodplain study approved by the County subsequent to the effective date of the FIRM.

D. A Floodplain Study, Type II, is a hydrologic and hydraulic analysis performed in accordance with standard engineering practice to determine the boundaries of the floodplain. A Floodplain Study, Type II, shall be prepared in accordance with the following requirements:

1. General

- a. Discharges associated with the 100-year, or 1% annual chance, rainfall event shall be used.
- b. The hydrologic method used shall be based on the regression equations and gauged stream flow data of “FEMA Region III Hydrologic Analysis Loudoun County, Virginia” revised June 2013, or other methods determined to be appropriate and acceptable by FEMA.
- c. Hydraulic modeling shall be conducted using HEC-RAS or other methods determined to be appropriate and acceptable by FEMA. Such other methods shall be approved by the Floodplain Administrator prior to their use.
- d. Model input parameters shall be consistent with the conditions of the watershed and stream corridor using standard engineering practice and subject to approval by the Floodplain Administrator. Model input parameters shall include the starting water-surface elevation determined by either the normal depth (slope area method), a known water-surface elevation, or other approximation methods acceptable to the Floodplain Administrator and roughness coefficients that accurately reflect channel and overbank conditions.

2. Cross-Section Selection and Location

- a. Cross-sections shall be located at:
 - i. Any existing development within the channel or valley of the floodplain.
 - ii. Any proposed development within the channel or valley of the floodplain, including previously approved floodplain alterations.
 - iii. Any floodplain contractions or expansions, sharp changes in invert slope, or abrupt changes in channel roughness.
- b. Cross-sections should be perpendicular to the stream centerline and generated using 2-foot contour interval topography created from

either ground run or aerial survey. When aerial survey is used, field verification of the cross-sections may be required. Ground run survey information shall be provided for any obstruction of the channel or valley of the floodplain resulting from existing development. The base line should be located as closely as possible to the center of the floodplain. Distances along the base line between cross-sections should not exceed 300 feet. Location of cross-sections is subject to the Floodplain Administrator's approval.

3. The floodplain study shall extend a minimum of 300 feet upstream and downstream from the particular site or property. The floodplain study prepared shall be shown to be consistent with other floodplain studies within 1000 feet along the affected stream of the study area.

5.420 RESERVED

5.430 RESERVED

5.440 DEVELOPMENT IN FLOODPLAINS

Any proposed development that affects the FOD (Major Floodplain or Minor Floodplain) shall require approval of a Declaration of No Impact to Floodplain or Floodplain Alteration. Variations (WAIV) of the requirements of Sections 5.440, 5.441, and 5.442 pursuant to FSM Section 1.200.A shall not be permitted for development within FOD (Major Floodplain).

5.441 DECLARATION OF NO IMPACT TO FLOODPLAIN

For the specific types of development listed below, a "Declaration of No Impact to Floodplain" narrative may be submitted in lieu of a Floodplain Alteration. Such a narrative shall be included in the associated Site Plan or Construction Plans and Profiles, or if such applications are not required, the associated zoning permit, and describe the development within the floodplain. Further, the narrative will provide certification that the proposed development within the floodplain will not impact offsite property and will have no impact on the boundaries of the floodplain, configuration of the natural active channel, and base flood elevation.

- A. Installation, repair, or upgrade of underground utility lines and appurtenances that will return the ground to its existing (i.e., predevelopment) grade.
- B. Storm drainage outfall channels.
- C. Clearing activities that do not involve changes to the existing grade.
- D. Excavation activities where the excavated material is removed in its entirety from the floodplain.

5.442 FLOODPLAIN ALTERATIONS

A floodplain alteration shall be submitted for development within the floodplain that is not eligible for a Declaration of No Impact or for which the Floodplain Administrator determines that a floodplain alteration is required in accordance with this Section. A floodplain alteration shall be approved prior to approval of the associated construction plans and profiles or site plan application, or if such applications are not required, the associated zoning permit, and shall include information required in Chapter 8 of this manual. Floodplain alteration analysis requirements are divided into Type I and Type II depending on the type of development. The analysis shall demonstrate conformance with the engineering and environmental criteria for floodplain alterations of the FOD and shall extend upstream and downstream to the point where the altered boundaries of the floodplain generally coincide with the original boundaries of the floodplain. For any floodplain alteration that proposes an increase in the base flood elevation of the FOD (Major Floodplain), a Conditional Letter of Map Revision (CLOMR) from FEMA shall be provided to the County prior to approval of such floodplain alteration. For floodplain alterations that propose an increase in the base flood elevation of the FOD (Major Floodplain) or change the boundary of the FOD (Major Floodplain), a Letter of Map Revision (LOMR) is required from FEMA. The LOMR shall be provided to the County prior to bond release for the associated construction plans and profiles or site plan application.

- A. The Floodplain Administrator may determine that a floodplain alteration is not required for the specific circumstances listed below:
 - 1. Development that will have no impact on the boundaries of the floodplain and base flood elevation, and is not associated with a previously approved Floodplain Alteration.
 - 2. Development that will have no impact on the boundaries of the floodplain and base flood elevation beyond the impacts associated with a previously approved Floodplain Alteration.

The request for such determination shall include a narrative describing the proposed development within the floodplain and grading and stabilization of the affected floodplain, and certification from a Licensed Professional Engineer (P.E.) or Surveyor that the proposed development meets 1. or 2. above. The request shall also be accompanied by an exhibit showing the proposed development within the floodplain with a scale that is sufficient to clearly depict the proposed development.

B. Type I Floodplain Alteration

A Type I floodplain alteration may be submitted separately or as a part of a construction plans and profiles application for driveways serving residential lots and private access easements as provided for by the [Land Subdivision and Development Ordinance](#) and road crossings associated with such driveways and

private access easements. Type I floodplain alteration applications shall conform to the following standards:

1. Option 1:

If no changes to the existing grade of the channel and valley of the floodplain are proposed, a plan shall be provided that illustrates the location and cross-section of the proposed driveway or private access easement and any associated road crossings.

2. Option 2:

If one or more culverts are proposed that meet the criteria below, a plan shall be provided that illustrates the location and cross-section of the proposed driveway or private access easement and any associated road crossings.

- a. The design shall be configured to convey the 10-year storm or bank full conditions.
- b. The cross-section shall demonstrate overland relief for the 100-year storm.
- c. No rise in base flood elevations shall occur beyond the limits of the applicant's property.
- d. Culvert designs and computations shall also be submitted.

Proposed designs for crossings shall be evaluated by the Floodplain Administrator to determine if more detailed engineering is necessary to ensure that there is no potential damage to neighboring property in any direction due to backwater or increased channel velocity. If more engineering detail is necessary, a Type II alteration shall be required.

The Floodplain Administrator may consider culvert and non-culvert design alternatives to the above criteria (i.e., low-flow crossings) if desired by the applicant. In such cases, however, the record plat shall provide a note disclosing the flooding potential of the driveway and private access easement, as applicable.

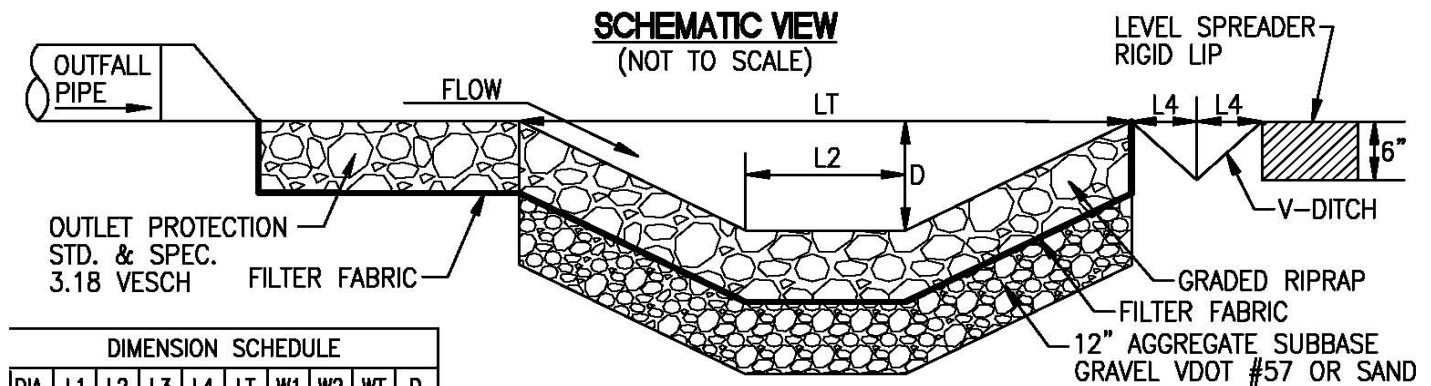
C. Type II Floodplain Alteration

All other development within the floodplain shall require a Type II floodplain alteration. A Type II floodplain alteration shall contain all information required by Section 5.411, Floodplain Studies, or shall be based on a study specifically conducted as part of the current FIRM for the County, or a floodplain study

approved by the County subsequent to the effective date of the FIRM. Additionally, all requirements of Chapter 8 of this manual for Floodplain Alteration shall be met.

LEVEL SPREADER WITH PLUNGE POOL

FIGURE 1



DIMENSION SCHEDULE

DIA.	L1	L2	L3	L4	LT	W1	W2	WT	D
15"	2'	2'	2'	1'	6'	2'	2'	6'	1'
18"	3'	2'	3'	1'	8'	3'	2'	8'	1'
24"	3'	2'	3'	1'	8'	3'	2'	8'	1'
30"	4'	2'	4'	1'	10'	4'	2'	10'	2'

NOTES:

1. RIPRAP SIZE AND THICKNESS WITHIN PLUNGE POOL SHALL MATCH OUTLET PROTECTION AND FSM REQUIREMENTS.
2. FILTER FABRIC MUST BE PERMEABLE AND MEET THE REQUIREMENTS FOUND IN STD. & SPEC. 3.19 IN THE VESCH.
3. CONSTRUCTION MATERIALS AND DESIGN LENGTH FOR LEVEL SPREADER RIGID LIP SHALL BE EQUIVALENT TO LEVEL SPREADER DETAILS AT THE VA. STORMWATER BMP CLEARINGHOUSE.

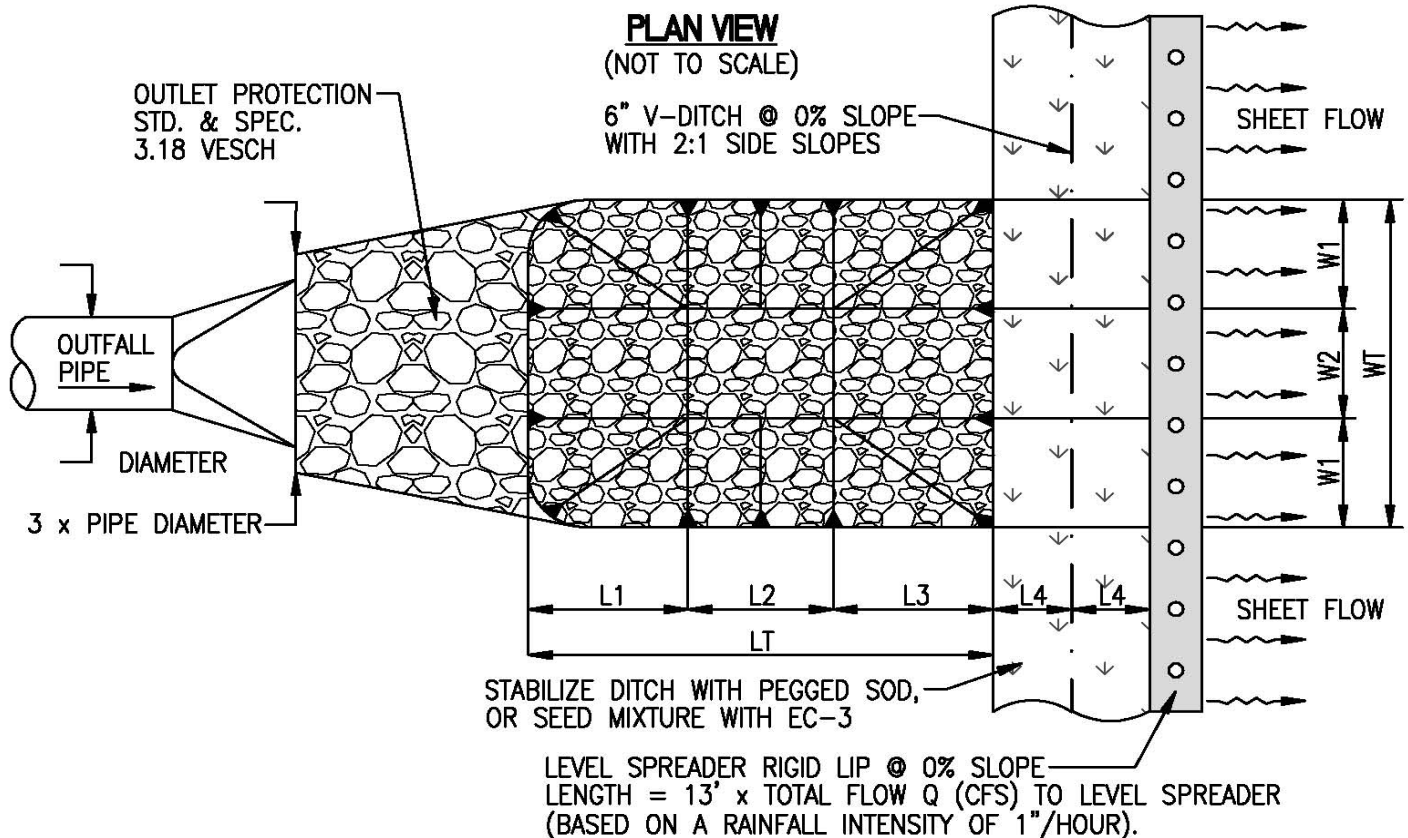


Figure 1 – Level Spreader with Plunge Pool
Effective Date: 02/01/2022

LOADING PLANE OF A BUILDING FOUNDATION (NOT TO SCALE)

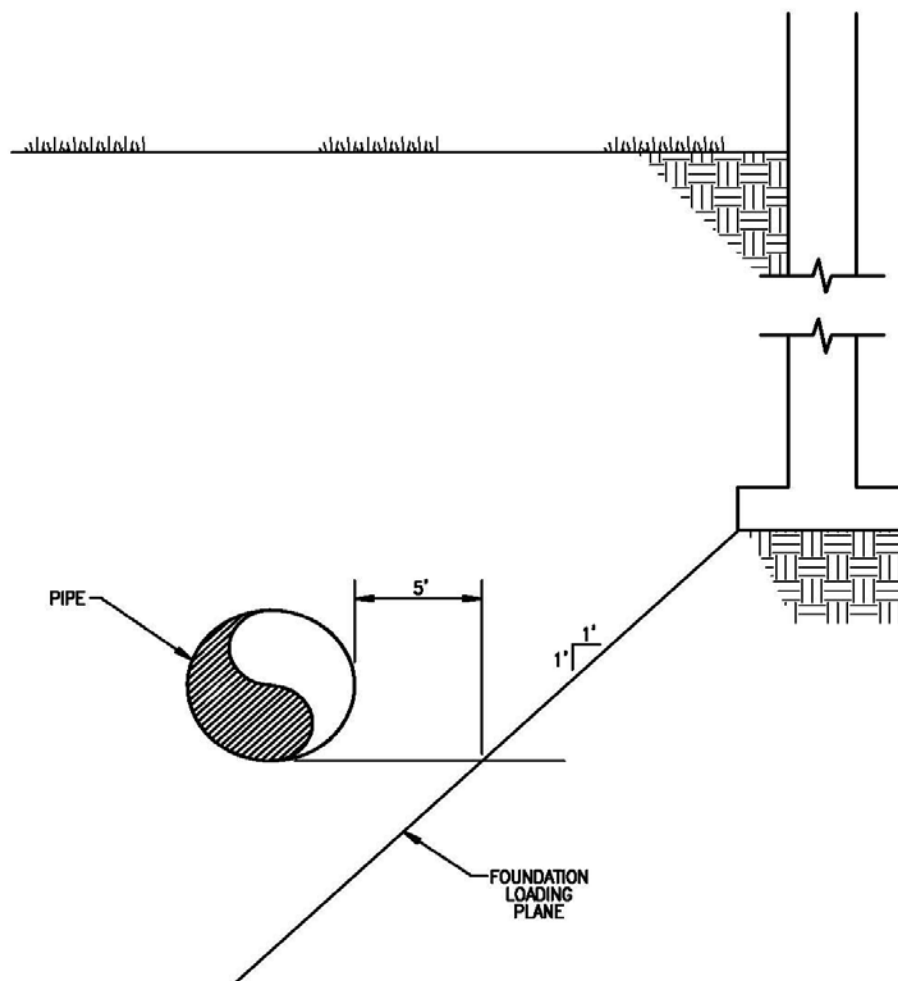


Figure 2 – Loading Plane of a Building Foundation
Effective Date: 02/01/2022

FIGURE 3

STACK TRASH PROTECTION FOR LOW FLOW ORIFICE

(NOT TO SCALE)

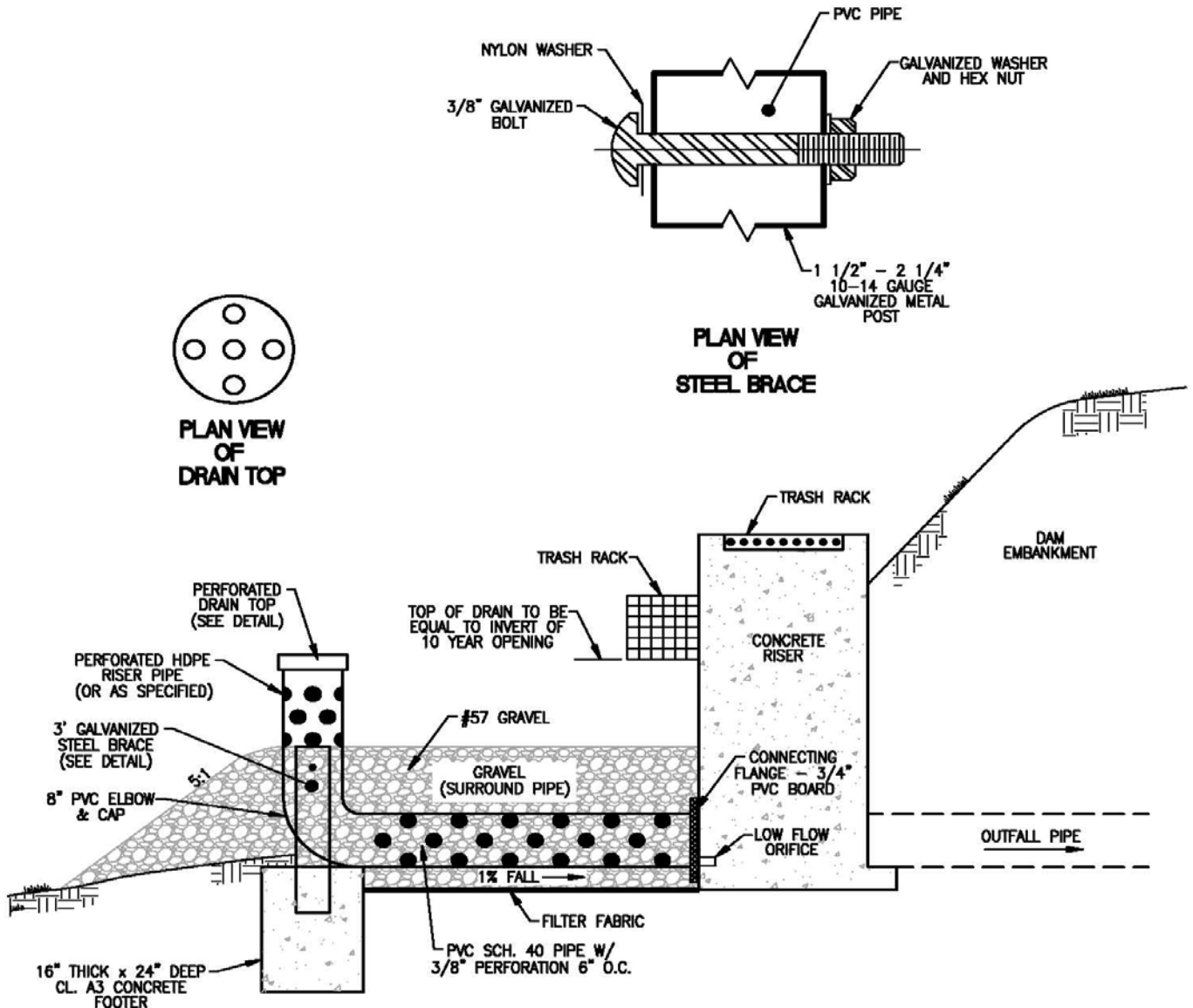


Figure 3 – Stack Trash Flow Orifice
Effective Date: 02/01/2022

FIGURE 4

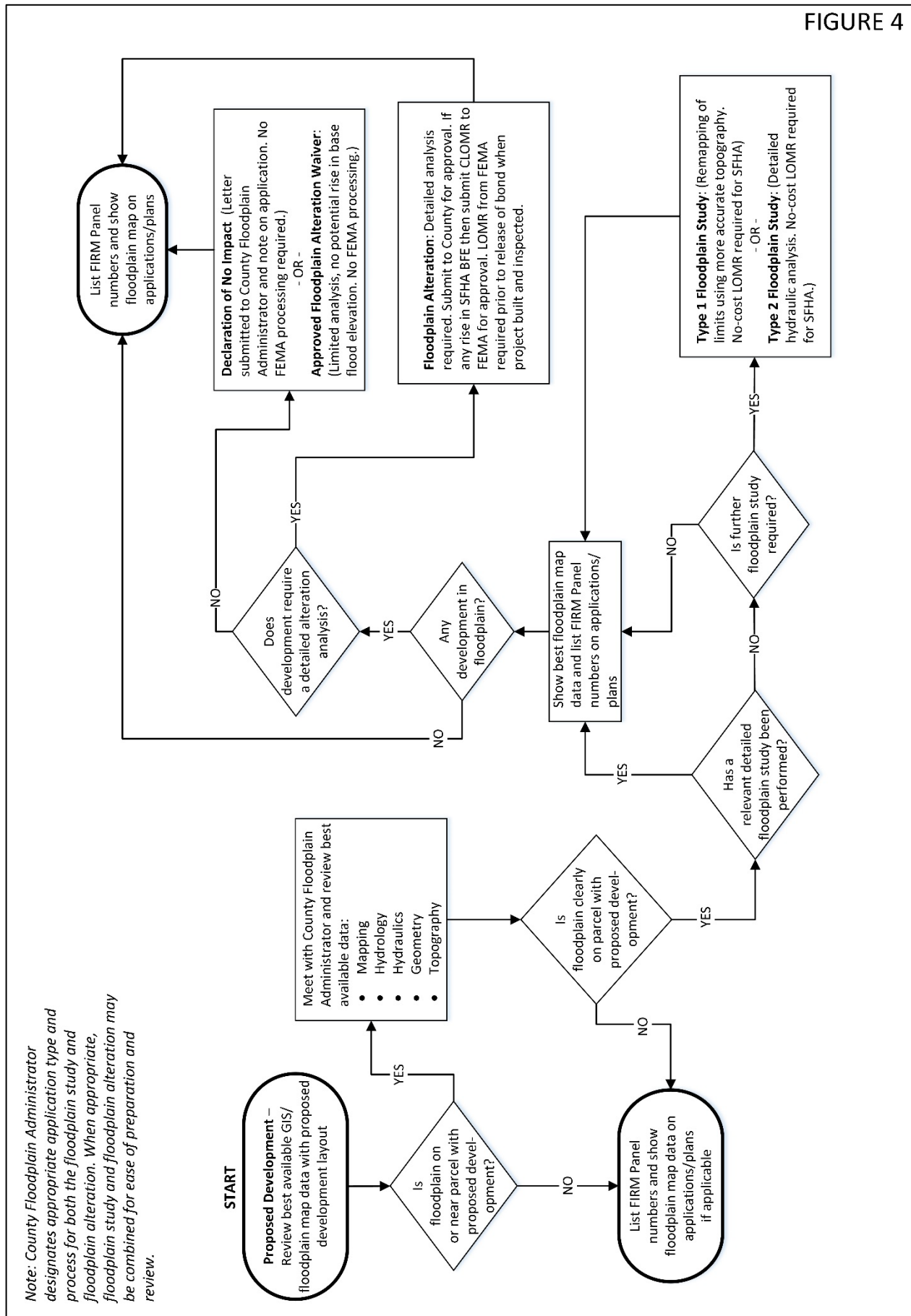


Figure 4 – Typical Floodplain Application Process
Effective Date: 02/01/2022

CHAPTER 6.000

SOILS, GEOTECHNICAL, GEOPHYSICAL AND HYDROGEOLOGICAL STUDIES

6.100 SOILS, GEOTECHNICAL AND GEOPHYSICAL STUDIES

- 6.110 TYPES OF SOILS, GEOTECHNICAL, AND GEOPHYSICAL STUDIES
- 6.120 SOILS MAP CERTIFICATION
- 6.130 PRELIMINARY SOILS STUDY INVESTIGATION AND REPORT
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- 6.150 GEOTECHNICAL STUDIES
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- 6.153 BORING DENSITIES
- 6.154 RECOMMENDATIONS/CONCLUSIONS
- 6.155 SOILS BORING LOGS
- 6.156 LABORATORY DATA
- 6.157 CONSTRUCTION/USE STANDARDS BASED ON UNDERLYING GEOLOGY
- 6.161 STANDARD REFERENCES, METHODS, AND PROCEDURES FOR SOILS AND GEOTECHNICAL STUDIES

6.200 HYDROGEOLOGIC TESTING

- 6.210 HYDROGEOLOGIC TESTING REQUIREMENTS FOR SUBDIVISIONS NOT SERVED BY CENTRAL WATER AND SEWER

Figure 6.210-1: Flowchart for Identifying Type of Water System and Well Drilling and Testing Requirements for Subdivision Developments in Loudoun County

- 6.211 SUBDIVISIONS WITH COMMUNAL WATER SYSTEMS
- 6.212 SUBDIVISIONS WITH INDIVIDUAL WELLS
- 6.213 REPORTING REQUIREMENTS

- 6.220 HYDROGEOLOGIC REPORT REQUIREMENTS FOR SOLID WASTE FACILITIES
- 6.230 HYDROGEOLOGIC REPORT REQUIREMENTS FOR RESOURCE EXTRACTION
- 6.240 HYDROGEOLOGIC REPORT REQUIREMENTS FOR OTHER DEVELOPMENTS
- 6.250 REFERENCES OF STANDARD PRACTICES AND GUIDELINES

CHAPTER 6.000

SOILS, GEOTECHNICAL, GEOPHYSICAL AND HYDROGEOLOGICAL STUDIES

Soils, geotechnical, and geophysical studies are required for all applicable development activities as specified in this manual and hydrogeological studies are required for specified development activities that will rely upon or may potentially impact groundwater resources. The extent of these studies is directly related to engineering and/or environmental impacts of the proposed development. In an effort to standardize these studies and to document that all factors have been considered, Loudoun County has formulated a systematic approach to soils, geotechnical, geophysical and hydrogeological requirements. Chapter 6.000 and the criteria for these studies are divided into Soils and Geotechnical / Geophysical Studies, which are defined in section 6.100, and Hydrogeological Testing, which are defined in section 6.200.

6.100 SOILS, GEOTECHNICAL AND GEOPHYSICAL STUDIES

Soils, geotechnical, and geophysical studies as defined in this document are evaluations of local soil conditions, the potential effects those soil characteristics may have on the proposed development or land use, and the potential effect the proposed development activity and land use changes may have on the soils and associated landforms. An investigation and report are the primary components of soils, geotechnical, and geophysical studies.

6.110 TYPES OF SOILS, GEOTECHNICAL, AND GEOPHYSICAL STUDIES

The County recognizes that there are many types of soils, geotechnical, and geophysical investigations and reports. Many reports will not conform to these standards and will not have to be submitted to the County. However, where County ordinances or this manual establish a requirement for such reports to be submitted to the County, it is in the applicant's, as well as the County's, best interest to insure all reports are complete and speak to the needs of the project. This report should insure that costly delays and misunderstandings will be avoided and that the quality desired by all will result.

6.120 SOILS MAP CERTIFICATION

The purpose of the soils map certification is to serve as a screening mechanism to identify those tracts of land or building sites, or parts thereof, where Class III and/or Class IV soil classifications exist. To provide a soils map certification, the following criteria shall be followed:

- A. The applicant shall review the latest adopted County soils map for the subject tract to determine the existing soil conditions.
- B. Land development applications for preliminary plans of subdivision, site plans, and construction plan and profiles shall contain:

1. A maximum 1:2400 scale (1 inch = 200 feet) copy of the proposed development layout, overlaid on the County soils map, including the soils, drains, spot points, and a soils table with mapping unit name and number, hydrologic class, general development class, and identifying hydric soils. Once a Preliminary Soils Review (PSR) has been completed for the property, the above information shall be updated, and;
2. A note stating whether or not Class III and/or Class IV soils exist on the development site per the following:

"The subject development site does (or does not) contain Class III and/or Class IV soils, per the latest County soils map as identified by the Interpretive Guide to Soils Maps, Loudoun County, Virginia, or per the approved Preliminary Soils Review Investigation and Report. Loudoun County recommends no construction of structures with subgrade levels within natural drainage swales or within soils or spots specifically identified as wet per the latest County soils map as identified by the Interpretive Guide to Soils Maps, Loudoun County, Virginia."

Such statement, once approved by the Director or his designee, constitutes the soils map certification.

6.130 PRELIMINARY SOILS STUDY INVESTIGATION AND REPORT

A Preliminary Soils Review (PSR) is to be prepared by or under the direction of a Virginia Certified Professional Soil Scientist (C.P.S.S.), Licensed Professional Engineer (P.E.) or Certified Professional Geologist (C.P.G.) pursuant to the rules and regulations that govern the practice of said professions, who has experience in soils science specific to the underlying geology, and who is either a consultant or County Staff.

The County can generally provide a Preliminary Soils Review to the applicant within 30 days of such request, provided:

1. The applicant bears the cost of soils and topographic maps required to complete the review;
 2. Field stake-out is provided, when requested by the County, to adequately identify specific soil characteristics within proposed disturbed land area.
 3. The applicant provides a backhoe and operator to the County for soil observation, if required based on seasonal or climatic conditions or stoniness.
- A. The scope of a Preliminary Soils Review is to provide detailed soil mapping for the subject study / review area. It is intended to verify and augment the detail of the

most recent Loudoun County Soil Survey and determine the general constraints related to the suitability of an area for some use or combination of uses. The Preliminary Soils Review must address the areas proposed for development and/or land disturbance. A separate Preliminary Soils Review shall be required prior to development and/or land disturbance of any areas of a given parcel or lot of record that were not included within a prior Preliminary Soils Review. Descriptions of soils and landscapes are appropriate for this review, which will rely heavily on a soils map and literature review, with site specific fieldwork to confirm published mapping or actual mapping of a tract of land. Field verification of the County soils map, or identification of required changes, must be conducted in accordance with the National Cooperative Soil Survey standards as set forth in the "[National Soil Survey Handbook](#)". The review report shall identify the mapping units as set forth in the Interpretative Guide to Soils Maps, discuss characteristics of the mapping unit, potential problems with proposed uses, and potential remedial actions, if available. The source of descriptions and their use potential ratings shall be documented, whether from a published report or actual field borings.

B. The Preliminary Soils Review report shall include the following:

1. Background
 - a. A description of the site location and terrain
 - b. A brief description of bedrock geology and overlying materials
 - c. A description of field methods and procedures
 - d. A description of laboratory methods and procedures, if used
2. Scope of Project and Objectives
3. Narrative of Standard Terminology, if required
4. Report of Field Investigation

C. The Report of Field Investigations shall contain the following:

1. A soils map, drawn to 1:2400 scale (1 inch = 200 feet) or larger, as desired, on sheet(s) 24 inches by 36 inches. Where small tracts are the subject of review (typically less than 12 acres), an 8 1/2-inch by 11-inch sheet may be used, provided it is at the 1:2400 scale and complies with all the requirements herein. Soil map(s) shall show the following:
 - a. The following information as per the Loudoun County planimetric base maps:

- i. Topography, with at least 5-foot contour intervals.
 - ii. Planimetric detail, including swamps, marshes, ponds, wooded areas, buildings, roads, fence lines, utility structures, etc.
 - iii. Approximate Coordinate Grid System, at 1,000-foot intervals, with complete annotation.
 - iv. Location map, at 1 inch = 2,000 feet, north arrow and approximate grid coordinate information.
- b. The general location and extent of soil mapping units for the tract and other soil/landscape features, including stone symbols, gullies, rock outcrop, springs, and sinkholes or other karst features.
 - c. General location of all borings and backhoe pits. Test holes/pits are to be numbered.
 - d. The proposed development plan as related to the mapped soil units.

2. Minimum Soil Boring Densities

The number of observations must be adequate to evaluate each landscape position, geologic formation and map unit according to the [National Soil Survey Handbook](#). Tracts of 100 acres or less require 1 boring/5 acres. Tracts greater than 100 acres require 1 boring/5 acres for first 100 acres, and 1 additional boring per 10 acres or fraction thereafter. The minimum number of borings required is 4. Boring density must be sufficient to evaluate each landscape position and geologic break within the area to be mapped.

3. Identification and Verification of Mapping Units

Mapping units shall be identified as set forth in the Interpretive Guide to the Use of Soils Maps, Loudoun County, Virginia. Such Mapping units either shall be verified, or recommended changes to the Loudoun County Soils Map and variations to the soils mapping units defined by the Interpretive Guide to the Use of Soils Maps, Loudoun County, Virginia, shall be provided. Descriptions and discussion of mapping units, including, without limitation, range in characteristics, slope, texture, color, structure, permeability, drainage, landscape position, parent material, presence of perched or ground water table, depth to rock and other site characteristics such as karst features that are identified as Karst Sensitive Environmental Features pursuant to the [Zoning Ordinance](#) also shall be provided. Whether

the source of such descriptions is from a published report or actual field borings shall be documented.

4. Narratives on Mapping Units

Each shown mapping unit's potential for proposed uses, problems with such proposed uses, and remedial actions for such proposed uses, if available, shall be described. Whether the source of such information is from a published report or actual field borings also shall be documented. Notes: Boring logs, field notes, field/laboratory data should be available for review if requested. (Refer to the [Interpretive Guide to the Use of Soils Maps, Loudoun County, Virginia.](#))

5. The following should be placed on the map and report, signed by the certified and/or licensed professional, and stating that:

"The field work verifying this soils map has been prepared by or under the direction of, a Virginia Licensed Professional Soil Scientist, Licensed Professional Engineer or Certified Professional Geologist as required in Chapter 6 of the Facilities Standards Manual for Loudoun County."

"This report has been prepared by, or under the direction of, a Virginia Licensed Professional Soil Scientist, Licensed Professional Engineer, or Certified Professional Geologist, as required in Chapter 6 of the Facilities Standards Manual for Loudoun County. This report was developed for submission to the Department of Building and Development which shall be notified, in writing, of any changes (amendments) to this report."

Signed _____ Date _____

Licensed Professional Soil Scientist
Certified Professional Geologist
Licensed Professional Engineer
Certification/License #: _____

D. Recommendations/Conclusions (As appropriate for proposed use)

1. Preliminary summary of soil/rock problems and their extent for proposed uses.
2. General recommendations on needs for drainage (foundation under drainage and/or curtain drains for sewage disposal systems).
3. General recommendations for undercutting expansive soils.
4. General recommendations on frost heave potential.

5. General recommendations on use suitability of soil materials for road fill and fill under slabs.
6. General recommendations for application of topsoil and vegetative stabilization (lawns and shrubs).
7. General recommendations on soil corrosivity.
8. Recommendations for a geotechnical and/or geophysical study (Section 6.150 of this chapter), if needed.
9. General recommendations for onsite sewage disposal.

6.140 DETAILED SOILS/SITE INVESTIGATIONS

Detailed soils/site investigation reports for all proposed onsite sewage disposal systems and facilities including those which are not exclusively regulated by the State are to be submitted to the Loudoun County Department of Health in accordance with County Code and current State regulations, where applicable. Prior to conducting the detailed soils/site study, which requires any land disturbance or tree removal in the Mountainside Development Overlay District, Limestone Overlay District and within areas of steep slopes, a conceptual site layout must be provided and approved by the Department of Building and Development. Necessary excavation of potential drainfield sites shall be performed by hand and not by using equipment that may require clearing and grading for access to the sites.

In addition, a detailed soils/site investigation may be required to determine the suitability or limitations of a particular tract of land for any land filling operation, solid waste operation, composting facility or other similar use. The investigation may require physical or chemical analyses, either in situ or on selected samples in a laboratory. The intensity of investigation should be sufficient to provide information for immediate use or planning decisions. The technical standards for a detailed soils/site investigation for a land filling operation, solid waste operation, composting or other similar use are set forth in the Codified Ordinances of Loudoun County and current State regulations, where applicable.

6.150 GEOTECHNICAL STUDIES

Geotechnical Studies shall be prepared by, or under the direction of, a Virginia Licensed Professional Engineer (PE) or Certified Professional Geologist (CPG) pursuant to the rules and regulations that govern the practice of said professions, who has experience in geotechnical engineering specific to the underlying geology. Geotechnical Studies shall not be required in areas where development and/or land disturbing activities are not proposed.

- A. In addition to the requirements of the Virginia Uniform Statewide Building Code and the Building Official, a Geotechnical Study shall be required for the following:

1. Residential structures and/or additions that meet at least one of the following criteria:
 - a. Said structure and/or addition is located in the Limestone Overlay District, and such a Geotechnical Study has been recommended by a Geophysical Study or by the Building Official.
 - b. A Geotechnical Study of said structure and/or addition is required by the Zoning Ordinance or the Interpretive Guide to the Use of Soils Maps, Loudoun County, Virginia.
2. All public and other infrastructure improvements located where known soil conditions may generate problems relative to the planned land use as identified by the latest adopted County soils map, including private streets, building foundations, and other infrastructure facilities (such as storm drainage and stormwater management), which require performance bonding with the County or are proposed to be accepted by the County for maintenance.
3. All soil classifications for proposed impoundment dams for retention in accordance with Chapter 5 of this manual or where any road or driveway serving two or more residences crosses a proposed or existing dam.
4. Development of all other public and private facilities shall not require a Geotechnical Study unless the specific need is identified and requested by the County at the time of preliminary subdivision and/or site plan, whichever is applicable.

B. Requirements for Geotechnical Studies

1. A Geotechnical Study shall contain laboratory data and field measurements to document findings and design parameters. Maps shall be provided to illustrate major conclusions. Each Geotechnical Study shall include a report that addresses areas impacted by the proposed construction and shall contain preliminary appropriate designs and earthwork specifications, and recommendations for remedial action in problem areas.
 - a. Laboratory data shall be collected through mechanical sieve and Atterberg limits tests and other industry standard tests as necessary.
 - b. Field measurements, such as subsurface stratification and ground water levels, shall be collected through industry standard methods.
2. Boring densities must be in accordance with the Boring Densities section of this Chapter 6, and as required by the Building Official and/or the Director.

3. Within the Limestone Overlay District, the Geotechnical Study shall be performed after, and shall identify and address the Geophysical Study required by this Chapter 6. In addition to the above requirements, the following requirements shall be met:
 - a. The Geotechnical report must include the recommendations found in the Recommendations/Conclusions section of this Chapter 6.
 - b. If borings are required to evaluate anomalies identified by the geophysical study, geotechnical testing and evaluation shall be provided by the following method:
 - i. By continuous Standard Penetration Test soil borings (with a Split Spoon Sampler) to a depth of 45 feet; or
 - ii. If such a Standard Penetration Test boring encounters refusal prior to a depth of 35 feet, either the location of the boring shall be moved adjacent to the initial location along the geophysical resistivity line until a 35-foot depth is achieved, or the boring shall be extended by other means into the obstruction an additional depth of 5 feet.
 - c. All borings attempted in the LOD shall be abandoned with either bentonite or neat cement, and recorded and certified by the driller and the supervising Licensed Professional Engineer/Certified Professional Geologist, on the boring log for each attempted boring.

C. Alternative Methodologies for Geotechnical Studies

To address site specific characteristics, an alternative methodology (such as, without limitation, cone penetrometer, flat blade dilatometer, and pneumatic hammer drill probes) for the collection of subsurface information, may be submitted to the Director for review and revision, if needed. If approved by the Director, such alternative methodology shall be followed in lieu of subparagraph B., above. However, the foregoing requirements for the abandonment of borings within the Limestone Overlay District shall apply.

6.151 GEOPHYSICAL STUDIES

Geophysical Studies shall be prepared by, or under the direction of, a Virginia Licensed Professional Engineer (PE), Certified Professional Geologist (CPG), or Licensed Professional Soil Scientist (LSS) pursuant to the rules and regulations that govern the practice of the said professions, who have experience in geophysics specific to the underlying regional geology.

A. Geophysical Studies shall be required for:

1. Landfills
2. Quarries
3. Any land disturbing activity within the Limestone Overlay District.
4. Other special uses, or as directed in a Preliminary Soils Review.

B. Requirements for Geophysical Studies:

1. Geophysical Study (conducted by ground penetrating radar, electromagnetic properties, electric resistivity, microgravity, seismic or other investigative techniques) must identify and address any anomalies or areas of voids, rocks, saturated soil, mud-filled voids, and all Karst Sensitive Environmental Features that are revealed by the Preliminary Soils Review, Geophysical Study, or contained in the Loudoun County Karst Feature Database.
2. Field measurements, such as subsurface stratification and ground water levels, shall be provided to document findings and design parameters. Maps shall be provided to illustrate investigations of karst features and major conclusions. The report shall address areas impacted by the proposed construction. It shall contain either appropriate recommendations for remedial action in problem areas or recommendations for borings to verify significant geophysical anomalies and findings within 45 feet of the surface or as directed by the Director.
3. Within the Limestone Overlay District, if recommended by the geophysical study, a geotechnical study, in accordance with this Chapter 6, and borings, in accordance with this Chapter 6, shall be performed to verify and address any potential karst features indicated by the geophysical study. Such geotechnical study shall be performed only after the geophysical study has been completed.

C. Alternative Methodologies for Geophysical Studies

To best address site specific characteristics, an alternative methodology (i.e. a list of alternative requirements) to those listed in subparagraph B of this section, above, may be submitted to the Director for review, and revision if needed. If approved by the Director, such alternative methodology shall be followed in lieu of subparagraph B., above.

6.152 ADDITIONAL REPORTING REQUIREMENTS FOR GEOTECHNICAL AND GEOPHYSICAL STUDIES

The geotechnical or geophysical report shall specifically address structural improvements proposed on soils with problematic conditions or properties such as low to very high expansive soils, high water tables, known low-bearing capabilities, and areas which have potential geomorphic instability per the Interpretive Guide to the Use of Soils Maps, Loudoun County, Virginia. The Geotechnical or Geophysical study shall be in compliance with the guidelines specified herein and as required by the Zoning Ordinance for the Limestone Overlay District. The study shall reflect the particular structures and facilities in the development proposal.

The Geotechnical and/or Geophysical study shall address areas of the site impacted by proposed construction. Where applicable, the Geotechnical and/or Geophysical study shall include, but not be limited to the following, unless otherwise approved by the Director or Building Official:

- A. Scope of Work Narrative
- B. Site and Project Description Narrative
- C. Regional and Site Geology/Hydrology Narratives
 - 1. Review of the site's Soil Descriptions and Classifications from the Interpretive Guide to the Use of Soils Maps, Loudoun County, Virginia.
 - 2. Review of the location, type, and hardness of bedrock encountered; evaluation of expected rippability.
 - 3. Review of the ground water conditions, including depth and type of aquifer, based on current published information.
 - 4. Review of the site's Made Land locations, placement, and condition.
- D. Mapping, Plans, and Cross-Sections
 - 1. Maps and Drawings

A map, drawn to 1:2400 scale (1 inch = 200 feet or larger, as needed for readability), and other maps as needed, on sheet(s) 24 inches by 36 inches. Where the proposal covers more than one sheet, a compiled photo reduction, at 1:12,000 scale (1 inch = 1,000 feet) of all maps shall be submitted in addition to the 1:2400 scale maps. Where the proposed site consists of less than 5 acres, maps at 1 inch = 50 feet scale or larger may be submitted. Maps shall show the following:

Per the Loudoun County planimetric base map or as produced by others:

- a. Existing topography, with a maximum of 5-foot contour intervals.
 - b. Within the Limestone Overlay District, proposed topography, with a minimum of 2-foot contour intervals.
 - c. Existing planimetric detail from base map and field observations, including swamps, marshes, ponds, wooded areas, rock outcrops, karst features, buildings, roads, fence lines, utility structures, etc.
 - d. Within the Limestone Overlay District, sinkholes, based on field observations.
 - e. Property and Site boundary lines.
 - f. Approximate grid coordinate system in 1,000 foot intervals with complete annotation.
 - g. Location map, at 1 inch = 2000 feet, with north arrow and approximate Coordinate Grid information.
 - h. Location of all test holes, borings, backhoe pits, geophysical data lines (such as, electric resistivity lines, etc.) and/or seismic tests on a soils map approved by the Director. These locations will be tested by survey, GPS, or other acceptable methods approved by the Director. Test holes/pits shown on the soils map are to be numbered. Boring log records shall include surface elevations based upon County topographic maps or more accurate survey data by others. Boring densities shall follow the criteria of Section 6.153.
 - i. The general spatial distribution of the various soils and geologic materials. Particular attention shall be paid to identifying and delineating areas where soil factors are expected to mandate modifications or special designs for proposed construction.
2. Cross-sections based upon County topographic maps of soil/geologic materials, showing stratigraphic relationships, including structure, and subsurface distribution.

E. Detailed Geology/Hydrology

1. A detailed section on geology and hydrology, evidenced by appropriate drill hole data and/or test pit data, shall be required when one or more of the following uses are proposed:

- a. Extraction of Natural Resources.
- b. Dams/impoundments over 15 feet in height or 25 acre feet in impoundment capacity, as required per Chapter 5.
- c. Land development proposed in mountain colluvium (mapping unit numbers 27C, 52E, 59C, 88C, 88D, 89D, and 89E) with slopes greater than 12 percent.
- d. Landfills.

The section shall include, as appropriate:

- i. Type(s) of rock materials present, including structural, stratigraphic, physical, chemical, and mineralogical properties, description of mapping units (geologic formations if more than one are shown on the map).
- ii. Macro- and micro-structure of rock or geologic material, including joints and fracture patterns; faults, if present; cleavage; foliation and bedding, if applicable.
- iii. Geologic map and cross-sections of the tract. At least two of these cross sections shall show elevation of the water table (i.e. hydrogeologic cross-section).
- iv. Directions of groundwater movement in both soil and geologic materials; method of recharge; dewatering effect of proposal; map showing groundwater contours; transmissibility of rock; effect of regional fractures (linear fractures) on water movement; discussion of existing ground water supply; discussion of existing levels of water; historic water availability.
- v. Environmental geology. Susceptibility of area to pollution from site-industry products, leachate, or surface contamination (such as landfills and sewage disposal facilities), and extraction of natural resources. This section of the report shall specifically address the potential of area to undergo catastrophic collapse, presence of slip plains, sinkholes, and shock transfer or the presence of asbestos content in rocks.
- vi. Geophysical data (i.e. the result of ground penetrating radar, electromagnetic properties, electric resistivity, microgravity, seismic or other instruments) is required. All applications

shall comply with State solid waste laws/or other environmental regulations.

- vii. Economic geology. (Required only for the extraction of resources.) Information needed for estimated length of extraction time for removal of natural resources and evidence of proven reserves.

F. Narratives describing soils and surface materials.

- 1. A detailed description of soils and surface materials illustrated on the map (Section 6.152.D.1) shall be required and should include the following:
 - a. Description of physical properties for soils in each affected mapping unit or area of similar soil conditions or "strata," including silt content, clay amount, and type (expansiveness, plasticity, bearing capacity of materials, chemical properties), particularly as these apply to revegetation, apparent stability of sidewalls in cuts.
 - b. Description of surface drainage, permeability, presence of seasonal perched water tables, and karst features, identified as Karst Sensitive Environmental Features within the Zoning Ordinance.
 - c. The Geotechnical Study shall note any significant differences from the County Soils Map.

G. Exploration Procedures, Sampling Methods, and Equipment Narrative

H. Site Exploration Results Narrative

- 1. Soils
- 2. Water Table
- 3. Made Land

I. Laboratory Testing, Procedures, and Results

- 1. Mechanical Sieve
- 2. Atterberg Limits
- 3. Hydrometer
- 4. Expansive Index

5. Proctor (Moisture vs. Density)
6. California Bearing Ratio
- J. Engineering Analysis and Recommendations
 1. Global Stability Analysis
 2. Infinite Slope Analysis
 3. Geophysical Analysis
 4. Slabs-On-Grade
 5. Foundation Design and Capacity
 6. Foundation Requirements for Sites with Expansive Soils
 7. Damp and/or Waterproofing
 8. Backfill
 9. Other recommendations considered necessary by the professional
- K. Recommendations/conclusions section, which shall address all of the above information and contain recommendations/conclusions as required by Section 6.154.

6.153 BORING DENSITIES

Boring density may include borings, test holes, backhoe pits, and geophysical investigative techniques, and seismic tests. The number and locations of observations shall be adequate to evaluate each landscape position, and/or geologic formation within the specific development site. Borings shall be selected to be representative of the variety of land forms and geologic formations within the specific development site.

- A. Roadways: Boring densities for proposed roadway construction shall be required as follows:
 1. As recommended by the Director at the time of preliminary subdivision or site plan, whichever is applicable, in Class I and Class II soils, as identified by the [Interpretive Guide to the Use of Soils Maps, Loudoun County, Virginia](#).

2. One boring per 250 feet, or fraction thereof, in Class III and Class IV soils, as identified by the [Interpretive Guide to Soils Maps, Loudoun County, Virginia.](#)
3. Borings in areas of transition from Class I and II soils to Class III or IV soils shall be spaced sufficiently to accurately estimate the location of soil change.
4. Storm Sewer Pipes and Culverts for Public Roadways:
 - a. Foundation data shall be provided for all pipe and/or culvert installations with a diameter or span of 36 inches or greater. For multiple pipe and/or culvert installations, the span is measured between the interiors of the outside walls of the outermost pipes and/or culverts and is measured along a line perpendicular to the barrel of the pipe and/or culvert.
 - b. The pH and resistivity analysis of the soil and water, and potential for an abrasive bed load, shall be provided for each pipe and/or culvert location allowing a metal pipe and/or culvert where any of the following conditions exist:
 - i. Diameter or span of 36 inches or greater (including multiple pipe and/or culvert installations).
 - ii. Pipe and/or culvert is to be installed in a live stream environment.
 - iii. Pipe and/or culvert is to be installed in an area of known premature pipe and/or culvert failure.

B. Impoundment dams and associated public improvements.

1. Foundation data shall be provided for all Storm Water Management basins, with a minimum of one boring located in the dam embankment area and one boring located in the basin area, in order to determine if:
 - a. The native material will support the dam embankment and provide adequate protection from seepage under the dam embankment.
 - b. Excavation material from the basin excavation area may be used to construct the dam embankment.
 - c. Rock may be encountered in the basin excavation area.

- d. A high water table is present which may alter the performance of the Storm Water Management basin.

C. Structures:

- 1. Boring densities associated with the building permit process will be determined on an individual basis by the Building Official, as defined in the [Virginia Uniform Statewide Building Code](#).
- 2. The following boring densities are required within the Limestone Overlay District:
 - a. 1 boring per 2,500 square feet of structure foot print for all commercial structures and structures containing multiple dwelling units where such dwelling units are not to be located on separate parcels.
 - b. Minimum of one (1) per foot print for every dwelling unit to be located on a separate parcel.

D. Boring Density Modifications:

- 1. Outside of the Limestone Overlay District: Prior to site investigation and boring, the Building Official or Director may approve a modification of minimum boring densities on a case-by-case basis if the following criteria are met:
 - a. The applicant has provided adequate justification, including documented evidence from adjoining sites and the [Interpretive Guide to the Use of Soils Maps, Loudoun County, Virginia](#), that the site being investigated has homogenous soils; and
 - b. The applicant has requested a reduction of the boring density requirements for commercial structures from one boring per 5,000 square feet of foot print, to no less than one boring per 10,000 square feet of foot print.
- 2. Within the Limestone Overlay District: Prior to site investigation and boring, the Building Official or Director may approve a modification of minimum boring densities on a case-by-case basis if the applicant provides a Geophysical Study that supports such a modification of the minimum boring densities.

6.154 RECOMMENDATIONS/CONCLUSIONS

The following are areas which shall be included in the recommendations and conclusions section of each report required under this Chapter 6 related to Soils, Geotechnical, or Geophysical studies, as appropriate:

A. Structures, Roadways, and Impoundment Dams

1. Recommendations for foundation design including specification of whether standard foundation design is, or special measures are, appropriate. Where special measures are appropriate, design standards for those special measures shall be included if applicable. Special measures shall be provided, at minimum, when structures are located:
 - a. Within drainage swales identified on the latest adopted County soils map, or by the Geotechnical Study;
 - b. On “wet” or “marsh” spot points identified on the latest adopted County soils map, or by the Geotechnical Study; or
 - c. Within areas where the presence of soil mapping units 4A, 6A, 66A, 69A, 79A or 99A are confirmed by the Geotechnical Study.
2. Recommendations for typical California Bearing Ratio (CBR) values and identification of potential subgrade stabilization problems or special pavement design requirements.
3. Recommendations on feasibility of slab on grade versus supported ground floor construction.
4. Allowable soil bearing values at all bearing locations and elevations.
5. If soil conditions indicate, recommended pile type, loading, tip elevation, etc.
6. Recommended bearing values of rock based on unconfined compression tests, pressure meter tests, triaxial tests.
7. Conclusion that rock strata are sound and not underlain with solution channels that would affect the allowable bearing loads or provide recommendations for correction of these conditions.
8. Ground water elevations and recommendations for temporary dewatering procedures during construction and for permanent dewatering facilities after construction, including effects of seasonal variations.

9. Other factors, such as alkali content, corrosivity, springs, fill areas, maximum depth of frost penetration, etc.
10. Thickness, consistency, character, compressibility, shear value, safe bearing value, etc., of the various strata encountered.
11. Recommendations for removal of perched/seasonal water tables, including foundation drainage, under drainage for roads, and feasibility of subgrade walls with finished living space.
12. Specifications for fill materials, including gradation ASTM, AASHTO, or VTM test method and percent of maximum theoretical density and optimum moisture, site preparation and material placement, qualifications of testing personnel and testing laboratory.
13. Recommendations to address low to very high expansive soils (shall include a description of the depth and thickness, encountered).
14. Recommendations to control differential settlement.
15. Shoring for utility or other deep excavations and safe cut slopes.
16. Recommendations for design lateral pressure for below grade foundation walls.
17. A statement indicating whether the problematic conditions or properties of the soil(s) where the structure is located will be minimized, alleviated, or avoided if the recommendations of the report are implemented.

B. Landfills

1. Refer to Chapter 1080 of the Codified Ordinances of Loudoun County.

C. Extraction of Natural Resources

1. Analysis of controlled blasting vibrations and their potential effects on structures near the proposed facility.
2. Recommendations for monitoring programs for blasting vibrations and ground water supplies, including location and number of observation points and frequency of sampling.

D. Additional Recommendations within LOD

1. Risks of, and recommended measures to mitigate, the potential for ground surface collapse as required by the Zoning Ordinance for the Limestone Overlay District.
2. Risks of, and recommended measures to mitigate, potential adverse impacts of pollution on surface water, or groundwater, or springs as required by the Zoning Ordinance for the Limestone Overlay District.
3. When blasting is required, the report must include a recommendation as to the need for post-blasting field inspection and/or additional geophysical investigation.

6.155 SOILS BORING LOGS

The following shall be provided with these studies and reports, if applicable:

- A. Boring/test pit number.
- B. Approximate surface elevation.
- C. Approximate elevation, thickness, description (ASTM D2487, ASTM D2488), and classification of each soil stratum.
- D. Location of all samples taken and field tests or laboratory analyses conducted.
- E. Location and identification of rock; indicate soundness.
- F. Location of water table and 24-hour water levels.
- G. "N Values" (standard penetration test results) and natural moisture content ("W") from split-spoon and/or Shelby tube samples.
- H. Other samples/tests to be performed.
- I. Name of company performing the field operation and the name of the driller and geological/engineering inspector that performed the field operation.
- J. Ground water monitoring data.
- K. Seismic or other geophysical data for site.
- L. Rock core descriptions.

6.156 LABORATORY DATA

All laboratory data shall be supplied as required to support recommendations and description narratives.

6.157 CONSTRUCTION/USE STANDARDS BASED ON UNDERLYING GEOLOGY

A. Implementation of Recommendations

The design engineer/architect will provide the Building Official and the Director with a written statement, stating that he has reviewed the plans and, as submitted, the plans were prepared in accordance with the recommendations of the Geotechnical/Geophysical Study.

B. Blasting in Limestone Overlay District

In addition to the blasting requirements of the Loudoun County Fire Prevention Code, Chapter 1602 of the [Codified Ordinances of Loudoun County](#), all blasting conducted in the Limestone Overlay District the County shall require the following:

1. A blasting plan shall be submitted to the Director for approval that contains blasting procedures, blast layout, explosives descriptions and quantities, drill logs, water sampling data, structural pre-blast surveys, etc. The plan should identify any water wells, springs, or streams within a 1000' radius of the blast location; and any structure within 500' radius of the blast location.
2. A pre-blasting site inspection and Geophysical study to determine base-line conditions, and the potential for solution channels or cavities below the blasting site.
3. The applicant shall contact and notify, in writing, the owners of wells within a 1000' radius of the proposed blasting location and offer to sample and test the water in a pre-blast condition.
4. The applicant shall contact and notify, in writing, the owners of structures within a 500' radius of the proposed blasting location, and complete a pre-blast survey to document the condition of the structure.
5. Monitoring of all blasts by appropriate seismic and noise measurements at sensitive locations identified in the blasting plan;
6. Post-blasting inspections and/or a new post-blasting Geophysical Study when required by the pre-blasting Geophysical Study.

7. Mitigation, as needed, based on the post-blasting Geophysical Study, and well water and structural damage complaints.
8. Restrictions on blasting and explosives, or limits on blasting to specific times and atmospheric conditions to minimize impact.

C. Nutrient Management Plans in Limestone Overlay District

1. Nutrient management plans, as required by the Zoning Ordinance for the Limestone Overlay District, shall be in accordance with DCR Standards and Criteria and Title 10.1 of the Code of Virginia and 4 VAC 5-15.

D. Structure / Building Pad Construction within the Limestone Overlay District

For any structure to be built in the Limestone Overlay District, it shall be verified and certified in writing to the Building Official or Director that the building pad proposed in the site development plans and to be built in the site construction process, is sufficient in size, compaction, and subgrade materials to support the proposed structure applied for in the building permit application. In furtherance of this requirement the following shall also be required:

1. Prior to commencing the work, the entity responsible for performing foundation construction monitoring and testing shall acknowledge and certify, and submit in writing or as approved by the Building Official or Director, the following:
 - a. Verification that the entity responsible for performing foundation construction monitoring and testing has researched, obtained, and reviewed the requirements of the approved geotechnical and geophysical studies.
 - b. Verification that the entity responsible for performing foundation construction monitoring and testing has researched, obtained and reviewed all construction and monitoring/compaction testing reports. Such acknowledgement shall also include a disclosure of any possible deficiencies, anticipated impacts to foundation construction for any proposed structure, and proposed corrective measures to rectify any deficiencies.
2. Upon completion of work, the entity responsible for approving the foundation subgrade shall verify and certify, and submit in writing, the following:
 - a. Verification that all prior work done for the building pad construction meets a reasonable standard of care prior to performing any subsequent work.

- b. Verification that daily inspections were performed and that electronic copies of all inspection reports and maps were submitted to the Building Official or Director in hardcopy, electronically, or other approved method.

E. Foundation Requirements for Sites with Expansive Soils

1. Definition of Expansive Soils

- a. Expansive Soils are defined as any soils meeting all four of the following provisions, except that tests to show compliance with Items i., ii., and iii. shall not be required if the test prescribed in Item iv. is conducted:

- i. Plasticity Index (PI) of 15 or greater, determined in accordance with ASTM D 4318.
- ii. More than 10 percent of the soil particles pass a No. 200 sieve (75 μ m), determined in accordance with ASTM D 422.
- iii. More than 10 percent of the soil particles are less than 5 micrometers in size, determined in accordance with ASTM D 422.
- iv. Expansion Index (EI) greater than 20 determined in accordance with ASTM D 4829.

- b. Policy

- i. If the Plasticity Index of the soil is 20 or less (e.g., $PI \leq 20$) and the Liquid Limit is 45 or less (e.g., $LL \leq 45$), the Plasticity Index Corrected (PI_{cor}) or the Expansion Index Corrected (EI_{cor}) may be substituted in the definition of Expansive Soils.

- a) Plasticity Index Corrected:

$$PI_{cor} = PI \times (\% \text{ Passing No. 40 Sieve}/100)$$

- b) Expansion Index Corrected:

$$EI_{cor} = EI \times (\% \text{ Passing No. 4 Sieve}/100)$$

- c) Liquid Limits: The water content corresponding to the behavior change between the liquid and plastic

state of silt or clay soil, determined in accordance with ASTM D 4318.

2. Sites with Low to Very High Expansive Soil conditions shall have the following requirements:
 - a. If Low to Very High Expansive Soil conditions are present to a depth of less than 5 feet below the proposed finished grade, the excavation shall be placed through the expansive soils, and:
 - i. Backfilled with a compactable and engineer controlled fill to an acceptable depth for the placement of the foundation; or
 - ii. The foundation shall be lowered to a depth that places it through the expansive soils.
 - b. If Low to Very High Expansive Soils conditions are present to a depth of greater than or equal to 5 feet below the proposed finished grade, the excavation shall be placed through the plastic soils, and to a minimum depth of 5 feet below the proposed finished grade, and:
 - i. Backfilled with a compactable and engineer controlled fill to an acceptable depth for the placement of the foundation; or
 - ii. The foundation shall be lowered to a minimum of 5 feet below the proposed finished grade.
 - c. If soil materials encountered at the proposed bearing depth have inadequate bearing capacity as determined by the on-site geotechnical inspector, the excavations shall be taken to a depth where the soil material has adequate bearing capacity, or another foundation method may be used, as approved by the Director/Building Official.
 - d. In areas whose parent rock is Marble, piles or piers are recommended.
 - e. Slabs shall have a minimum 2-foot separation between the expansive soils and the base of the slab.
 - f. Other Recommendations:
 - i. Low to Very High Expansive soils must not be used for:
 - a) Backfill material against structure, walls, etc.

- b) Structural or controlled fill.
- ii. Continuous foundation reinforcement for any footing founded on dissimilar materials shall be provided.

F. Use of Lime During Construction

All use of Lime for Soil Drying, Modification, and Stabilization shall be in accordance with the Department of Building and Development's Technical Memorandum "Guidelines for the use of Lime for Soil Drying, Modification, and Stabilization."

6.161 STANDARD REFERENCES, METHODS, AND PROCEDURES FOR SOILS AND GEOTECHNICAL STUDIES

The following will be considered standard reference manuals and publications:

Black, C.A. (ed.), 1965. Methods of Soil Analysis: Parts I and II, Agronomy Series, American Society of Agronomy, Madison, Wisconsin.

American Society of Testing and Materials, 2009. Annual Book of ASTM Standards, Volume 4.08; Soil and Rock; Dimension Stone; Geosynthetics.

Soil Survey Staff, 1972. Soil Survey Laboratory Methods.

Soil Survey Staff, Soil Conservation Service, National Soil Survey Handbook, title 430-VI (Washington D.C., U.S. Government Printing Office, November, 1993).

Virginia Department of Highways and Transportation, 2009. Virginia Test Manual.

NWWA/EPA Series RCRA Groundwater Monitoring Technical Enforcement Guidance Document, Sept. 1986.

Conrad, E. T., et al., 1981. Solid Waste Landfill Design and Operation Practices, Environmental Protection Agency, Washington, D. C.

The International Code Council, Building and Residential Codes.

Virginia State Sewage Disposal and Handling Regulations.

Codified Ordinance Loudoun County, Chapter 1040 (Water Wells) and Chapter 1066 (Private Sewage Disposal Systems).

Interpretive Guide to the Use of Soils Maps, Loudoun County, Virginia, 2000, County Extension Office, Loudoun County, Department of Building and Development.

Sowers, G.F. Introductory Soils Mechanics and Foundations: Geotechnical Engineering, Fourth Edition, Macmillan Publishing Co., Inc., N.Y.

Terzaghi, K., Peck, R.B and Mesri, G. (1966). Soil Mechanics in Engineering Practice, 3rd, ed. Wiley-Interscience.

Braja, M. Das and Jonathan Wickert, (2005). Introductory Principles of Geotechnical Engineering, Sixth Edition, Thomas Learning College.

Budhu, Muni (2006). Soil Mechanics and Foundations, Second Edition, John Wiley & Sons, Inc.

Bowles, J. (1996). Foundation Analysis and Design, Fifth Edition, McGraw-Hill Publishing Company.

Kramer, Steven L. (1996). Geotechnical Earthquake Engineering, Prentice-Hall, Inc.

Rajapakse, Ruwan, (2008). Pile Design and Construction, Butterworth-Heinemann

Loudoun County Karst Feature Database – The County maintains an informational database of the following features within the Limestone Overlay District, which shall be updated based on information in Geophysical Studies provided by applicants for land disturbing activities and land development applications within the Limestone Overlay District, information identified in Preliminary Soils Reviews as required by the Facilities Standards Manual, Revised United States Geologic Survey (USGS) Geological Mapping updates, and information provided through field inspections:

1. The known extent of the Limestone Bedrock Formations (Sensitive Limestone Areas);
2. Sinkholes, Swallets and Closed Depressions;
3. Rock Outcrops;
4. Springs;
5. Cave Openings; and
6. Perennial Sinking Streams.

Geologic Map of Loudoun County.

Loudoun County Department of Building and Development Technical Memorandum: Guidelines for the use of Lime for Soil Drying, Modification, and Stabilization.

Loudoun County Soils Map.

Virginia Department of Transportation (VDOT), Drainage Design Memorandum 1.1.

6.200 HYDROGEOLOGIC TESTING

Hydrogeologic testing as set forth in this document is an evaluation of groundwater quantity and quality and the potential effects that a proposed land development may have on water resources. The evaluation is based on both on-site hydrogeologic testing and existing and readily available information. Hydrogeologic testing and reports are required and specifically defined for four general types of land development applications: (1) residential subdivisions not served by central water and sewer (further divided into those with wells on individual lots and those with communal systems); (2) solid waste facilities (for example landfills), (3) resource extraction areas (for example quarries and mines), and (4) other types such as certain industrial, irrigation, commercial, and recreational developments.

Described below are the requirements for hydrogeologic testing and reports as related to the general types of land development applications. Each hydrogeologic test shall be performed by or under the direct supervision of a professional geologist certified by the Commonwealth of Virginia. A report of the evaluation, the Hydrogeologic Report, shall be prepared and signed by the professional geologist and submitted to the County for review. Where not specifically defined in Chapter 6.200, the methodology used for testing and evaluation shall follow generally accepted professional hydrologic and hydrogeologic practices and standards. Examples of documents and sources considered representative of professional standards and methods are included in section 6.250.

6.210 HYDROGEOLOGIC TESTING REQUIREMENTS FOR SUBDIVISIONS NOT SERVED BY CENTRAL WATER AND SEWER

A hydrogeologic report for subdivisions will examine the local hydrogeologic conditions and the relationship between the proposed land use and those conditions. The testing will focus on the groundwater quantity and quality as they relate to the requirements of the proposed subdivision and the potential impacts the subdivision may have on the water resources. A hydrogeologic report is required prior to a preliminary subdivision submission in accordance with Section 8.102.B of this manual.

Subdivisions not served by central water and sewer can be divided into two groups based on the type of water supply system; those having a private well on each individual lot and those having communal (community) water systems serving multiple lots. Many of the requirements for hydrogeologic evaluation are the same for both types of water supply systems and will be listed in this section (6.210). However, there are a number of requirements that are specific to either communal systems or wells on individual lots and will be listed separately in sections 6.211 and 6.212, respectively.

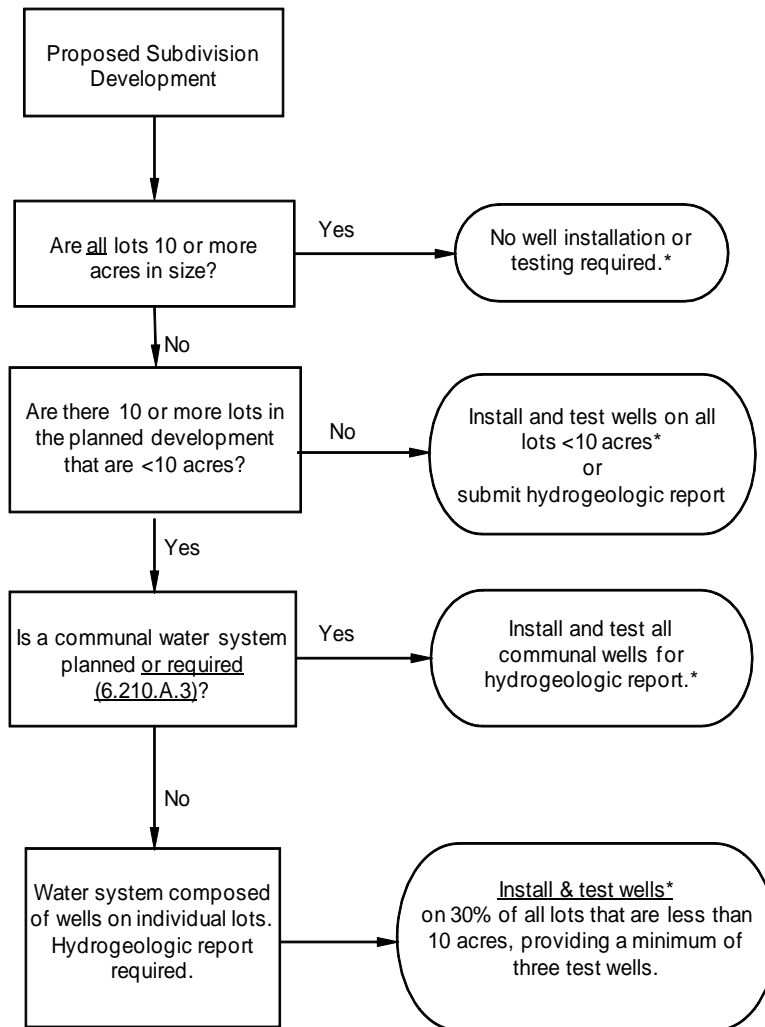
A. Applicability of Hydrogeologic Testing for Subdivision Water Supply Approvals

1. The hydrogeologic testing requirements and procedures must be conducted on any new subdivision having ten (10) or more lots of less than ten (10) acres.

2. If the number of proposed lots less than ten (10) acres is nine (9) or less, the applicant has the option of either conducting Hydrogeologic Testing or drilling and successfully testing a well for water quantity and quality on each lot in accordance with the requirements of the [Codified Ordinances](#) of Loudoun County, Chapter 1040 (Water).
3. Hydrogeologic testing shall be required for all communal water supply systems.

Prior to obtaining permits or initiating any site preparation, hydrogeologic testing, or well installation within the MDOD or steep slopes, the applicant shall provide a conceptual site layout and obtain a Locational Clearance through the County in accordance with Sections 4-1600 or 5-1508 of the [Zoning Ordinance](#).

Figure 6.210-1: Flowchart for Identifying Type of Water System and Well Drilling and Testing Requirements for Subdivision Developments in Loudoun County



* Any development in Mountainside Development Overlay District (MDOD), Limestone Overlay District (LOD), or steep slopes, as defined in the Revised 1993 Zoning Ordinance, shall obtain a Locational Clearance from the County prior to the issuance of any permits or land disturbing activity.

B. Background Information

Conduct a background evaluation of the hydrogeology using readily available existing resources such as publications and/or data from the U.S. Geological Survey, State of Virginia Water Control Board, U.S. Environmental Protection Agency, Loudoun County Department of Health, Department of Building and Development and the Office of Mapping and Geographic Information. At a minimum, extend the evaluation to include the area within approximately one (1) mile beyond the property boundary. Such evaluation shall include the following:

1. USGS and Loudoun County topographic information, whichever is more detailed.
2. Property plats and aerial photographs.
3. Geologic maps and data reports (well logs, water quality analysis, geologic information).
4. Existing well data or descriptive statistical summary of the same (e.g., minimum, maximum and mean of well depths and yields).
5. Reference existing research reports, hydrogeologic reports, geophysics reports, etc.
6. Existing pollution sources (e.g., underground storage tanks, septic fields, graveyards, etc.) of record or those observed on site and within a minimum of 2,000 feet of the site boundary. An attempt shall be made to verify sources of record by field reconnaissance. The report shall contain a copy of a study from a company (or companies) that specializes in federal and state database searches for historical pollution source reporting. The report shall contain statements as to the type of background investigation conducted for pollution sources, the results of the investigation, and a verification statement that certifies that this historical pollution search has been conducted.

6.211 SUBDIVISIONS WITH COMMUNAL WATER SYSTEMS

The testing and analyses specified in this section shall be conducted for subdivisions planning to use communal (formerly termed community) water systems. These shall include all communal systems, including those with fourteen (14) or fewer connections.

A. Analysis of Background Information

1. Using the background information compiled previously, conduct an evaluation of the site hydrogeology and the occurrence, quality, and quantity of groundwater, including:

- a. Preliminary field verification of existing geologic information including rock outcrops, karst features, etc.
 - b. Analysis of fracture fabric: At sites with bedrock outcrops, fracture orientations (strike and dip measurements) shall be measured and documented in the report. The number and orientations of linear features or photo lineaments shall be analyzed and correlated with documented bedrock fractures.
 - c. Groundwater budget analysis: The effects of the proposed development on groundwater shall be evaluated using water budget concepts. The evaluation shall include available recharge under normal (10 inches/year) and drought (6 inches/year) conditions and net consumption of groundwater by the development at a rate specific and appropriate to the conditions and intended use. The evaluation should also include groundwater baseflow to streams using, when possible, available data from the subwatershed in which the proposed development is located.
2. Prioritization of groundwater zones: Based upon the data derived from the preliminary field verification, analysis of fracture fabric and groundwater budget analysis, each groundwater zone shall be delineated and prioritized according to the probability of developing the groundwater resources. Each of these zones shall be placed on a map (acceptable scales 1:2400 to 1:12000) identifying all probable or favorable zones and ranking the zones by their estimated relative potential to develop water for the proposed development.
 3. A geophysical investigation shall be conducted on each zone being considered for drilling of a communal well. The geophysical method used and the area of investigation shall be appropriate for the hydrogeologic conditions and purpose of the study. A summary of the investigation shall be included in the report with a copy of all logs, field data, and data interpretations provided to the County if requested.

B. Water Supply Testing

Wells shall be installed and tested to provide evidence that the hydrogeologic system is capable of furnishing and sustaining the potable water needs of the eventual inhabitants of the proposed development. Well construction and testing shall be performed in accordance with the latest revisions of the [Waterworks Regulations](#) of the Virginia Department of Health, the Loudoun County [Codified Ordinances](#), and Loudoun County Sanitation Authority (Loudoun Water) water system standards, whichever is more stringent.

1. Wells: For each proposed water supply (planned production) well installed, a minimum of two (2) observation wells will be constructed unless suitable existing observation wells are available. However, in LOD, the minimum number of observation wells shall be the number necessary to identify a wellhead's zone of influence (i.e. The area surrounding a pumping well within which the water table or potentiometric surface has been changed due to the well's pumping.) The locations of the observation wells shall be proposed by the applicant to the Loudoun County Department of Health and the Department of Building and Development for approval.
2. Formation Sampling: During all drilling, representative samples shall be collected for each change in geologic formation encountered and at intervals of twenty (20) feet when in the same geologic formation. The applicant shall retain these samples for a period of one (1) year after the study has been approved and be provided to the County if requested. A Virginia Certified Professional Geologist shall complete a geologic drilling log for each well constructed for the investigation.
3. Aquifer Pumping Test: An aquifer pumping test shall be conducted on each proposed communal water supply well that is constructed.
 - a. Method and Rate: Each test shall employ the down-hole method of pumping and be at a continuous and constant rate. A pumping rate shall be used that reasonably stresses the aquifer but does not result in excessive drawdown in the well. The minimum acceptable pumping rate for the test shall be one (1) gallon per minute (gpm) for each proposed equivalent hookup. The selected pumping rate shall not vary by more than 10 percent during the test. Discharge water shall be conveyed downgradient a sufficient distance (minimum 200 feet) from the pumping and observation wells, or to an impermeable conveyance feature (e.g., storm drain) or stream, to prevent recharge to the aquifer that could affect the test results.
 - b. Duration: Pumping shall be continuous for not less than seventy-two (72) hours and shall continue until the water level in the well reaches equilibrium or near equilibrium conditions. Immediately upon completion of pumping, the recovery phase of the test shall begin and continue for a period equal to the duration of pumping or until the water level in the pumping well recovers to within 90 percent of the pre-pumping water level, whichever occurs first.
 - c. Monitoring: The rate of discharge from the pumping well shall be measured and recorded at standard intervals during the test. (See Section 6.250 for references of standards and guidelines.) Water levels in the pumping and observation wells shall be monitored during the pumping phase and recovery phase of the test. All water

level drawdown and recovery measurements shall be made at standard intervals. Monitoring shall include pre-test measurements of water levels in the pumping well and observation wells to identify possible water level trends. Pre-test monitoring shall be for a period of at least 48 hours immediately prior to the start of pumping.

C. Laboratory Testing for Water Quality

1. For all proposed communal wells, tests shall be conducted to provide evidence that the system is capable of providing potable water. Such tests shall be conducted in accordance with the latest revision of the [Waterworks Regulations](#) of the Virginia Department of Health. Water quality testing results to satisfy this requirement shall be applicable for not more than three (3) years after sample collection unless the subdivision plat or plats for the entire subdivision have been recorded.
2. The County may require additional water quality sampling if a well has one or more of the water quality test results listed below in subparagraphs a through c. The Applicant shall notify the County Department of Health and County Department of Building and Development prior to conducting any additional sampling.
 - a. The presence of any regulated contaminant at a concentration above the maximum contaminant level as defined in the latest version of the [Waterworks Regulations](#) of the Virginia Department of Health.
 - b. The presence of any unregulated contaminant as defined in the latest version of the [Waterworks Regulations](#) of the Virginia Department of Health at a concentration equal to or greater than the laboratory's detection or reporting limit.
 - c. The presence of any hazardous compound associated with either regulated or unregulated contaminants [e.g., methyl tertiary butyl ether (MTBE)] at a concentration equal to or greater than the laboratory's detection or reporting limit.

D. Well Protection

Upon completion of all testing, the applicant shall assure that each well is secured and permanently protected until being put in use by:

1. Installing a lockable well cap with lock or welding a piece of flat steel that completely seals the well casing; and
2. Placing a seven (7)-foot post of a bright, visible color next to the well casing to ensure visible identification of the well.

6.212 SUBDIVISIONS WITH INDIVIDUAL WELLS

The testing and analyses specified in this section shall be conducted for proposed subdivisions planning to use a private well on each individual lot. A summary of the well drilling and testing requirements for various proposed subdivision development scenarios is presented in Figure 6.210-1.

A. Analysis of Background Information

Using the background information compiled previously, conduct an evaluation of the site hydrogeology and the occurrence, quality, and quantity of groundwater, including:

1. Preliminary field verification of existing geologic information including rock outcrops, karst features, etc.; and
2. Groundwater budget analysis: The effects of the proposed development on groundwater shall be evaluated using water budget concepts. The evaluation shall include available recharge under normal (10 inches/year) and drought (6 inches/year) conditions, net consumption of groundwater by the development at a rate specific and appropriate to the conditions and intended use, and groundwater baseflow to streams using, when possible, available data from the subwatershed in which the proposed development is located.
3. Analysis of fracture fabric: At sites with bedrock outcrops, fracture orientations (strike and dip measurements) shall be measured and documented in the report. The number and orientations of linear features or photolineaments shall be analyzed and correlated with documented bedrock fractures.

B. Water Supply Testing

A portion of the proposed total number of wells shall be installed and tested to provide evidence that the hydrogeologic system is capable of furnishing and sustaining the potable water needs of the proposed development. Well construction and testing shall be performed in accordance with the latest revisions of the [Waterworks Regulations](#) of the Virginia Department of Health and the Loudoun County [Codified Ordinances](#), whichever is more stringent.

1. Wells: All wells shall be designed to meet standards defined in Chapter 1040 of the Loudoun County [Codified Ordinance](#). The proposed locations of the wells shall be submitted by the applicant as part of a subdivision layout showing proposed well sites for each building lot to the Loudoun County Department of Health and the Department of Building and

Development for approval. The number and general placement of test wells shall be based on the following criteria:

- a. A minimum of three (3) test wells shall be required for each study.
 - b. Selected test well sites shall include at least one well on each unique combination of landform and geologic formation on which wells are proposed.
 - c. Test wells shall be installed and tested on thirty percent (30%) of the proposed lots that are less than 10 acres.
 - d. Where individual wells are proposed for each lot, physical or chemical alteration of geologic materials or structures (e.g., hydraulic fracturing, use of explosives, or addition of chemicals) to increase yield of test wells will not be permitted prior to the pumping test.
2. Formation Sampling: During all drilling, representative samples shall be collected for each change in geologic formation encountered and at intervals of twenty (20) feet when in the same geologic formation. The applicant shall retain these samples for a period of one (1) year after the study has been approved and be provided to the County if requested. A Virginia Certified Professional Geologist shall complete a geologic drilling log for each well constructed for the investigation.
 3. Aquifer Pumping Test: An aquifer pumping test shall be conducted on each well constructed for water supply testing. For each pumping well test, the two closest available test wells shall be monitored as observation wells unless otherwise approved by the County.
 - a. Method and Rate: Each test shall employ the down-hole method of pumping and be at a continuous and constant rate. A pumping rate shall be used that reasonably stresses the aquifer but does not result in excessive drawdown in the well. The minimum acceptable pumping rate for the test shall be one (1) gpm. Generally, the maximum required pumping rate shall be 20 gpm unless otherwise directed by the County. The selected pumping rate shall not vary by more than 10 percent during the test. Discharge water shall be conveyed downgradient a sufficient distance (minimum 200 feet) from the pumping and observation wells, or to an impermeable conveyance feature (e.g., storm drain) or stream, to prevent recharge to the aquifer that could affect the test results.
 - b. Duration: Pumping shall be continuous for not less than eight (8) hours and, if possible, continue until the water level in the well

reaches equilibrium or near-equilibrium conditions. Immediately upon completion of pumping, the recovery phase of the test shall begin and continue for a period equal to the duration of pumping or until the water level in the pumping well recovers to within 90 percent of the pre-pumping water level, whichever occurs first.

- c. Monitoring: The rate of discharge from the pumping well shall be measured and recorded at standard intervals during the test. (See Section 6.250 for references of standards and guidelines.) Water levels in the pumping and observation wells shall be monitored during the pumping phase of the test and the pumping well shall be monitored during the recovery phase of the test. All water level drawdown and recovery measurements shall be made at standard intervals. Monitoring shall include pre-test measurements of water levels in the pumping well and observation wells to identify possible water level trends and shall be for a period of at least 8 hours immediately prior to the start of pumping.

C. Laboratory Testing for Water Quality

- 1. Water quality sampling and analyses shall be conducted on each test well to provide evidence that the local groundwater system is capable of providing potable water. Such tests shall be conducted in accordance with the latest revision of the Chapter 1040 of the [Codified Ordinances](#) of Loudoun County. Water quality testing results to satisfy this requirement shall be applicable for not more than three (3) years after sample collection unless the subdivision plat or plats for the entire subdivision have been recorded.
- 2. The County may require additional water quality sampling if a well has one or more of the water quality test results listed below in subparagraphs (a) through (c). The Applicant shall notify the County Department of Health and County Department of Building and Development prior to conducting any additional sampling.
 - a. The presence of any regulated contaminant at a concentration above the maximum contaminant level as defined in the latest version of the [Waterworks Regulations](#) of the Virginia Department of Health.
 - b. The presence of any unregulated contaminant as defined in the latest version of the [Waterworks Regulations](#) of the Virginia Department of Health at a concentration equal to or greater than the laboratory's detection or reporting limit.
 - c. The presence of any hazardous compound associated with either regulated or unregulated contaminants (e.g., methyl tertiary butyl

ether [MTBE]) at a concentration equal to or greater than the laboratory's detection or reporting limit.

D. Well Protection

Upon completion of all testing, the applicant shall assure that each well is secured and permanently protected until being put in use by:

1. Installing a lockable well cap with lock or welding a piece of flat steel that completely seals the well casing; and
2. Placing a seven (7)-foot post of a bright, visible color next to the well casing to ensure visible identification of the well.

6.213 REPORTING REQUIREMENTS

The detailed hydrogeologic report shall include, at a minimum, the items described in paragraphs A through N below. All report material shall be organized by either "type" (well completion reports, pumping test analyses, water quality reports, etc.) or by well, in tabbed appendices clearly marked showing the content of the tabbed section. Identification of test sites, field data, laboratory reports, and test analyses must all match exactly. Raw field data (and corrected data if used) from the pumping tests and a tabulated summary of well drilling and testing results (including items listed below in sections F, G, and, unless pre-approved by the County, section H) shall be included with the report in a digital format acceptable to the County.

A. General Discussion

A discussion of the geologic setting, local watershed, hydrogeologic units, land surface elevation and relief, occurrence and movement of surface water and groundwater, and interpretation of groundwater data from surrounding areas, including groundwater quality.

B. Maps

A map or set of maps (scales from 1:2400 [1 inch = 200 feet] to 1:12000 [1 inch = 1,000] feet and with north arrows and explanations as needed) covering the development proposal. The map(s) shall contain all existing planimetric features, topography with contour intervals of 5 feet or less in North American Vertical Datum of 1988 (NAVD 88), North American Datum of 1983 Virginia North State plane (NAD 83 HARN) coordinate grid system, all proposed roads, proposed lot lines, proposed lot sites, proposed house sites, proposed septic fields, surface water features, and springs. Groundwater contours with data control points and direction of groundwater flow shall be illustrated. (Projects that were started prior to November 9, 2009 may use the previously required NAD 27 datum.)

C. Cross-Sections

The report shall contain one or more cross-sections, at true horizontal scale and vertical scale (exaggerated as appropriate). The location of each cross-section shall be shown on the plan view map and the cross-section shall contain the following information:

1. Geologic data including regolith, bedrock, and structural features if present.
2. Well site locations showing well casings, total depths, and specific capacities.
3. Elevations of ground surface, rock formations, and static water surfaces.
4. Final water level in each pumped well at the end of the pumping tests and the corresponding pumping rate of the well.

D. Geologic Logs

For each well drilled for the investigation, a geologic log shall be completed and sealed by a Virginia certified professional geologist. A Virginia Water Well Completion Report (form GW-2) shall be completed for each well and signed by the driller who shall be licensed to do business in Loudoun County. The geologic log shall include the NAD 83 HARN grid coordinates and land surface elevation in NAVD 88 of the well. (Projects that were started prior to November 9, 2009 may use the previously required NAD 27 datum.)

E. Well Construction Diagrams

For each well constructed for the investigation, provide a well construction diagram with vertical scale showing (when applicable) the well number, well permit number, date of construction, well location coordinates, land surface elevation, total depth, well casing depth, grout depth, bentonite seal thickness, top and bottom of well screen, height of casing above land surface, static water level and date, depth of distinct water bearing zones and estimated contribution per zone, and corresponding graphic (symbol) geologic log with generalized descriptive text.

F. Well Construction Summary

For all wells constructed for the investigation, provide a summary table which includes, at a minimum, the well I.D. number, well construction permit number, completion date, land surface elevation, total well depth, well casing depth, depth to bedrock, static water level (all on the same date), total well yield and yield test method, and depths and estimated yields of water producing zones.

G. Well Testing Summary

In either the well construction summary table (previous item) or a separate table, summarize the well testing results, including at a minimum, the well number (and pumping well number if different), date tested, duration of pumping, pumping rate, pre-pumping (static) water level, maximum observed water level drawdown, distance to pumped well, percent of available drawdown used (assume maximum available drawdown is 40 feet above well bottom or use more stringent criteria if appropriate), specific capacity, transmissivity, storativity (if available), and time to achieve 90 percent recovery (or the percent recovery after a specified time) in the pumped well.

H. Groundwater Quality

For all wells tested for the investigation, provide a table summarizing the groundwater quality and include, at a minimum, the concentrations of any compounds exceeding the maximum contaminant levels as defined in the latest version of the [Waterworks Regulations](#) of the Virginia Department of Health and any detected organic compound or pesticide. Copies of the laboratory reports shall be included in the appendices.

I. Water Balance

The report shall develop groundwater mass balance and recharge estimates for the area. Applicable calculations and references shall be included as well as assumptions and limitations of the methods used. The report shall include a discussion of the following information, including appropriate supporting calculations and diagrams, which shall include, at a minimum:

1. Identification of the source or sources of recharge, using recharge from rainfall for normal conditions of 10 inches per year and for drought conditions of 6 inches per year.
2. The calculated effect of all proposed subdivision wells pumping at a daily net consumption rate specific and appropriate to the conditions and intended use. For subdivisions with communal water systems, provide calculations for both of the following conditions:
 - a. At a rate that does not include lawn and landscape irrigation.
 - b. At a rate that does include irrigation of private lawns and any irrigated common area lawns and landscaping. Irrigation rates used in calculations shall follow normal recommendations for the area (e.g., 1 inch of water per week for turf lawns during dry periods).

J. For communal systems in LOD, prepare:

1. A wellhead protection plan to include:

- a. Delineation of wellhead's zone of influence. The methodology used to delineate the zone of influence shall be technically based on site-specific data, and be appropriate to Hydrogeologic conditions and the withdrawal rate of the intended use. The methodology chosen shall be referenced and justified in terms of its appropriateness.
- b. Estimation of sustainable yield (i.e. the average rate of pumping that can be maintained without endangering either the quantity or quality of groundwater.)
- c. Pumping schedule.
- d. Number and location of independent backup wells.

2. An analysis and evaluation of the impact of groundwater withdrawals on the groundwater and surface water resources including the impact on surrounding water supply wells.

3. A plan for investigating potential impacts on existing off-site water supply wells within a minimum of 1,000 feet of the proposed development's production wells if the off-site wells experience water level or water quality problems during periods of production well use. Initial mitigation measures would include demand management strategies.

K. Nitrate Loading Computations shall be performed in accordance with the Loudoun County Department of Health memorandum dated February 27, 1989.

L. Evaluate the possibility of wells on the remaining (non-tested) individual lots having inadequate yield and propose how these may be addressed.

M. Aquifer Test Analyses

The transmissivity and storativity of the various materials evaluated by aquifer tests interpreted using professionally accepted methods. Indicate the analytical method used, the appropriateness of the selected method relative to the hydrogeologic conditions, and show a summary of calculations. If there are significant background trend effects that are identified in the pre-test monitoring data or by other means, then the pumping test data shall be corrected for these effects prior to analysis and the corrected data shown on a graph.

N. Safe Yield Evaluation

Testing results and topics pertinent to the concept of “safe yield” shall be presented and discussed under a separate heading of the report. The methods used in the evaluation along with the method's assumptions and limitations shall be explained. For the purposes of this report, the safe yield evaluation shall encompass the assessment of the effects from the combined groundwater withdrawal of the proposed subdivision. These effects shall include but not be limited to:

1. Estimated extent of the one (1)-foot drawdown contour using representative values of transmissivity and storativity (based on the on-site testing) and a net withdrawal rate of 150 gpd per household or the rate used in paragraph 6.213.I.2 above, whichever is greater.
2. Alteration of groundwater flow direction including a map showing estimated groundwater contours and flow directions resulting from the effects of the net withdrawal rate used in the calculations for paragraph 6.213.I.2 above or based on more accurate data if available. This map shall be on the same base and scale as the pre-development groundwater contour and flow map required in paragraph 6.213.B.
3. The potential adverse or undesired affects to the water resources caused by the estimated combined groundwater withdrawal from all of the proposed development wells (items 1 and 2 above). Examples of adverse effects are the possibilities of lowering or depleting on-site surface water or groundwater sources and drawing in or altering the flow direction of groundwater from potential pollution sources such as leaking USTs, ASTs, waste water, or other zones of contaminated surface or groundwater. Such discussion should also address the potential for lowering or depleting offsite surface water or groundwater sources.

6.220 HYDROGEOLOGIC REPORT REQUIREMENTS FOR SOLID WASTE FACILITIES

Refer to the most recent versions of Chapter 1080 of the Codified Ordinances of Loudoun County and the Virginia Solid Waste Management Regulations for the hydrogeologic report requirements for solid waste facilities.

6.230 HYDROGEOLOGIC REPORT REQUIREMENTS FOR RESOURCE EXTRACTION

The following information, testing, analyses, and reporting are required at a minimum:

A. Background Information

Conduct a background evaluation of the hydrogeology using readily available existing resources such as publications and/or data from the U.S. Geological Survey, State of Virginia Water Control Board, U.S. Environmental Protection

Agency, Loudoun County Department of Health, and Office of Mapping and Geographic Information. At a minimum, extend the evaluation to include the area within approximately one (1) mile beyond the property boundary.

1. USGS and Loudoun County topographic information, whichever is more detailed.
2. Property plats and aerial photographs.
3. Geologic maps and data reports (well logs, water quality analysis, geologic information).
4. Existing well data or descriptive statistical summary of the same. (For example, minimum, maximum and mean of well depths, water levels, etc.).
5. Reference existing research reports, hydrogeologic reports, geophysics reports, etc.
6. Existing pollution sources (e.g., underground storage tanks, septic fields, graveyards, etc.) of record or observed on site and within a minimum of 2,000 feet of the site boundary. An attempt shall be made to verify sources of record by field reconnaissance. The report shall contain a copy of a study from a company or companies that specialize in federal and state database searches for historical pollution source reporting. The report shall contain statements as to the type of background investigation conducted for pollution sources, the results of the investigation, and a verification statement that certifies that this historical pollution search has been conducted.

B. Analysis of Background Information

Using the background information compiled previously, conduct an evaluation of the site hydrogeology including:

1. Preliminary field verification of existing geologic information including rock outcrops, karst features, etc.
2. Analysis of fracture fabric: At sites with bedrock outcrops, fracture orientations (strike and dip measurements) shall be measured and documented in the report. The number and orientations of linear features or photo lineaments shall be analyzed and correlated with documented bedrock fractures.
3. Locations and identifications of all wells within 2,000 feet of the proposed area of resource extraction or production wells.

4. Water budget analysis: The effects of the proposed development on groundwater and surface water discharges shall be evaluated using water budget concepts. The evaluation shall include available recharge under normal and drought conditions, net consumption of groundwater by the development, and groundwater baseflow to streams using, when possible, available data from the subwatershed in which the proposed development is located.

C. Geophysical Survey

A geophysical survey shall be conducted to investigate zones adjacent to the proposed resource extraction area that may be sensitive to soil/rock removal or dewatering activities in the form of reduced stability or increased groundwater flow. Information from the background data analyses shall be used to assist in targeting potential transects for the surveys. The geophysical method or methods used shall be appropriate for the hydrogeologic conditions and purpose of the study. A summary of the survey shall be presented in the report including a description of the methods used, diagrams of the survey transect locations, an interpretation of the data, and an analysis of the findings with respect to the proposed land use. A copy of all logs, field data, and data interpretations shall be provided to the County if requested. Results of the survey shall be used to help select sites for additional investigation, well construction, and aquifer testing.

D. Geology

For each well drilled for the investigation, lithologic samples shall be collected at intervals of 10 feet or change in lithology, whichever is less. Geologic logs shall be completed and sealed by a Virginia Certified Professional Geologist. The Applicant shall retain these samples for a period of one (1) year after the study has been approved and provide them to the County if requested.

E. Pumping Test

The minimum number of pumping tests required is contingent on acreage, layout, and volume of the proposed area of resource extraction. The tests shall include:

1. Wells: For each well to be tested, a minimum of two (2) observation wells will be required. Additional existing wells shall be monitored as observation wells if they are available and within a distance that is reasonable to expect measurable impacts from the pumping test. The locations of the wells intended for monitoring shall be proposed by the applicant and approved by the Loudoun County Department of Health and the Department of Building and Development. If dewatering will be part of the proposed resource extraction process, a series of test wells near the edge of the proposed extraction area shall be installed and completed to a depth

below the planned level of dewatering for use in simulating dewatered conditions.

2. **Method and Rate:** Each test shall employ the down-hole method of pumping and be at a continuous and constant rate. A pumping rate shall be used that reasonably stresses the aquifer but does not result in excessive drawdown in the well. The selected pumping rate shall not vary by more than ten (10) percent during the test. If test wells are pumped to simulate dewatered conditions, the pumping test shall be a constant drawdown test and the water level in the well shall be quickly pumped down to and held at or below the planned level of dewatering. In all cases, discharge water shall be conveyed downgradient a sufficient distance (minimum 200 feet) from the pumping and observation wells, or to an impermeable conveyance feature (e.g., storm drain) or stream, to prevent recharge to the aquifer that could affect the test results.
 3. **Duration:** Pumping shall be continuous for not less than forty-eight (48) hours and continue until the water level reaches equilibrium or near-equilibrium conditions. Immediately upon completion of pumping, the recovery phase of the test shall begin and continue for a period equal to the duration of pumping or until the water level in each well (and at each surface water site) recovers to within 90 percent of the pre-pumping water level, whichever occurs first.
 4. **Monitoring:** The rate of discharge from each pumping well shall be measured and recorded at standard intervals during the test. (See Section 6.250 for references of standards and guidelines.) Water levels in the pumping and observation wells shall be monitored during the pumping phase and recovery phase of the test. All water level drawdown and recovery measurements shall be made at standard intervals. Monitoring shall include pre-test measurements of water levels in the pumping well and observation wells to identify possible water level trends. Pre-test monitoring shall be conducted for a period of at least 48 hours immediately prior to the start of pumping. If there are significant background trend effects that are identified in the pre-test monitoring data or by other means, then the pumping test data shall be corrected for these effects prior to analysis and the corrected data shown on a graph. The water level of ponds, streams, and springs within the immediate vicinity of the pumping well(s) shall be measured on an hourly basis for the duration of pumping. Where appropriate and technically feasible, flow measurements shall be recorded in streams and springs at a minimum of every six (6) hours. Pre-test monitoring of surface waters shall be conducted for a period of at least 48 hours immediately prior to the start of pumping.
- F. The transmissivity and storativity of the aquifer(s) based on aquifer tests evaluated using professionally accepted methods. Indicate the analytical method used, the

appropriateness of the selected method relative to the hydrogeologic conditions, and show a summary of the calculations including data plots and curve matching.

G. Groundwater monitoring program proposal to include:

1. Monitoring well locations and construction specifications.
2. Monitoring and reporting frequency.
3. Water quality sampling and analysis plan (methodologies according to Virginia Groundwater Quality or ASTM Standards, whichever is more stringent).
4. Well maintenance and security.

H. Hydrogeologic cross-sections showing the geology, proposed area of extraction (include diagrams showing before extraction and after extraction conditions), well casings and total depths, and static groundwater levels.

I. Include an evaluation on the impact of the proposed extraction operations (including but not limited to dewatering) on surrounding geologic stability, groundwater and surface water.

J. For existing and future off-site water supply wells within a minimum of 1,000 feet of the proposed resource extraction area, quantity and quality baseline testing prior to extraction shall be conducted and submitted and a ~~A~~ plan for investigating and mitigating the potential impacts on existing off-site water supply wells within a minimum of 1,000 feet of the proposed resource extraction area if the off-site wells experience water level or water quality problems while the extraction process or dewatering is active.

K. Include all water level monitoring and pumping data used in the report in a digital format acceptable to the County.

6.240 HYDROGEOLOGIC REPORT REQUIREMENTS FOR OTHER DEVELOPMENTS

Other types of developments that withdraw groundwater, including but not limited to recreational developments (golf courses, water theme parks, etc.), large non-agricultural irrigation systems, and industrial or commercial developments with water demands potentially exceeding an average of ten thousand (10,000) gallons per day during any single thirty (30)-day period. Also included are proposed agricultural developments potentially withdrawing more than one million (1,000,000) gallons during any 30-day period. The minimum information, testing, analyses, and reporting requirements for other developments are listed in the section below. Given the wide range of these developments, the resulting potential impacts to groundwater and surface water resources may vary significantly. For some proposed developments, more rigorous testing and evaluation may

be appropriate because of their planned groundwater needs or their location. It is recommended that the applicant, prior to conducting their investigation, arrange a meeting with the County to discuss their proposed development and find out if more rigorous testing and evaluation requirements are appropriate.

A. Background Information

Conduct a background evaluation of the hydrogeology using readily available existing resources such as publications and/or data from the U.S. Geological Survey, State of Virginia Water Control Board, U.S. Environmental Protection Agency, Loudoun County Department of Health, and Office of Mapping and Geographic Information. At a minimum, extend the evaluation to include the area within approximately one (1) mile beyond the property boundary.

1. USGS and Loudoun County topographic information, whichever is more detailed.
2. Property plats and aerial photographs.
3. Geologic maps and data reports (well logs, water quality analysis, geologic information).
4. Existing well data or descriptive statistical summary of the same. (For example, minimum, maximum and mean of well depths, water levels, etc.)
5. Reference existing research reports, hydrogeologic reports, geophysics reports, etc.
6. Existing pollution sources (e.g., underground storage tanks, septic fields, graveyards, etc.) of record or observed on site and within a minimum of 2,000 feet of the site boundary. An attempt shall be made to verify sources of record by field reconnaissance. The report shall contain a copy of a study from a company or companies that specialize in federal and state database searches for historical pollution source reporting. The report shall contain statements as to the type of background investigation conducted for pollution sources, the results of the investigation, and a verification statement that certifies that this historical pollution search has been conducted.

B. Analysis of Background Information

Using the background information compiled previously, conduct an evaluation of the site hydrogeology including:

1. Preliminary field verification of existing geologic information including rock outcrops, karst features, etc.

2. Analysis of fracture fabric: At sites with bedrock outcrops, fracture orientations (strike and dip measurements) shall be measured and documented in the report. The number and orientations of linear features or photo lineaments shall be analyzed and correlated with documented bedrock fractures.
3. Locations and identifications of all wells within 2,000 feet of the proposed development's production wells.
4. Water budget analysis: The effects of the proposed development on groundwater and surface water discharges shall be evaluated using water budget concepts. The evaluation shall include available recharge under normal and drought conditions, net consumption of groundwater by the development, and groundwater baseflow to streams using, when possible, available data from the subwatershed in which the proposed development is located.

C. Geophysical Survey

Depending on the type of development and its water demands, the County may require that a geophysical survey be conducted to investigate subsurface conditions that cannot be readily determined through other methods. The Applicant shall present the preliminary findings of the initial investigation (sections 6.240 A and B above) to the Loudoun County Department of Health and Department of Building and Development for a determination of the need for a geophysical study. If a geophysical survey is conducted, information from the background data analyses shall be used to assist in targeting potential transects for the surveys. The geophysical method or methods used shall be appropriate for the hydrogeologic conditions and purpose of the study. A summary of the survey shall be presented in the report including a description of the methods used, diagrams of the survey transect locations, an interpretation of the data, and an analysis of the findings with respect to the proposed land use. A copy of all logs, field data, and data interpretations shall be provided to the County if requested. Results of the survey shall be used to help select sites for additional investigation, well construction, and aquifer testing.

D. Geology

For each well drilled for the investigation, lithologic samples shall be collected at intervals of 10 feet or change in lithology, whichever is less. Geologic logs shall be completed and sealed by a Virginia Certified Professional Geologist. The Applicant shall retain these samples for a period of one (1) year after the study has been approved and provide them to the County if requested.

E. Pumping Test

The minimum number of pumping tests required are contingent on acreage and layout of the proposed development and the volume and proposed use of groundwater.

1. Wells: For each well to be tested, a minimum of two (2) observation wells will be required unless otherwise approved by the County. Other test wells may be temporarily used as the required two observation wells provided they are within a distance that is reasonable to expect measurable impact from the test pumping well. (In addition to the two required observation wells, additional existing wells, if they are available, shall also be monitored as observation wells if they are relatively close to the pumping test well.) The locations of the wells intended for monitoring shall be proposed by the applicant and approved by the Loudoun County Department of Health and the Department of Building and Development.
2. Method and Rate: Each test shall employ the down-hole method of pumping and be at a continuous and constant rate. A pumping rate shall be used that reasonably stresses the aquifer but does not result in excessive drawdown in the well. The pumping rate shall not be less than the maximum anticipated daily withdrawal rate used in the proposed groundwater withdrawal plan (see Section 6.240.I). The selected pumping rate shall not vary by more than ten (10) percent during the test. Discharge water shall be conveyed downgradient a sufficient distance (minimum 200 feet) from the pumping and observation wells, or to an impermeable conveyance feature (e.g., storm drain) or stream, to prevent recharge to the aquifer that could affect the test results.
3. Duration: Pumping shall be continuous for not less than forty-eight (48) hours and continue until the water level the well reaches equilibrium or near-equilibrium conditions. A minimum test duration greater than forty-eight (48) hours may be appropriate and required depending on the location and groundwater needs of the proposed development or to satisfy requirements of other agencies. Immediately upon completion of pumping, the recovery phase of the test shall begin and continue for a period equal to the during of pumping or until the water level in each well (and each surface water site) recovers to within 90 percent of the pre-pumping water level, whichever occurs first.
4. Monitoring: The rate of discharge from each pumping well shall be measured and recorded at standard intervals during the test. (See Section 6.250 for references of standards and guidelines.) Water levels in the pumping and observation wells shall be monitored during the pumping phase and recovery phase of the test. All water level drawdown and recovery measurements shall be made at standard intervals. Monitoring

shall include pre-test measurements of water levels in the pumping well and observation wells to identify possible water level trends. Pre-test monitoring shall be conducted for a period of at least 48 hours immediately prior to the start of pumping. If there are significant background trend effects that are identified in the pre-test monitoring data or by other means, then the pumping test data shall be corrected for these effects prior to analysis and the corrected data shown on a graph. The water level of ponds, streams, and springs within the immediate vicinity of the pumping well(s) shall be measured on an hourly basis for the duration of pumping unless otherwise approved by the County. Where appropriate and technically feasible, measurements shall be recorded in streams and springs at a minimum of every six (6) hours. Pre-test monitoring of surface waters shall be conducted for a period of at least 48 hours immediately prior to the start of pumping.

- F. Determination of aquifer transmissivity and storativity.
- G. Groundwater monitoring program proposal to include:
 - 1. Monitoring well locations and construction specifications.
 - 2. Monitoring and reporting frequency.
 - 3. Water quality sampling and analysis plan (methodologies according to Virginia Groundwater Quality or ASTM Standards, whichever is more stringent).
 - 4. Well maintenance and security.
- H. Hydrogeologic cross-sections showing the geology, proposed production wells, test and observation well casings, total depths, and static groundwater levels.
- I. Proposed groundwater withdrawal plan including estimated average and maximum withdrawals, by well, by month, for a one year period and the estimated maximum withdrawal for a one (1)-day period. Include a percentage breakdown of the major uses of the groundwater.
- J. An analysis and evaluation of the impact of groundwater withdrawals on the groundwater and surface water resources including the impact on surrounding water supply wells.
- K. A plan for investigating and mitigating potential impacts on existing off-site water supply wells within a minimum of 1,000 feet of the proposed development's production wells if the off-site wells experience water level or water quality problems during periods of production well use.

- L. Water Quality Sampling: Any well used or potentially used for potable water supply shall be sampled in accordance with the latest version of the [Waterworks Regulations](#) of the Virginia Department of Health. Contact the Loudoun County Department of Health for specific testing requirements.
- M. Include all water level monitoring and pumping data used in the report in a digital format acceptable to the County.

6.250 REFERENCES OF STANDARD PRACTICES AND GUIDELINES

[American Society for Testing and Materials \(ASTM\) Standards](#): [D 653](#), Terminology Related to Soil, Rock, and Contained Fluids; [D 2488](#), Practice for Description and Identification of Soils (Visual Manual Procedure); [D 4043](#), Guide for Selection of Aquifer-Test Field and Analytical Procedures in Determination of Aquifer Properties by Well Techniques; [D 4050](#), Standard Test Method (Field Procedure) for Withdrawal and Injection Well Tests for Determining Hydraulic Properties of Aquifer Systems; [D 4105](#), Test Method (Analytical Procedure) for Determining Transmissivity and Storativity of Nonleaky Confined Aquifer by the Modified Theis Nonequilibrium Method; [D 4106](#), Test Method (Analytical Procedure) for Determining Transmissivity and Storativity of Nonleaky Confined Aquifers by the Theis Nonequilibrium Method; [D 4448](#), Standard Guide for Sampling Ground Water Monitoring Wells; [D 4750](#), test Method for Determining Subsurface Liquid Levels in a Borehole or Monitoring Well (Observation Well); and [D 5092](#), Standard Practice for Design and Installation of Ground Water Monitoring Wells in Aquifers. [E 1527](#), Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process.

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CHAPTER 7.000

ENVIRONMENTAL DESIGN STANDARDS

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CHAPTER 7.000

ENVIRONMENTAL DESIGN STANDARDS

7.100 STREET AND SITE LIGHTING STANDARDS

The standards established within this section are applicable to lighting required in conjunction with subdivision and/or site plan development. In addition, the light and glare performance standards established within the Zoning Ordinance shall be met, where applicable.

It is the intent of this section to assure lighting practices and systems that will improve the quality and effectiveness of night-time lighting, protect the night sky, provide glare reduction, minimize light trespass, and conserve energy and resources, while maintaining night-time safety, utility, security and productivity.

7.110 GENERAL REQUIREMENTS

Construction plans and profiles and site plan submissions shall show the layout of the proposed lighting fixtures. The plans shall also include a narrative specifically outlining the proposed lighting standards and specifications, the parties responsible for the associated operation and maintenance costs and, if applicable, the permit requirements, as established in this section. Fixtures shall be located so as not to interfere with other utilities, and to minimize potential conflicts with building sites. Lighting shall be provided in accordance with the following:

- A. Unless prohibited by VDOT standards, full cutoff and fully shielded light fixtures shall be utilized to meet the requirements of this Chapter.
- B. Residential Subdivisions/Site Plans
 - 1. Street lighting shall be provided at Public and Category A subdivision street intersections within single family detached subdivisions in accordance with the standards outlined in this Chapter. This applies to street intersections in all Urban Districts and all Planned Districts as defined in the Zoning Ordinance with the exception of PD-RV and PD-CV Districts.
 - 2. Street lighting shall be provided along private streets/accessways within townhouse developments in accordance with the standards outlined in this Chapter.
 - 3. Site lighting shall be provided within multi-family developments in accordance with the standards outlined in this Chapter.

C. Retail, Commercial, Office, And Industrial Subdivisions/Site Plans

1. Street lighting shall be provided at Public and Category A subdivision street intersections in accordance with the standards outlined in this Chapter.
2. Site lighting shall be provided within developments which provide customer services to the general public after 5:00 p.m.

7.120 LIGHTING STANDARDS

A. Street Lighting

1. Lighting located at subdivision street intersections shall be at a minimum of a five thousand (5,000) lumen colonial fixture with a Type III reflector or approved equal mounted at a fourteen (14) foot height. Four way intersections will require a maximum of two (2) lights located on opposite corners. Intersections with four lane divided roadways will require lights at all corners.

B. Site Lighting

1. Lighting located within single family attached or multi-family developments shall be in general accordance with the Table below. Deviations from this table may be allowed if adequate information is provided to ensure that the requirements are met in an equivalent manner.

Table 1 - Standard Street Lighting Spacing

Lamp: Colonial Fixture		
Reflector: Type III		
Lumen Rating	Mounting Height	Maximum Spacing
5,000	10'	100'
5,000	14'	120'
8,000	10'	150'
8,000	14'	190'

2. Lighting located within developments which provide customer service to the public after 5:00 p.m. shall have a minimum of six tenths (0.6) foot-candle at grade and the average horizontal illumination shall not exceed forty (40) foot-candles at grade level, subject to a uniformity ratio (ratio of average to minimum illuminance) no greater than 4:1.

7.130 OPERATIONAL, MAINTENANCE, AND INSTALLATION COSTS

- A. Operation and maintenance costs of the lighting system will not be the responsibility of Loudoun County.
- B. The recordation documents of the subdivision will indicate that the operational and maintenance costs are not the public responsibility, and will further designate the party with whom these responsibilities will ultimately lie.
- C. Where the proposed system lies within or adjacent to dedicated public street right-of-way, the Virginia Department of Transportation requires that such operation, maintenance, and installation can only be contracted through public utilities or Loudoun County. The developer or responsible party shall sign an agreement with the public utility which guarantees full payment to the public utility of all associated charges, as well as all administrative costs experienced by the public utility. Said agreement shall be executed prior to Performance Bond release.
- D. When VDOT requests the installation of street lights within publicly maintained street right-of-way concurrent with the land development application process of Loudoun County, VDOT shall be obligated for the future operation and maintenance costs arising after the acceptance into the State system.

7.200 RESERVED

7.300 TREE CONSERVATION

- A. The County recommends that the following be considered priorities for tree conservation:
1. Trees, shrubs, and plants located within the Floodplain Overlay District;
 2. Intermittent and perennial stream buffers, non-tidal wetlands, and steep slope areas;
 3. Contiguous forest that connects the largest undeveloped or most vegetated tracts of land within and adjacent to the site;
 4. Trees, shrubs, or plants determined to be rare, threatened, or endangered under the federal Endangered Species Act and those species identified by the Virginia Department of Game and Inland Fisheries;
 5. Trees that are identified as part of a registered historic site;
 6. Hedgerows/Fencerows; and
 7. Invigorated, healthy, structurally sound trees having a diameter measured at four and a half (4.5) feet above the ground of thirty (30) inches or more.
- B. Conservation of Existing Trees and Vegetation to Meet Canopy and Buffer Requirements:
1. Existing tree canopy and vegetation, including those areas of tree canopy and vegetation that an Applicant has agreed to preserve or conserve as part of a proffer or condition of approval, may be used to meet canopy and/or buffering and screening requirements of the Zoning Ordinance, if the following requirements are met:
 - a. The following shall not be used to meet canopy or buffering and screening requirements:
 - i. Concentrated stands of Virginia Pine.
 - ii. Concentrated stands of invasive plant species as identified on the Virginia Department of Conservation and Recreation, [Virginia Invasive Plant Species List](#).
 - iii. Existing tree canopy and vegetation located within the PRZ, as defined in Section 7.303.
 - iv. Existing tree canopy and vegetation, located on residential lots of twenty thousand (20,000) square feet or less.

- b. Existing tree canopy shall meet the standards of desirability and life-year expectancy established by the Zoning Administrator. Existing vegetation shall be suitable to provide buffering and screening in accordance with the requirements of the Zoning Ordinance. To demonstrate that these requirements are met, a field inspection of the existing tree canopy and vegetation proposed to be used to meet the canopy and/or buffering and screening requirements of the Zoning Ordinance shall be conducted, and a narrative prepared, by a Certified Arborist, Urban Forester, or Landscape Architect. The date of the inspection and the name of the individual who conducted the inspection shall be identified in the narrative.

The narrative may be accompanied by photographs. The narrative shall describe the overall size, species and general conditions of the area where such existing trees and vegetation are located. General conditions include factors such as dominant species, growth rate, stocking/basal area, structure, form and quality characteristics, regeneration, age range, soils, aspect, stand history, invasive species, and hazard trees. The narrative shall also inventory by field location, common name, scientific name and International Society of Arboriculture (ISA) condition rating of all trees within the area of trees and vegetation to be preserved or conserved located within fifty (50) feet of the limits of clearing and grading that have a diameter breast height (d.b.h.) of thirty (30) inches or more.

- C. Conservation of Existing Trees and Vegetation for Use as Best Management Practices (BMP):
 1. A field inspection shall be conducted, and a narrative prepared, by a Certified Arborist, Urban Forester, or Landscape Architect. The date of the inspection and the name of the individual who conducted the inspection shall be identified in the narrative.
 2. The narrative may be accompanied by photographs and shall describe the overall size, species and general condition of the conserved area where the existing trees and vegetation are located to demonstrate compliance with the BMP requirements of Chapter 5 of this Manual. General conditions include factors such as dominant species, growth rate, stocking/basal area, structure, form and quality characteristics, regeneration, age range, soils, aspect, stand history, invasive species, and hazard trees.
 3. Existing tree canopy and vegetation used as BMPs in accordance with Chapter 5 of this Manual shall be located within an easement dedicated to the County of Loudoun.

7.301 LANDSCAPE PLANTINGS

The County recommends that tree and shrub plantings be native and have multiple values such as biomass, nuts, fruits, browse, nesting, and aesthetics. Table 3 (Trees and Shrubs) provides a list of the species that may be used to meet the requirements of Sections 7.302 and 7.305. The Director or Director's Designee may approve the use of additional species not listed in Table 3 if such species demonstrate the values listed above. The Director or Director's Designee shall establish the minimum planting area (square feet) and canopy coverage provided (square feet), if applicable, for any approved additional species.

7.302 TREE CONSERVATION AND LANDSCAPE PLANS

When new plantings or existing tree canopy and vegetation are used to satisfy the requirements of the Zoning Ordinance, this Manual, a proffer, or a condition of approval of a special exception or variance, an applicant shall submit a Tree Conservation and Landscape Plan.

- A. The Tree Conservation and Landscape Plan shall be overlain upon the site plan or construction plans and profiles, whichever is applicable, to illustrate the following:
1. Accurate location and species of each planting.
 2. No plantings are proposed that would be detrimental to the purpose of sight distance easements or other easements.
 3. Required landscape buffers.
 4. Areas of existing tree canopy and vegetation to be preserved or conserved.
 5. All tree protection measures required by Section 7.303 of this Chapter.
 6. Tree canopy calculations.
 7. Landscape planting schedule.
 8. Any narrative required by Section 7.300 of this Chapter.
 9. References to the appropriate guidelines for planting and maintenance of new plant material provided by [Landscape Contractors Association's; Landscape Specifications Guidelines for Baltimore - Washington Metropolitan Area](#).
 - a. Above-ground landscape containers and planters for trees shall be designed in accordance with Virginia Cooperation Extension publication 430-023, [Trees for Landscape Containers and Planters](#).

- b. All planting areas shall contain soils suitable for planting. Soils shall be free of construction materials. Excessive rock and gravel or compaction shall be addressed prior to installation of landscape material.

B. For new plantings used to meet canopy, landscaping and/or buffering and screening requirements, a Landscape Table shall be provided as follows below. For tree plantings, canopy coverage provided shall be in accordance with Table 3, or as established by the Director or Director's designee for additional species. To achieve diversity:

1. If 40 or more trees of a planting category are required to be planted, then no more than one-fourth of any category of trees (large deciduous, small deciduous, and evergreen) shall be composed of one species.

“SAMPLE” LANDSCAPE TABLE

KEY	SCIENTIFIC NAME	COMMON NAME	SIZE (CALIPER or HEIGHT)	TYPE OF ROOT STOCK TO BE PLANTED *1	QUANTITY	____-YEAR CANOPY COVERAGE PROVIDED PER TREE	TOTAL CANOPY COVERAGE PROVIDED
Large Deciduous Trees							
Ar	Acer rubrum	Red Maple	2" caliper	B&B	15	270	4,050
Ls	Liquidambar styraciflua	Sweetgum	2" caliper	B&B	15	270	4,050
Qp	Quercus palustris	Pin Oak	2" caliper	B&B	15	270	4,050
Zs	Zelkova serrata	Japanese Zelkova	2" caliper	B&B	15	270	4,050
Total					60		16,200

Small Deciduous Trees							
Cf	Cornus florida	Flowering Dogwood	1" caliper	B&B	18	115	2,070
Cc	Cercis canadensis	Redbud	1" caliper	B&B	18	115	2,070
Aa	Amelanchier arborea	Downy Serviceberry	1" caliper	B&B	18	115	2,070
Li	Lagerstroemia idica	Common Crapemyrtle	1" caliper	B&B	18	115	2,070
Total					72		8,280
Evergreen Trees							
Pa	Picea abies	Norway Spruce	6'	CON	20	190	3,800
Ps	Pinus strobus	Eastern White Pine	6'	CON	20	190	3,800
Io	Ilex opaca	American Holly	6'	CON	20	115	2,300
Mg	Magnolia grandiflora	Southern Magnolia	6'	CON	20	190	3,800
Total					80		13,700
Total Canopy					212		38,130
Shrubs							
Ra	Rhododendron atlantica	Dwarf Azalea	3 gallon	CON	20	0	0
As	Alnus serrulata	Common Alder	3 gallon	CON	10	0	
Co	Cephalanthus occidentalis	Buttonbush	3 gallon	CON	18	0	0
Ca	Cornus amomum	Silky Dogwood	3 gallon	CON	15	0	0
Total					63		
Note: Substitute plantings may be permitted in accordance with Chapter 7 of the FSM.							

Footnotes:

*1 Type of Root Stock to be planted shall be specified as follows:

- balled and burlapped = B&B

- bare root = BR
- container = CON

C. The use of deciduous trees, evergreen trees, shrubs, ornamental grasses and perennials, or a combination of these plant types only, shall be used to achieve the required buffer planting units. Buffer tables shall be provided as follows below.

“SAMPLE” ROAD CORRIDOR BUFFER TABLE

Adjacent Road Name and Type		“Road Name” (Major Collector)		
Road Corridor Buffer Type Required		Type 2		
Plant Units Per 100 Linear Feet		60		
Total Linear Feet		300		
Total Required Plant Units		180		
Plant Types	Quantity	Plant Unit Equivalents	Plant Units	Percentage
Large Deciduous	6	10 Plant Units = 1 Plant	60	33%
Evergreen	0	6 Plant Units = 1 Plant	0	0%
Small Deciduous	12	5 Plant Units = 1 Plant	60	33%
Shrubs	25	2 Plant Units = 1 Plant	50	28%
Ornamental Grasses	0	1 Plant Unit = 1 Plant	0	0%
Perennials	40	0.25 Plant Unit = 1 Plant	10	6%
Total	N/A	N/A	180	N/A

“SAMPLE” BUFFER YARD TABLE

Proposed Land Use		Group 10		
Adjacent Land Use		Group 2		
Use Buffer Type Required		Type B		
Plant Units Per 100 Linear Feet		80		
Total Linear Feet		350		
Total Required Plant Units		280		
Plant Types	Quantity	Plant Unit Equivalents	Plant Units	Percentage
Large Deciduous	8	10 Plant Units = 1 Plant	80	29%
Evergreen	5	6 Plant Units = 1 Plant	30	11%
Small Deciduous	10	5 Plant Units = 1 Plant	50	18%
Shrubs	40	2 Plant Units = 1 Plant	80	29%
Ornamental Grasses	20	1 Plant Unit = 1 Plant	20	7%
Perennials	80	0.25 Plant Unit = 1 Plant	20	7%
Total	N/A	N/A	280	N/A

D. For existing trees, canopy coverage provided shall be determined as follows:

- For groups of trees, the area of canopy coverage provided shall only include canopy that meet the requirements of Section 7.300.

2. For individual trees, canopy coverage provided shall be equal to the area of the CRZ, as defined in Section 7.303.

E. Total canopy coverage calculations shall be provided in tabular form as follows:

“SAMPLE” CANOPY COVERAGE CALCULATIONS

	Acreage	sq. ft.
Gross Site Area	200	8,712,000
Less Exclusion Areas per <u>Zoning Ordinance</u>	5	217,800
Net Site Area	195	8,494,200
Canopy Coverage Required (10%)	19.5	849,420
Canopy Coverage Provided	21	914,760
Existing Canopy	12	522,720
Proposed Canopy on Lots - (excluding Street Trees)	1	43,560
Proposed Canopy – Open Space	5	217,800
Proposed Canopy – Street Trees	2	87,120
Proposed Canopy – Buffers	1	43,560
Reforestation	0	0
Total Canopy Coverage Provided	21	914,760
Requirement is met . . . 914,760 sq. ft. is greater than 849,420 sq. ft.		

- F. At the time of planting, the applicant may submit a written request to the Director or Director’s designee to approve the substitution of a species shown on the approved Landscape Plan with a species from the same planting category in Table 3.

7.303 TREE PROTECTION

Tree protection measures during land disturbing activities shall be in accordance with the [Virginia Erosion and Sediment Control Handbook](#). Additionally, the following shall apply:

- A. Areas of existing tree canopy and vegetation that an applicant has agreed to conserve or preserve as part of a proffer or condition of approval or to meet canopy and/or buffering and screening requirements shall be protected during construction.

- B. Critical Root Zone/Protected Root Zone

When areas of existing tree canopy and vegetation that an Applicant has agreed to preserve or conserve as part of a proffer or condition of approval or to meet canopy and landscape buffer requirements are identified on a site plan or construction plans and profiles, the corresponding critical root zone (CRZ) or protected root zone (PRZ), as applicable, shall be delineated on the site plan and construction plans and profiles, as well as any grading plan prepared in association with and/or any grading permit application accompanying said site plan or construction plans and profiles.

1. For individual trees, the CRZ shall be represented by a concentric circle centered on the tree trunk with a radius equal in feet to one (1) times the number of inches of the trunk diameter (i.e., The CRZ for a twenty (20) inch diameter tree is twenty (20) feet), as shown in Figure 1.
2. For groups of trees, the PRZ shall be represented by a line drawn within the area of tree canopy and vegetation to be preserved or conserved that is parallel to and 15 feet from the limits of clearing and grading, as shown in Figure 1.

Figure 1 - Critical Root Zone/Protected Root Zone

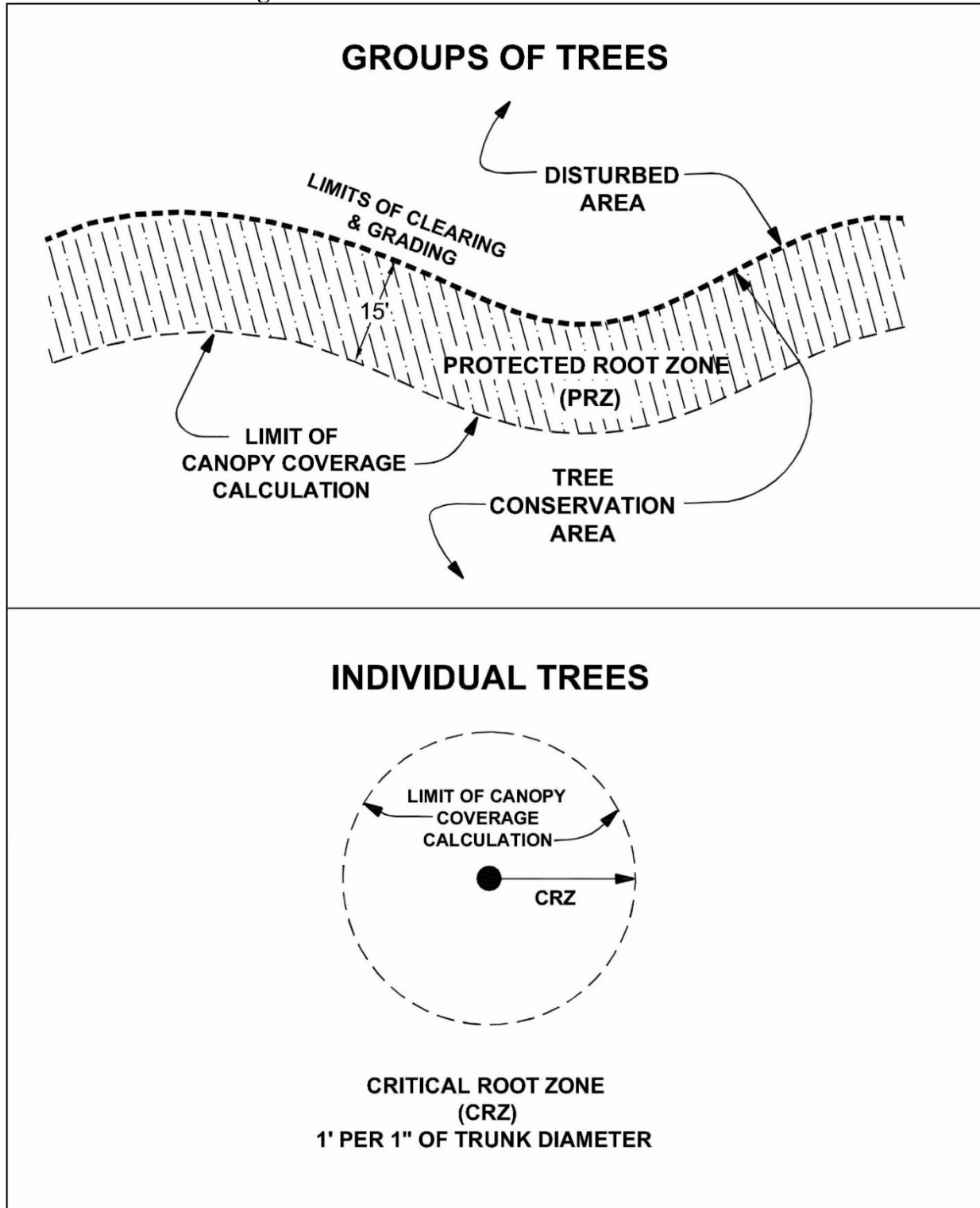


FIGURE 1
Section 7.303
(NOT TO SCALE)

C. General Requirements

1. Prior to any land disturbance, protective barriers, such as Super Silt Fence as shown in Figure 3, or welded wire fence as shown in Figure 6, shall be installed along the CRZ of any tree, or along the limits of clearing and grading of any group of trees, as applicable, to be preserved. Protective barriers shall remain so installed throughout all phases of construction. No grade changes or storage of equipment, materials, debris, or fill shall be allowed within the area protected by the barrier. No construction traffic, parking of vehicles, or disposal of liquids is permitted within the CRZ and PRZ. All protective barriers are recommended to display tree protection signage, as shown in Figure 2, installed at a minimum of one sign every fifty (50) feet.
2. Tree roots which must be severed shall be cut by a trencher or similar equipment aligned radially to the tree. This method reduces the lateral movement of the roots during excavation, which if done by other methods could damage the intertwined roots of adjacent trees. This effort shall take place and be complete prior to any land disturbance activities.
3. Within four hours of any severance of roots, all tree roots that have been exposed and/or damaged shall be trimmed cleanly and covered temporarily with moist peat moss, moist burlap, or other moist biodegradable material to keep them from drying out until permanent cover can be installed.
4. Prior to completion of Phase 1 erosion and sediment control construction activity, hazard trees shall be identified by an Urban Forester, Certified Arborist, or Landscape Architect, marked with paint, saw cut, and removed. Trees that become hazard trees following Phase 1 erosion and sediment control construction activity shall also be marked with paint, saw cut, and removed prior to bond release. Tree stumps located within areas of existing canopy and vegetation to be preserved or conserved on open space parcels shall be left intact.
5. Slopes abutting a CRZ or PRZ shall not have a grade greater steeper than 2:1 for a distance of five (5) feet outside the CRZ or PRZ, or a retaining wall shall be required. Any wall constructed within five (5) feet of the CRZ or PRZ shall be reviewed and approved by the County Urban Forester or Director's designee. Grade changes and excavations shall not encroach within the CRZ or PRZ, unless approved by the County Urban Forester or Director's designee.
6. No toxic materials, including petroleum products, shall be stored within 100 feet of the CRZ or PRZ.
7. Sediment, retention, and detention basins shall not be located within the CRZ or PRZ. Such basins shall not discharge directly into the CRZ or PRZ.

unless the discharge is transitioned back to sheet flow prior to entering the CRZ or PRZ or is discharged into an adequate natural channel, in accordance with Chapter 5 of this manual.

D. Pruning Methods

All final cuts shall be made sufficiently close to the trunk or parent limb but without cutting into the branch collar or leaving a protruding stub, according to the American National Standards Institute [\(A300 \(Part 1\) – Pruning\)](#). All necessary pruning cuts must be made to prevent bark from being torn from the tree and to facilitate rapid healing. Flush cuts are unacceptable.

Figure 6 - Tree Protective Barrier Detail

Tree Protective Barrier Detail

Welded Wire Fence

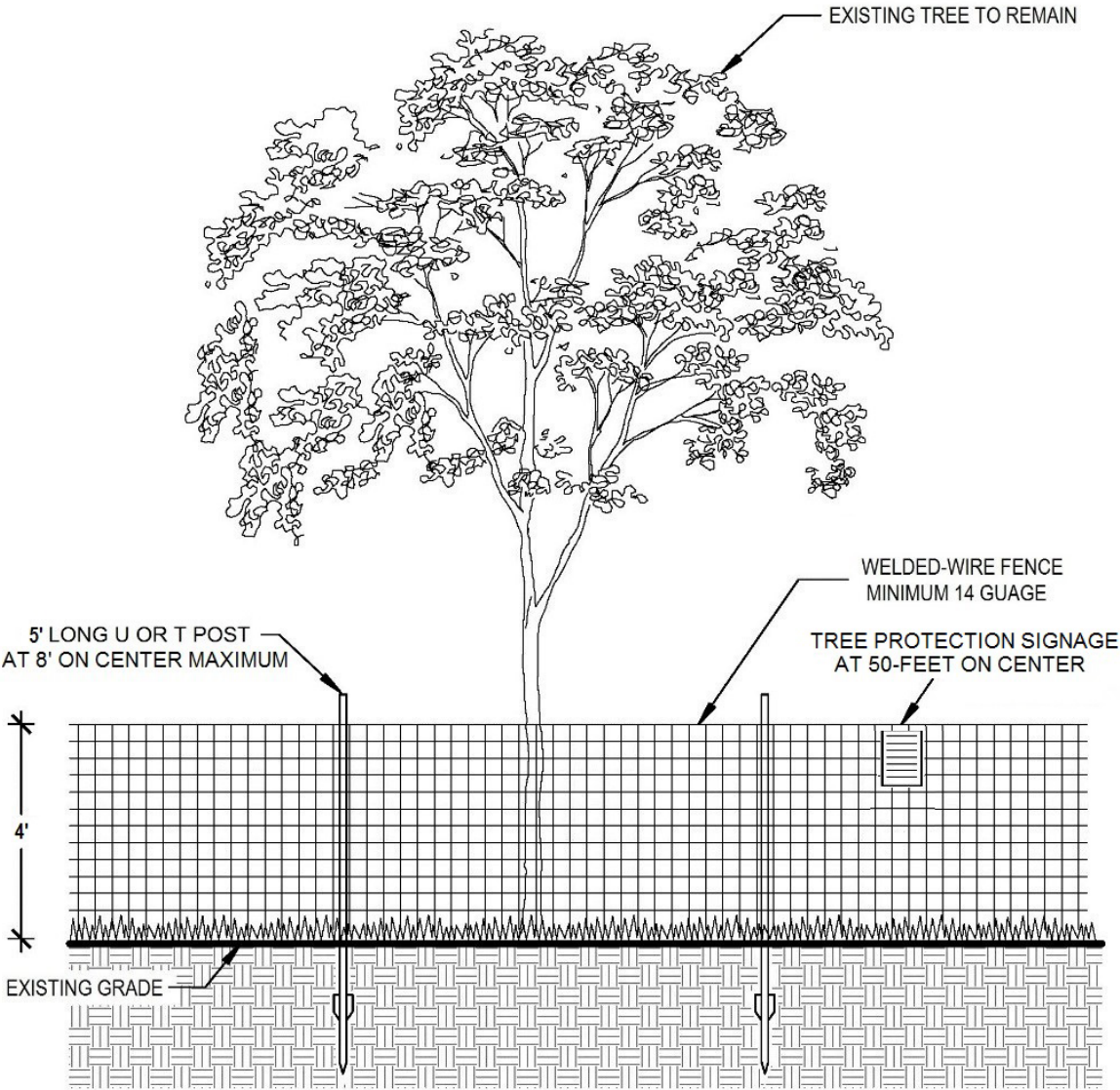


FIGURE 6

Section 7.303

Figure 2 - Typical Tree Protection Signage

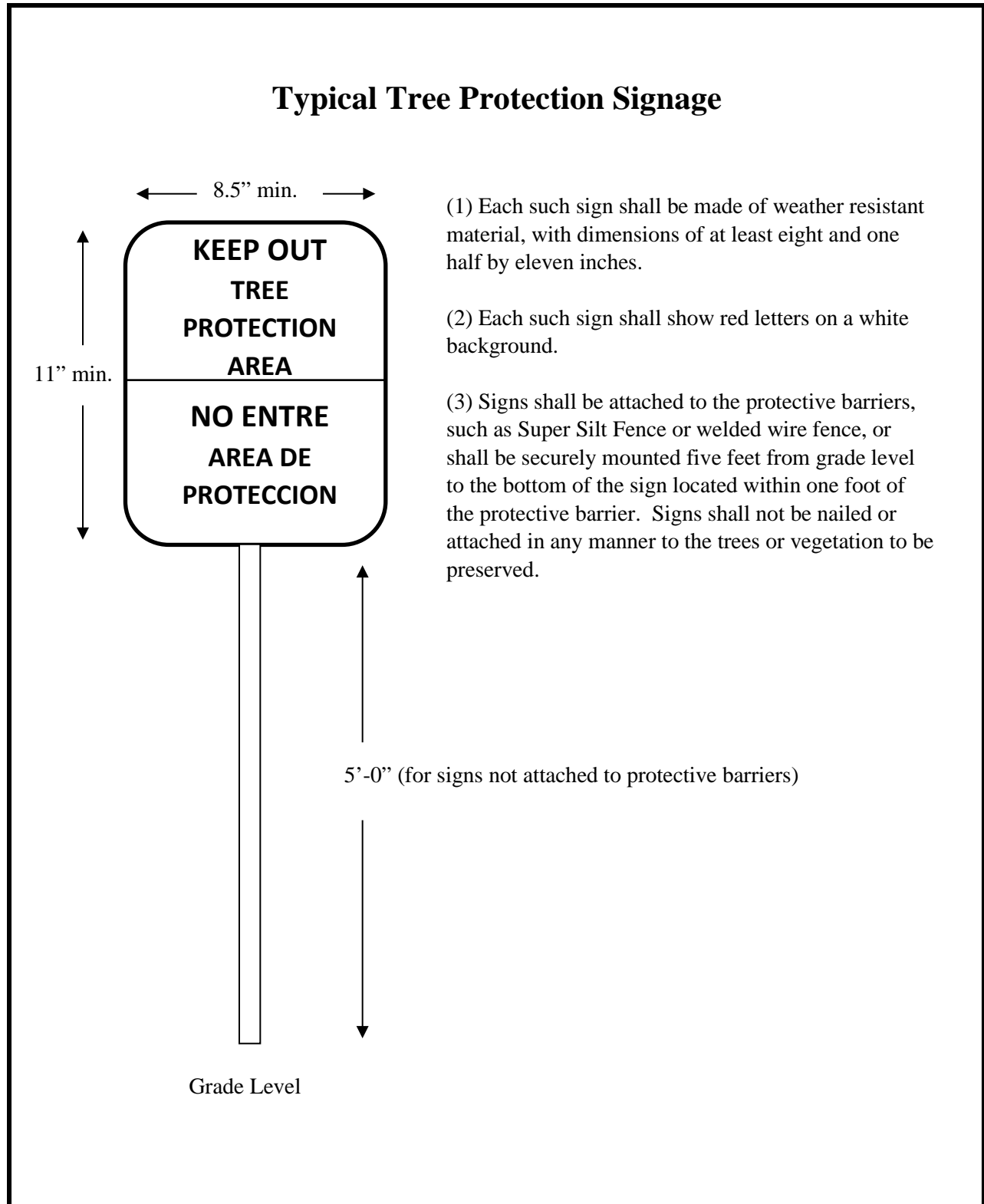


FIGURE 2
Section 7.303

7.304 FOREST MANAGEMENT PLAN

Prior to timber harvesting or silvicultural activities, a Forest Management Plan (FMP), when required by the Zoning Ordinance for the Floodplain Overlay District, Mountainside Development Overlay District, Limestone Overlay District, and Steep Slope Standards, shall be required and submitted to the Director or Director's designee for approval. The approved FMP is required to be on file with the Director or Director's designee and a copy kept on site throughout the duration of the timber harvest or silvicultural activity, including site stabilization, where applicable.

- A. A meeting with the Director or Director's designee is recommended to discuss the scope of the proposed timber harvest or silvicultural activities prior to the preparation and submission of the FMP.
- B. The purpose of the FMP is to establish the tract location and to describe the Best Management Practices (BMP's) required for structural stabilization and re-vegetation of all exposed mineral soil sites. The FMP shall be prepared by the Virginia Department of Forestry, or a professional forester with, at a minimum, a Bachelor of Science degree from and accredited School of Forestry, and shall contain the following information:
 - 1. Sheet size of 11 inches x 17 inches with a scale large enough to clearly depict tract boundaries, timber type lines, water bodies, topography and acreage to be harvested. These maps are available through the Loudoun County Office of Mapping and Geographic Information.
 - 2. Identify all streams, their headwaters and a Streamside Management Zone (SMZ) at least fifty (50) feet wide on either side of the stream.
 - 3. Approximate location of all decks, haul roads, primary skid trails, and any other road, trail, or travelway that will be used for the timber harvest or silvicultural activity.
 - 4. If grading, including excavation or filling, is necessary for deck or haul road construction, or construction of any other road, trail, or travelway that will be used for the timber harvest or silvicultural activity, a detailed map showing location, topography and information addressing stabilization.
 - 5. Identify species composition, stocking, regeneration, soils, stand history, unique natural features, percent slope, quality and growth rate, and approximate stems per acre to be harvested.
 - 6. Harvest type (i.e., selective, shelterwood, diameter limit cut, clear-cut, etc.)
 - 7. Means of regeneration (natural or artificial).
 - 8. Means of post-harvest closure and stabilization, as applicable.

9. Recommendations regarding the viability of a fuel wood harvest.
 10. Statement that all BMP's shall be in accordance with the Virginia Department of Forestry Best Management Practices for Water Quality and all post-harvest BMP's shall be implemented immediately upon logging completion.
 11. Plan shall be signed by the drafting professional forester.
- C. The following notification shall be provided:
1. Notification pursuant to Section 10.1-1181.2 (H) of the Code of Virginia ["Notification of Commercial Harvesting of Timber" (800/939-LOGS)].
 2. A call to the County Urban Forester or Director's designee at least twenty-four (24) hours prior to commencement of the logging operation.
 3. A call to the County Urban Forester or Director's designee immediately upon installation of all BMP's.

7.305 REFORESTATION STANDARDS

Any required reforestation used to satisfy the Zoning Ordinance, a proffer, or a condition of approval of a special exception or variance shall comply with the following standards. These standards may serve as guidance for other voluntary planting efforts.

A planting plan prepared by an Urban Forester, Certified Arborist, or Landscape Architect shall be required and shall be reviewed and approved by the County Urban Forester or Director's Designee. The planting plan shall specifically address plant materials, plant density/stocking requirements, site preparation, site stabilization, release/maintenance, livestock exclusion, wildlife damage, maintenance, and restocking requirements (post-establishment) in accordance with the Natural Resources Conservation Service [Tree and Shrub Establishment Guidelines](#) and the Virginia Department of Forestry [Hardwood Management: Planting Guidelines](#). Tree plantings shall be native and have multiple use benefits that improve or enhance wildlife, recreation, and overall aesthetic values and shall consist primarily of pioneer (early succession) tree species. Any proposed streambank stabilization and control of invasive plant species also should be addressed by the planting plan.

A. Plant Materials

A general description of the existing trees and vegetation on the site shall be provided. To achieve diversity, large deciduous tree plantings shall consist of a mixture of five (5) or more species from Table 3 and small deciduous and evergreen tree plantings shall consist of a mixture of three (3) or more species from Table 3. The County Urban Forester or Director's Designee may approve the use of additional tree species where appropriate.

1. Plantings should be installed in early Spring (March–April) or Fall (October–November).

B. Planting Density/Stocking Requirements

1. Plantings shall be installed in accordance with one of the plant density options listed in Table 2. The County Urban Forester or Director’s designee may allow the use of existing native vegetation to meet the plants per acre requirement.

Table 2 - Required Plant Densities for Reforestation

Plant Size	Plants per Acre	Plant Spacing (ft)
Option 1: Seedlings		10’ x 10’
Large Deciduous Trees	350	Tree plantings shall be evenly distributed with evergreens and/or small deciduous trees interspersed between the large deciduous trees.
Small Deciduous Trees and/or	85	
Evergreen Trees		
Option 2: Container (3-gallon or larger) or Balled and Burlapped		12’ x 12’
Large Deciduous Trees	240	Tree plantings shall be evenly distributed with evergreens and/or small deciduous trees interspersed between the large deciduous trees.
Small Deciduous Trees and/or	60	
Evergreen Trees		

2. Planting Tubes. Protect all seedlings with four (4)-foot high protective, biodegradable tree shelters.
3. Buck Rub Protection. Protect each container or balled and burlapped tree with a wire cage one (1) foot in diameter and a minimum of forty-eight (48) inches tall secured with a two-inch by two-inch (2” x 2”) oak stake.

C. Release/Maintenance

Newly installed plant material shall be periodically maintained to ensure release for up to two (2) years after planting.

D. Restocking Requirements (Post-Establishment)

If a targeted stocking of seventy-five percent (75%) survival with uniform distribution is not achieved within two (2) years of planting as determined by the County Urban Forester or Director's designee, the Applicant shall provide a one-time supplemental planting to achieve the full, initial stocking.

Table 3 - Trees and Shrubs

Planting Category – Large Deciduous													
The Uses column identifies certain species that may be better suited for planting in Parking Lots and underneath overhead Utility Lines. Gateway Corridor Buffer Yards shall be planted with species specified for Gateway Corridor.													
Botanical Name	Common Name	Minimum Planting Area in sq. ft.		N: Native	PL: Parking Lot U: Utility Lines GC: Gateway Corridor		Canopy Coverage (sq. ft.) Per Caliper 10 Year				Canopy Coverage (sq. ft.) Per Caliper 20 Year		
					Uses		1.0"	2.0"	3.0"		1.0"	2.0"	3.0"
<i>Acer rubrum</i> 'Columnare'	Columnar Red Maple	55			PL		45	55	75		70	75	90
<i>Carpinus betulus</i> 'Fastigiata'	Fastigate European Hornbeam	55					45	55	75		70	75	90
<i>Fagus sylvatica</i> 'Fastigiata'	Fastigate European Beech	55			GC		45	55	75		70	75	90
<i>Ginkgo biloba</i> 'Princeton Sentry'	Princeton Sentry Ginkgo	55					45	55	75		70	75	90
<i>Quercus robur</i> 'Fastigiata'	Fastigate English Oak	55			PL		45	55	75		70	75	90
<i>Aesculus flava</i>	Yellow Buckeye	90		N	GC		130	150	175		195	205	210
<i>Aesculua glabra</i>	Ohio Buckeye	90					130	150	175		195	205	210
<i>Aesculus hippocastanum</i>	Common Horsechestnut	90			GC		130	150	175		195	205	210
<i>Betula alleghaniensis</i>	Yellow Birch	90		N			130	150	175		195	205	210
<i>Betula lenta</i>	Black Birch	90		N	GC		130	150	175		195	205	210
<i>Betula nigra</i>	River Birch	90		N	GC		130	150	175		195	205	210
<i>Castanea mollissima</i>	Chinese Chestnut	90					130	150	175		195	205	210
<i>Celtis occidentalis</i>	Common Hackberry	90		N	GC		130	150	175		195	205	210
<i>Cercidiphyllum japonicum</i>	Katsuratree	90			PL		130	150	175		195	205	210
<i>Cladrastis lutea</i>	Yellowwood	90		N	PL		130	150	175		195	205	210
<i>Diospyros virginiana</i>	Common Persimmon	90		N	GC		130	150	175		195	205	210
<i>Eucommia ulmoides</i>	Hardy Rubber Tree	90			PL		130	150	175		195	205	210
<i>Fagus sylvatica</i>	European Beech	90					130	150	175		195	205	210

Planting Category – Large Deciduous

The Uses column identifies certain species that may be better suited for planting in Parking Lots and underneath overhead Utility Lines. Gateway Corridor Buffer Yards shall be planted with species specified for Gateway Corridor.

Botanical Name	Common Name	Minimum Planting Area in sq. ft.	N: Native	PL: Parking Lot U: Utility Lines GC: Gateway Corridor	Canopy Coverage (sq. ft.) Per Caliper 10 Year			Canopy Coverage (sq. ft.) Per Caliper 20 Year		
				Uses	1.0"	2.0"	3.0"	1.0"	2.0"	3.0"
<i>Gleditsia triacanthos</i> var. <i>inermis</i> (Identify Specific 'Cultivar')	Thornless Common Honeylocust	90	N	PL, GC	130	150	175	195	205	210
<i>Gymnocladus dioicus</i>	Kentucky Coffeetree	90		PL	130	150	175	195	205	210
<i>Juglans cinerea</i>	Butternut	90	N		130	150	175	195	205	210
<i>Maclura pomifera</i>	Osage-Orange	90	N		130	150	175	195	205	210
<i>Magnolia acuminata</i>	Cucumbertree Magnolia	90	N		130	150	175	195	205	210
<i>Magnolia macrophylla</i>	Bigleaf Magnolia	90	N		130	150	175	195	205	210
<i>Metasequoia glyptostroboides</i>	Dawn Redwood	90			130	150	175	195	205	210
<i>Nyssa aquatica</i>	Water Tupelo	90	N		130	150	175	195	205	210
<i>Nyssa sylvatica</i>	Black Gum	90	N	PL, GC	130	150	175	195	205	210
<i>Ostrya virginiana</i>	Eastern Hophornbeam	90	N	GC	130	150	175	195	205	210
<i>Pistacia chinensis</i>	Chinese Pistache	90		PL	130	150	175	195	205	210
<i>Prunus pensylvanica</i>	Pin Cherry	90	N		130	150	175	195	205	210
<i>Prunus sargentii</i>	Sargent Cherry	90			130	150	175	195	205	210
<i>Prunus serotina</i>	Wild Black Cherry	90	N	GC	130	150	175	195	205	210
<i>Prunus serrulata</i> 'Kwanzan'	'Kwanzan' Japanese Flowering Cherry	90			130	150	175	195	205	210
<i>Prunus subhirtella</i> var. <i>pendula</i>	Weeping Higan Cherry	90			130	150	175	195	205	210
<i>Prunus x yedoensis</i>	Yoshino Cherry	90			130	150	175	195	205	210
<i>Quercus hemisphaerica</i>	Laurel Oak	90	N		130	150	175	195	205	210
<i>Quercus ilicifolia</i>	Bear Oak	90	N		130	150	175	195	205	210
<i>Quercus lyrata</i>	Overcup Oak	90	N		130	150	175	195	205	210

Planting Category – Large Deciduous

The Uses column identifies certain species that may be better suited for planting in Parking Lots and underneath overhead Utility Lines. Gateway Corridor Buffer Yards shall be planted with species specified for Gateway Corridor.

Botanical Name	Common Name	Minimum Planting Area in sq. ft.		N: Native	PL: Parking Lot U: Utility Lines GC: Gateway Corridor	Canopy Coverage (sq. ft.) Per Caliper 10 Year			Canopy Coverage (sq. ft.) Per Caliper 20 Year		
						1.0"	2.0"	3.0"	1.0"	2.0"	3.0"
<i>Quercus marilandica</i>	Blackjack Oak	90		N		130	150	175	195	205	210
<i>Quercus muehlenbergii</i>	Chinkapin Oak	90		N		130	150	175	195	205	210
<i>Quercus nigra</i>	Water Oak	90		N		130	150	175	195	205	210
<i>Quercus stellata</i>	Post Oak	90		N		130	150	175	195	205	210
<i>Robinia pseudoacacia</i>	Black Locust	90		N		130	150	175	195	205	210
<i>Salix babylonica</i>	Babylon Weeping Willow	90				130	150	175	195	205	210
<i>Salix nigra</i>	Black Willow	90		N	GC	130	150	175	195	205	210
<i>Sassafras albidum</i>	Sassafras	90		N	GC	130	150	175	195	205	210
<i>Taxodium ascendens</i>	Pondcypress	90		N	PL	130	150	175	195	205	210
<i>Taxodium distichum</i>	Common Baldcypress	90		N	GC	130	150	175	195	205	210
<i>Tilia cordata</i> (Identify Specific 'Cultivar')	Littleleaf Linden	90			PL	130	150	175	195	205	210
<i>Tilia tomentosa</i>	Silver Linden	90			PL	130	150	175	195	205	210
<i>Acer negundo</i>	Boxelder (Reforestation Only)	x		N		x	x	x	x	x	x
<i>Acer rubrum</i>	Red Maple	130		N	PL, GC	150	200	250	225	270	300
<i>Acer saccharinum</i>	Silver Maple (Reforestation Only)	x		N		x	x	x	x	x	x
<i>Acer saccharum</i>	Sugar Maple	130		N	GC	150	200	250	225	270	300
<i>Carya cordiformis</i>	Bitternut Hickory	130		N	GC	150	200	250	225	270	300
<i>Carya glabra</i>	Pignut Hickory	130		N	GC	150	200	250	225	270	300
<i>Carya illinoensis</i>	Pecan	130			GC	150	200	250	225	270	300
<i>Carya laciniata</i>	Shellbark Hickory	130		N	GC	150	200	250	225	270	300

Planting Category – Large Deciduous

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Botanical Name	Common Name	Minimum Planting Area in sq. ft.		N: Native	PL: Parking Lot U: Utility Lines GC: Gateway Corridor	Canopy Coverage (sq. ft.) Per Caliper 10 Year			Canopy Coverage (sq. ft.) Per Caliper 20 Year		
						1.0"	2.0"	3.0"	1.0"	2.0"	3.0"
<i>Carya ovata</i>	Shagbark Hickory	130		N	GC	150	200	250	225	270	300
<i>Carya tomentosa</i>	Mockernut Hickory	130		N	GC	150	200	250	225	270	300
<i>Celtis laevigata</i>	Sugar Hackberry	130		N		150	200	250	225	270	300
<i>Fagus grandifolia</i>	American Beech	130		N	GC	150	200	250	225	270	300
<i>Ginkgo biloba</i> (male)	Ginkgo	130			PL	150	200	250	225	270	300
<i>Juglans nigra</i>	Black Walnut	130		N		150	200	250	225	270	300
<i>Liquidambar styraciflua</i>	American Sweetgum	130		N	GC	150	200	250	225	270	300
<i>Liriodendron tulipifera</i>	Tuliptree	130		N		150	200	250	225	270	300
<i>Platanus occidentalis</i>	Sycamore	130		N	GC	150	200	250	225	270	300
<i>Platanus x acerifolia</i>	London Planetree	130			PL, GC	150	200	250	225	270	300
<i>Populus deltoides</i>	Cottonwood	130		N	GC	150	200	250	225	270	300
<i>Quercus alba</i>	White Oak	130		N	GC	150	200	250	225	270	300
<i>Quercus bicolor</i>	Swamp White Oak	130		N	PL, GC	150	200	250	225	270	300
<i>Quercus coccinea</i>	Scarlet Oak	130		N	PL, GC	150	200	250	225	270	300
<i>Quercus falcata</i>	Southern Red Oak	130		N	PL, GC	150	200	250	225	270	300
<i>Quercus imbricaria</i>	Shingle Oak	130		N		150	200	250	225	270	300
<i>Quercus michauxii</i>	Swamp Chestnut Oak	130		N	PL	150	200	250	225	270	300
<i>Quercus montana</i>	Chestnut Oak	130		N	PL, GC	150	200	250	225	270	300
<i>Quercus palustris</i>	Pin Oak	130		N	PL, GC	150	200	250	225	270	300
<i>Quercus phellos</i>	Willow Oak	130		N	PL, GC	150	200	250	225	270	300
<i>Quercus rubra</i>	Northern Red Oak	130		N	PL, GC	150	200	250	225	270	300
<i>Quercus shumardii</i>	Shumard Oak	130			PL, GC	150	200	250	225	270	300

Planting Category – Large Deciduous

The Uses column identifies certain species that may be better suited for planting in Parking Lots and underneath overhead Utility Lines. Gateway Corridor Buffer Yards shall be planted with species specified for Gateway Corridor.

Botanical Name	Common Name	Minimum Planting Area in sq. ft.	N: Native	PL: Parking Lot U: Utility Lines GC: Gateway Corridor	Canopy Coverage (sq. ft.) Per Caliper 10 Year			Canopy Coverage (sq. ft.) Per Caliper 20 Year		
				Uses	1.0"	2.0"	3.0"	1.0"	2.0"	3.0"
<i>Quercus velutina</i>	Black Oak	130	N		150	200	250	225	270	300
<i>Salix matsudana</i> 'Tortuosa'	Corkscrew Willow	130			150	200	250	225	270	300
<i>Sophora japonica</i>	Japanese Pagodatree	130		GC	150	200	250	225	270	300
<i>Tilia americana</i> (Identify Specific 'Cultivar')	American Linden (Basswood)	130	N	PL	150	200	250	225	270	300
<i>Ulmus americana</i>	American Elm	130	N	PL, GC	150	200	250	225	270	300
<i>Ulmus carpinifolia</i>	Smoothleaf Elm	130			150	200	250	225	270	300
<i>Ulmus parvifolia</i>	Chinese Elm	130		PL, GC	150	200	250	225	270	300
<i>Zelkova serrata</i>	Japanese Zelkova	130		PL, U	150	200	250	225	270	300

Planting Category – Small Deciduous

The Uses column identifies certain species that may be better suited for planting in Parking Lots and underneath overhead Utility Lines. Gateway Corridor Buffer Yards shall be planted with species specified for Gateway Corridor.

Botanical Name	Common Name	Minimum Planting Area in sq. ft.	N: Native	PL: Parking Lot U: Utility Lines GC: Gateway Corridor	Canopy Coverage (sq. ft.) Per Caliper 10 Year			Canopy Coverage (sq. ft.) Per Caliper 20 Year		
				Uses	1.0"	2.0"	3.0"	1.0"	2.0"	3.0"
<i>Acer buergerianum</i>	Trident Maple	55		GC	75	100	125	115	135	150
<i>Acer campestre</i>	Hedge Maple	55		U	75	100	125	115	135	150
<i>Acer ginnala</i>	Amur Maple	55		U	75	100	125	115	135	150
<i>Acer griseum</i>	Paperbark Maple	55			75	100	125	115	135	150
<i>Acer palmatum</i>	Japanese Maple	55		U	75	100	125	115	135	150
<i>Aesculus pavia</i>	Red Buckeye	55		PL	75	100	125	115	135	150
<i>Amelanchier arborea</i>	Downy Serviceberry	55	N	U	75	100	125	115	135	150
<i>Amelanchier canadensis</i>	Shadblow Serviceberry	55	N	U, GC	75	100	125	115	135	150
<i>Amelanchier laevis</i>	Allegheny Serviceberry	55	N	U, GC	75	100	125	115	135	150
<i>Asimina triloba</i>	Common Pawpaw	55	N	GC	75	100	125	115	135	150
<i>Betula populifolia</i>	Gray Birch	55			75	100	125	115	135	150
<i>Carpinus caroliniana</i>	American Hornbeam	55	N	GC	75	100	125	115	135	150
<i>Castanea pumila</i>	Allegheny Chinkapin	55	N	GC	75	100	125	115	135	150
<i>Cercis canadensis</i>	Redbud	55	N	U, GC	75	100	125	115	135	150
<i>Chionanthus virginicus</i>	White Fringetree	55	N	U	75	100	125	115	135	150
<i>Cornus alternifolia</i>	Pagoda Dogwood	55	N		75	100	125	115	135	150
<i>Cornus florida</i>	Flowering Dogwood	55	N	U	75	100	125	115	135	150
<i>Cornus kousa</i>	Kousa Dogwood	55		U, GC	75	100	125	115	135	150
<i>Crataegus coccinea</i>	Scarlet Hawthorn	55			75	100	125	115	135	150
<i>Crataegus crusgalli</i>	Cockspur Hawthorn	55	N		75	100	125	115	135	150

Planting Category – Small Deciduous

The Uses column identifies certain species that may be better suited for planting in Parking Lots and underneath overhead Utility Lines. Gateway Corridor Buffer Yards shall be planted with species specified for Gateway Corridor.

Botanical Name	Common Name	Minimum Planting Area in sq. ft.	N: Native	PL: Parking Lot U: Utility Lines GC: Gateway Corridor	Canopy Coverage (sq. ft.) Per Caliper 10 Year			Canopy Coverage (sq. ft.) Per Caliper 20 Year		
				Uses	1.0"	2.0"	3.0"	1.0"	2.0"	3.0"
<i>Crataegus phaenopyrum</i>	Washington Hawthorn	55	N	U	75	100	125	115	135	150
<i>Crataegus viridis</i>	Winter King Hawthorn	55		GC	75	100	125	115	135	150
<i>Franklinia alatomahala</i>	Franklinia	55	N		75	100	125	115	135	150
<i>Halesia diptera</i>	Two-Winged Silverbell	55	N	GC	75	100	125	115	135	150
<i>Halesia tetraptera</i>	Carolina Silverbell	55	N	GC	75	100	125	115	135	150
<i>Hamamelis virginiana</i>	Witchhazel	55	N	U, GC	75	100	125	115	135	150
<i>Koelreuteria paniculata</i>	Panicked Goldenraintree	55		GC	75	100	125	115	135	150
<i>Laburnum x. wateri</i>	Golden Chain	55			75	100	125	115	135	150
<i>Lagerstroemia spp.</i> (Identify Species & 'Cultivar')	Crape Myrtle	55		U	75	100	125	115	135	150
<i>Magnolia x soulangeana</i>	Saucer Magnolia	55			75	100	125	115	135	150
<i>Magnolia stellata</i>	Star Magnolia	55		U	75	100	125	115	135	150
<i>Magnolia virginiana</i>	Sweetbay Magnolia	55	N	U, GC	75	100	125	115	135	150
<i>Malus spp.</i>	Crabapple	55		U	75	100	125	115	135	150
<i>Morus rubra</i>	Red Mulberry	55	N		75	100	125	115	135	150
<i>Oxydendrum arboreum</i>	Sourwood	55	N	GC	75	100	125	115	135	150
<i>Persea borbonia</i>	Redbay Sweetbay	55	N		75	100	125	115	135	150
<i>Prunus americana</i>	American Wild Plum	55	N		75	100	125	115	135	150
<i>Prunus cerasifera</i>	Flowering Plum	55		U	75	100	125	115	135	150
<i>Prunus virginiana</i>	Choke Cherry	55	N		75	100	125	115	135	150

Planting Category – Small Deciduous

The Uses column identifies certain species that may be better suited for planting in Parking Lots and underneath overhead Utility Lines. Gateway Corridor Buffer Yards shall be planted with species specified for Gateway Corridor.

Botanical Name	Common Name	Minimum Planting Area in sq. ft.	N: Native	PL: Parking Lot U: Utility Lines GC: Gateway Corridor	Canopy Coverage (sq. ft.) Per Caliper 10 Year			Canopy Coverage (sq. ft.) Per Caliper 20 Year		
				Uses	1.0"	2.0"	3.0"	1.0"	2.0"	3.0"
<i>Prunus x incamp 'Okame'</i>	'Okame' Cherry	55		U	75	100	125	115	135	150
<i>Rhamnus caroliniana</i>	Carolina Buckthorn	55	N		75	100	125	115	135	150
<i>Stewartia koreana</i>	Korean Stewartia	55		U	75	100	125	115	135	150
<i>Stewartia ovata</i>	Mountain Stewartia	55		U	75	100	125	115	135	150
<i>Stewartia pseudocamellia</i>	Japanese Stewartia	55		U, GC	75	100	125	115	135	150
<i>Styrax japonicus</i>	Japanese Snowbell	55		U, GC	75	100	125	115	135	150
<i>Syringa reticulata</i>	Japanese Tree Lilac	55		U	75	100	125	115	135	150

Planting Category – Evergreen

The Uses column identifies certain species that may be better suited for planting underneath overhead Utility Lines.
Gateway Corridor Buffer Yards shall be planted with species specified for Gateway Corridor.

Botanical Name	Common Name	Minimum Planting Area in sq. ft.		N: Native	U: Utility Lines GC: Gateway Corridor	Canopy Coverage (sq. ft.) Per Height 10 Year			Canopy Coverage (sq. ft.) Per Height 20 Year		
						6.0'	8.0'	10.0'	6.0'	8.0'	10.0'
<i>Ilex x attenuata</i> 'Fosteri'	Foster's Holly	35			U, GC	45	55	75	70	75	90
<i>Ilex x</i> 'Nellie R. Stevens'	Nellie Stevens Holly	35			U, GC	45	55	75	70	75	90
<i>Juniperus chinensis</i> (Identify Specific 'Cultivar')	Chinese Juniper	35			U	45	55	75	70	75	90
<i>Juniperus virginiana</i> 'Manhattan Blue' 'Princeton Sentry'	Manhattan Blue Princeton Sentry	35				45	55	75	70	75	90
<i>Taxus baccata</i>	English Yew	35				45	55	75	70	75	90
<i>Taxus baccata</i> 'Fastigiata'	Upright Irish Yew	35				45	55	75	70	75	90
<i>Thuja occidentalis</i> (Identify Specific 'Cultivar')	Eastern Arborvitae	35		N		45	55	75	70	75	90
<i>Thuja orientalis</i> (Identify Specific 'Cultivar')	Oriental Arborvitae	35				45	55	75	70	75	90
<i>Abies concolor</i>	White Fir	55				75	100	125	115	135	150
<i>Chamaecyparis lawsoniana</i>	Lawson Falsecypress	55				75	100	125	115	135	150
<i>Chamaecyparis obtusa</i>	Hinoki Falsecypress	55				75	100	125	115	135	150
<i>Chamaecyparis thyoides</i>	Atlantic White Cedar	55		N		75	100	125	115	135	150
<i>Cryptomeria japonica</i>	Japanese Cryptomeria	55			GC	75	100	125	115	135	150
<i>X Cupressocyparis leylandii</i>	Leyland Cypress	55				75	100	125	115	135	150
<i>Ilex aquifolium</i>	English Holly	55			U	75	100	125	115	135	150
<i>Ilex opaca</i>	American Holly	55		N	U, GC	75	100	125	115	135	150
<i>Juniperus virginiana</i>	Eastern Red Cedar (Do not plant within 900 ft. of commercial orchards)	55		N	GC	75	100	125	115	135	150
<i>Picea glauca</i>	White Spruce	55				75	100	125	115	135	150

Planting Category – Evergreen

The Uses column identifies certain species that may be better suited for planting underneath overhead Utility Lines.
Gateway Corridor Buffer Yards shall be planted with species specified for Gateway Corridor.

Botanical Name	Common Name	Minimum Planting Area in sq. ft.		N: Native	U: Utility Lines GC: Gateway Corridor		Canopy Coverage (sq. ft.) Per Height 10 Year				Canopy Coverage (sq. ft.) Per Height 20 Year		
							6.0'	8.0'	10.0'		6.0'	8.0'	10.0'
<i>Picea omorika</i>	Serbian Spruce	55					75	100	125		115	135	150
<i>Picea orientalis</i>	Oriental Spruce	55					75	100	125		115	135	150
<i>Picea pungens</i>	Colorado Spruce	55					75	100	125		115	135	150
<i>Pinus bungeana</i>	Lacebark Pine	55					75	100	125		115	135	150
<i>Pinus parviflora</i>	Japanese White Pine	55					75	100	125		115	135	150
<i>Pinus serotina</i>	Pond Pine	55		N			75	100	125		115	135	150
<i>Pseudotsuga menziesii</i>	Douglasfir	55					75	100	125		115	135	150
<i>Taxus cuspidata</i> (Identify Specific 'Cultivar')	Japanese Yew	55					75	100	125		115	135	150
<i>Thuja plicata</i>	Western Arborvitae	55					75	100	125		115	135	150
<i>Tsuga canadensis</i>	Canadian Hemlock	55		N			75	100	125		115	135	150
<i>Tsuga caroliniana</i>	Carolina Hemlock	55		N			75	100	125		115	135	150
<i>Cedrus atlantica</i>	Atlas Cedar	90					125	150	175		190	205	210
<i>Picea abies</i>	Norway Spruce	90			GC		125	150	175		190	205	210
<i>Pinus echinata</i>	Shortleaf Pine	90		N			125	150	175		190	205	210
<i>Pinus sylvestris</i>	Scotch Pine	90					125	150	175		190	205	210
<i>Cedrus deodara</i>	Deodar Cedar	110			GC		125	150	175		190	205	210
<i>Magnolia grandiflora</i>	Southern Magnolia	110			GC		125	150	175		190	205	210
<i>Pinus rigida</i>	Pitch Pine	110		N			125	150	175		190	205	210
<i>Pinus strobus</i>	Eastern White Pine	110		N			125	150	175		190	205	210
<i>Pinus taeda</i>	Loblolly Pine	110		N	GC		125	150	175		190	205	210

Planting Category: Shrubs – Deciduous	
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Gateway Corridor Buffer Yards shall be planted with species specified for Gateway Corridor.

Botanical Name	Common Name	N: Native	GC: Gateway Corridor		Botanical Name	Common Name	N: Native	GC: Gateway Corridor
			Uses					Uses
<i>Aesculus parviflora</i>	Bottlebrush Buckeye				<i>Hydrangea spp.</i> (Identify Species & 'Cultivar')	Hydrangea	N	GC
<i>Alnus spp.</i> (Identify Species & 'Cultivar')	Alder	N			<i>Hypericum spp.</i> (Identify Species & Cultivar)	St. John's Wort		
<i>Aronia spp.</i> (Identify Species & 'Cultivar')	Chokeberry	N	GC		<i>Ilex spp.</i> (Identify Species & 'Cultivar')	Holly	N	
<i>Aucuba japonica</i>	Japanese Aucuba				<i>Itea virginica</i>	Virginia Willow (Sweetspire)	N	GC
<i>Baccharis halimifolia</i>	High Tide Bush	N			<i>Iva frutescens</i>	Marsh Elder	N	
<i>Buddelia davidii</i>	Butterfly Bush		GC		<i>Kerria japonica</i>	Japanese Kerria		
<i>Callicarpa americana</i>	American Beautyberry	N	GC		<i>Leucothoe spp.</i> (Identify Species & 'Cultivar')	Leucothoe	N	
<i>Caryopteris x clandonensis</i>	Blue-Mist Shrub		GC		<i>Lindera benzoin</i>	Spicebush	N	
<i>Ceanothus americanus</i>	New Jersey Tea	N			<i>Lyonia lucida</i>	Shining Fetterbush	N	
<i>Cephalanthus occidentalis</i>	Buttonbush	N			<i>Myrica pensylvanica</i>	Northern Wax Myrtle	N	
<i>Chimonanthus praecox</i>	Fragrant Wintersweet		GC		<i>Photinia spp.</i> (Identify Species & 'Cultivar')	Choke Cherry		
<i>Clethra alnifolia</i>	Sweet Pepper-Bush	N	GC		<i>Physocarpus opulifolius</i>	Common Ninebark		
<i>Cornus spp.</i> (Identify Species & 'Cultivar')	Dogwood	N	GC		<i>Rhododendron viscosum</i>	Swamp Azalea	N	
<i>Corylus americana</i>	American Hazelnut				<i>Rhus spp.</i> (Identify Species & 'Cultivar')	Sumac	N	
<i>Corylopsis pauciflora</i>	Buttercup Winterhazel		GC		<i>Rosa spp.</i>	Rose	N	GC
<i>Corylopsis spicata</i>	Spike Winterhazel		GC		<i>Rubus spp.</i> (Identify Species & 'Cultivar')	Blackberry	N	
<i>Cotinus coggygria</i>	Smoketree		GC	<i>Salix spp.</i> (Identify Species & 'Cultivar')	Willow	N		
<i>Cotinus obovatus</i>	American Smoketree	N	GC	<i>Sambucus canadensis</i>	Common Elderberry	N		

Planting Category: Shrubs – Deciduous

Gateway Corridor Buffer Yards shall be planted with species specified for Gateway Corridor.

Botanical Name	Common Name	N: Native	GC: Gateway Corridor		Botanical Name	Common Name	N: Native	GC: Gateway Corridor
			Uses					Uses
<i>Cottoneaster spp</i>	Cottoneaster				<i>Spirea spp.</i> (Identify Species & 'Cultivar')	Spirea	N	GC
<i>Crataegus flabellata</i>	Fanleaf Hawthorn				<i>Stewartia malacodendron</i>	Silky Camelia	N	
<i>Cyrilla racemiflora</i>	Swamp Cyrilla	N			<i>Styrax americanus</i>	American Snowbell		
<i>Deutzia gracilis</i>	Deutzia				<i>Symphoricarpos orbiculatus</i>	Coral Berry		
<i>Euonymus spp.</i> (Identify Species & 'Cultivar')	Euonymus	N			<i>Vaccinium spp.</i> (Identify Species & 'Cultivar')	Vaccinium	N	
<i>Fothergilla gardenia</i>	Dwarf Fothergilla		GC		<i>Viburnum spp.</i> (Identify Species & 'Cultivar')	Viburnum	N	GC
<i>Fothergilla major</i>	Fothergilla		GC		<i>Vitex agnus</i>	Chastetree		GC
<i>Gaylussacia spp.</i> (Identify Species & 'Cultivar')	Huckleberries	N						

Planting Category: Shrubs – Evergreen

Gateway Corridor Buffer Yards shall be planted with species specified for Gateway Corridor.

Botanical Name	Common Name	N: Native	GC: Gateway Corridor		Botanical Name	Common Name	N: Native	GC: Gateway Corridor
			Uses					Uses
<i>Berberis julianae</i>	Wintergreen Barberry				<i>Osmanthus heterophyllus</i>	Falseholly	N	
<i>Buxus microphylla</i>	Littleleaf Boxwood		GC		<i>Pieris floribunda</i>	Evergreen Mountain Fetterbush	N	
<i>Buxus sempervirens</i>	Common Boxwood		GC		<i>Pieris japonica</i>	Japanese Pieris		
<i>Camellia japonica</i>	Japanese Camellia				<i>Potentilla fruticosa</i>	Cinquefoil		
<i>Euonymus spp.</i> (Identify Species & 'Cultivar')	Euonymus				<i>Prunus laurocerasus</i>	Common Cherry Laurel		GC
<i>Gaultheria procumbens</i>	Wintergreen	N			<i>Rhododendron atlanticum</i>	Dwarf Azalea	N	
<i>Ilex x aquipernyi</i>	Dragon Lady Holly				<i>Rhododendron calendulaceum</i>	Flame Azalea	N	
<i>Ilex cornuta</i>	Chinese Holly				<i>Rhododendron catawbiense</i>	Catawba Rhododendron	N	
<i>Ilex cornuta</i> 'Burfordii'	Burford Holly				<i>Rhododendron cumberlandense</i>	Cumberland Flame Azalea	N	
<i>Ilex crenata</i>	Japanese Holly				<i>Rhododendron maximum</i>	Great Rhododendron Rose Bay	N	
<i>Ilex glabra</i>	Inkberry	N	GC		<i>Rhododendron periclymenoides</i>	Pinxter Flower	N	
<i>Ilex spp.</i> (Identify Species & 'Cultivar')	Holly		GC		<i>Rhododendron prinophyllum</i>	Rose Azalea	N	
<i>Ilex vomitoria</i>	Yaupon Holly	N			<i>Rhododendron spp.</i> (Identify Species & 'Cultivar')	Azalea and Rhododendron		
<i>Juniperus spp.</i> (Identify Species & 'Cultivar')	Juniper		GC		<i>Skimmia japonica</i>	Japanese Skimmia		
<i>Kalmia latifolia</i>	Mountain Laurel	N	GC		<i>Taxus baccata</i>	English Yew		
<i>Mahonia aquifolium</i>	Oregon Grapeholly				<i>Taxus cuspidata</i>	Japanese Yew		
<i>Morella cerifera</i>	Southern Wax Myrtle	N	GC		<i>Taxus x media</i>	Anglojap Yew		

7.400 STREAM RESTORATION

Stream restoration pursuant to Section 4-1505(A)(16) of the Revised 1993 Zoning Ordinance, shall be designed in accordance with the most recent version or edition, as applicable, of the below publications, and shall meet the floodplain requirements of Chapter 5 of this manual.

- A. Natural Channel Design (Rosgen): As presented in Applied River Morphology (Rosgen Dave. Applied River Morphology. Pagosa Springs, CO: Wildland Hydrology.), and associated reference material presented on the Wildland Hydrology website and in Wildland Hydrology course materials (i.e. Rosgen Levels I through V).
- B. Virginia Handbook: Department of Conservation and Recreation. The Virginia Stream Restoration & Stabilization Best Management Practices Guide.
- C. Regenerative Step Pool Storm Conveyance (SPSC): Anne Arundel County, Maryland. Regenerative Step Pool Storm Conveyance (SPSC) – Also Known as Coastal Plain Outfalls Design Guidelines.
- D. EPA, Stream Mechanics and USFWS Function-Based Framework (i.e. stream pyramid): Harman, W., R. Starr, M. Carter, K. Tweedy, M. Clemmons, K. Suggs, C. Miller. A Function-Based Framework for Stream Assessment and Restoration Projects. US Environmental Protection Agency, Office of Wetlands, Oceans, and Watersheds, Washington, DC EPA 843-K-12-006.
- E. EPA, Stream Mechanics and USFWS Natural Channel Design Handbook: Harman, W., R. Starr. Natural Channel Design Review Checklist. US Fish and Wildlife Service, Chesapeake Bay Field Office, Annapolis, MD and US Environmental Protection Agency, Office of Wetlands, Oceans, and Watersheds, Wetlands Division. Washington, D.C. EPA 843-B-12-005.
- F. Urban Enlargement Factor: Caraco, D.S. "Dynamics of Urban Stream Channel Enlargement." Watershed Protection Techniques: 3(3); 729-734.
- G. Maryland Piedmont Regional Curve: McCandless, Tamara L., and Everett, Richard A. Maryland Stream Survey: Bankfull Discharge and Channel Characteristics of Streams in the Piedmont Hydrologic Region. Annapolis, Maryland: U.S. Fish and Wildlife Service.
- H. Virginia Piedmont Regional Curve: Lotspeich, Russell R. Regional Curves of Bankfull Channel Geometry For Non-Urban Streams In The Piedmont Physiographic Province, Virginia. Scientific Investigations Report 2009-5206, Reston, Virginia: United States Geological Survey.

- I. U.S. Department of Agriculture Natural Resources Conservation Service Conservation Practice Standards, criteria and guidance.

The Floodplain Administrator may allow for other publications to be used as the basis for such design where such publication is in keeping with established engineering practices and procedures.

7.500 RESERVED

7.600 EROSION AND SEDIMENT CONTROL

- A. The [Virginia Erosion and Sediment Control Handbook](#) and the Loudoun County [Codified Ordinances](#) shall be the accepted references in the preparation of grading plans and erosion and sediment control proposals.

The following measures currently specified as acceptable by the Handbook are, in fact, prohibited within Loudoun County without the specific authorization from the Director of Building and Development:

1. Straw bale barriers.
 2. Brush barriers.
- B. The use of diversion berms to break up drainage divides to support the use of sediment traps shall only be allowed where it can be demonstrated that maintenance of the berm can be accomplished during site grading activities.
- C. The erosion and sediment control plan shall provide for two-phase erosion and sediment measures.
1. The First Phase shall reflect the perimeter controls and any interior controls necessary to protect undisturbed land areas and shall reflect existing conditions including drainage divides. Existing drainage divides shall be the basis to determine the use of sediment traps versus sediment basins.
 2. The Second Phase shall reflect specific controls once the infrastructure and storm sewer pipes are installed. Future drainage divides shall be considered when designing this phase.
- D. See FSM Section 8.111 for Grading Permit application requirements.
- E. The erosion and sediment control plan shall provide a detailed narrative to include the following:
1. Project Description.
 2. Existing Site Conditions.
 3. Adjacent Property Information (Including adequate outfall analysis, if applicable).
 4. Off-Site Areas (i.e. Stockpile Areas, Site Access).
 5. Soil Information.

6. Critical Erosion Areas.
7. Explanation of the designed erosion and sediment control measures.
8. Sequence of construction plan/schedule and, if applicable, the phasing of proposed clearing and construction activities.

F. Super silt fence is a temporary barrier of Geotextile Class F over two (2) inch wire fabric mesh (chain link) used to control sediment-laden runoff from small drainage areas where the use of typical silt fence is questionable due to slope, proximity to a stream or other site conditions. Super silt fence should be used where the installation of a dike would destroy sensitive areas such as woods and wetlands.

1. Super silt fence should be placed as close to the contour as possible. No section of silt fence should exceed a grade of five percent (5%) for more than fifty (50) feet.
2. Super silt fence is not intended to replace primary controls such as sediment traps or sediment basins.
3. Length of the flow contributing to the super silt fence installation site shall conform to the following limitations:

Table - Super Silt Fence Installation Site Limitations – Length of Flow

SLOPE	SLOPE STEEPNESS	SLOPE LENGTH (MAX.)	SILT FENCE LENGTH (MAX.)
0-10%	0-10:1	Unlimited	Unlimited
10-20%	10:1-5:1	200 feet	1,500 feet
20-33%	5:1-3:1	100 feet	1,000 feet
33-50%	3:1-2:1	100 feet	500 feet
50% Plus	2:1 Plus	50 feet	250 feet

4. Construction Specifications:
 - a. Super silt fence shall be installed as shown in Figure 3.
 - b. Fencing shall be forty-two (42) inches in height and constructed in accordance with the latest [Virginia Department of Transportation Road and Bridge Standards](#) for chain link fencing.
 - c. Chain link fence shall be securely fastened to the fence posts with wire ties or other suitable means. The lower tension wire, brace and

truss rods, drive anchors and post caps are not required except on the ends of the fence.

- d. The silt fence fabric shall be securely fastened to the chain link fence with ties spaced every twenty-four (24) inches at the top and mid-section.
- e. The silt fence fabric shall be embedded a minimum of eight (8) inches into the ground.
- f. When two sections of silt fence fabric adjoin each other, they shall be overlapped by six (6) inches and folded.
- g. Maintenance shall be performed as needed and silt build-up removed when the silt reaches one-half the height of the fence.
- h. The silt fence fabric shall meet the following requirements for Geotextile, Class F:

Table - Silt Fence Fabric Requirements for Geotextile, Class F

Tensile Strength	50 lb/in (Min)	ASTM Test Method D-4595
Tensile Modulus	20 lb/in (Min)	ASTM Test Method D-4595
Flow Rate	0.3 gal/cu.ft/min. (Max)	ASTM Test Method D-5141
Filtering Efficiency	75 Percent (Min)	ASTM Test Method D-5141

- G. A pipe outlet sediment trap is required for drainage areas of one to 2.99 acres. Storage volume calculations shall be based on 134 cubic yards per acre. Pipe outlet sediment traps are more efficient than typical weir sediment traps for sediment removal and treatment in the range of drainage area acreage stated above.

- 1. Construction Specifications:
 - a. Pipe outlet sediment traps shall be installed as shown in Figure 4.
 - b. The embankment shall be a minimum of three and a half (3.5) feet high and have a minimum top width of three (3) feet.
 - c. The riser structure shall be made of 18-inch corrugated metal pipe that connects to a 15-inch corrugated metal outfall pipe.
 - d. The top of the riser structure shall be perforated by three rows of 1-inch holes spaced six (6) inches apart vertically and twelve (12) inches horizontally (nine holes total).

- e. A gravel cone of VDOT #1 crushed aggregate shall be placed around the riser from the bottom to the top of the riser to prevent clogging of the perforations.
 - f. The riser structure will be anchored using an attached steel plate or concrete base. The size of the bottom of the steel or concrete base will be two times the diameter of the riser. If a concrete base is used it will need to be eighteen (18) inches thick measured from the bottom and extending underneath the riser a minimum of six (6) inches.
- H. Curb inlet protection is an erosion and sediment control device that is used to provide protection when curb inlets are made operational before permanent stabilization has been established in the corresponding drainage area. The curb inlet protection device recommended for use in Loudoun County is an enhanced design based on a type depicted in the [Virginia Erosion and Sediment Control Handbook](#). The enhancements provide for a better weir overflow and anchorage with stakes, thus making it more durable and not easily moved or damaged in a manner that would compromise effectiveness.
1. Construction Specifications:
- a. Figure 5 depicts the recommended curb inlet protection.
 - b. Use two 2" x 6" or one 4" x 4" on each side as spacers out to the height of the curb. (These will be used on both sides of the inlet to act as spacers for the 2" x 4" cross board to create a 3-inch spillway along the top of the inlet.)
 - c. Inlet lengths will vary in size. Ensure the 2" x 4" cross board will extend twelve (12) inches past the inlet on both sides.
 - d. Inlets with longer lengths may require additional "spacers" along the cross board for support.
 - e. Nail two 2" x 6" spacers together (or use optional 4" x 4").
 - f. Nail 2" x 4" cross board flush along the top of the spacers to allow a 2-inch opening along the bottom for stormwater to access the inlet after being filtered.
 - g. Attach wire mesh along the top of the 2" x 4" cross board to conform with the curb and gutter.
 - h. Apply filter stone to the entire length of the cross board.

- i. Attach the wire mesh to the top of the cross board to encapsulate the filter stone.
- j. Attach 2" x 4" anchors on top of each end of the cross board to anchor the inlet protection.
- k. Use sand bags on top of the 2" x 4" anchors to secure the inlet protection to the structure or drive stakes into the ground at the rear of the structure and nail to the 2" x 4" anchor boards.

I. Development of Parks, Recreation and Community Services Facilities

Grading and construction of any facilities for the Loudoun County Department of Parks, Recreation and Community Services (PRCS), such as ballfields, trails and open space areas, shall comply with the PRCS Construction & Design Guidelines in effect at the time construction commences.

Figure 3 - Super Silt Fence

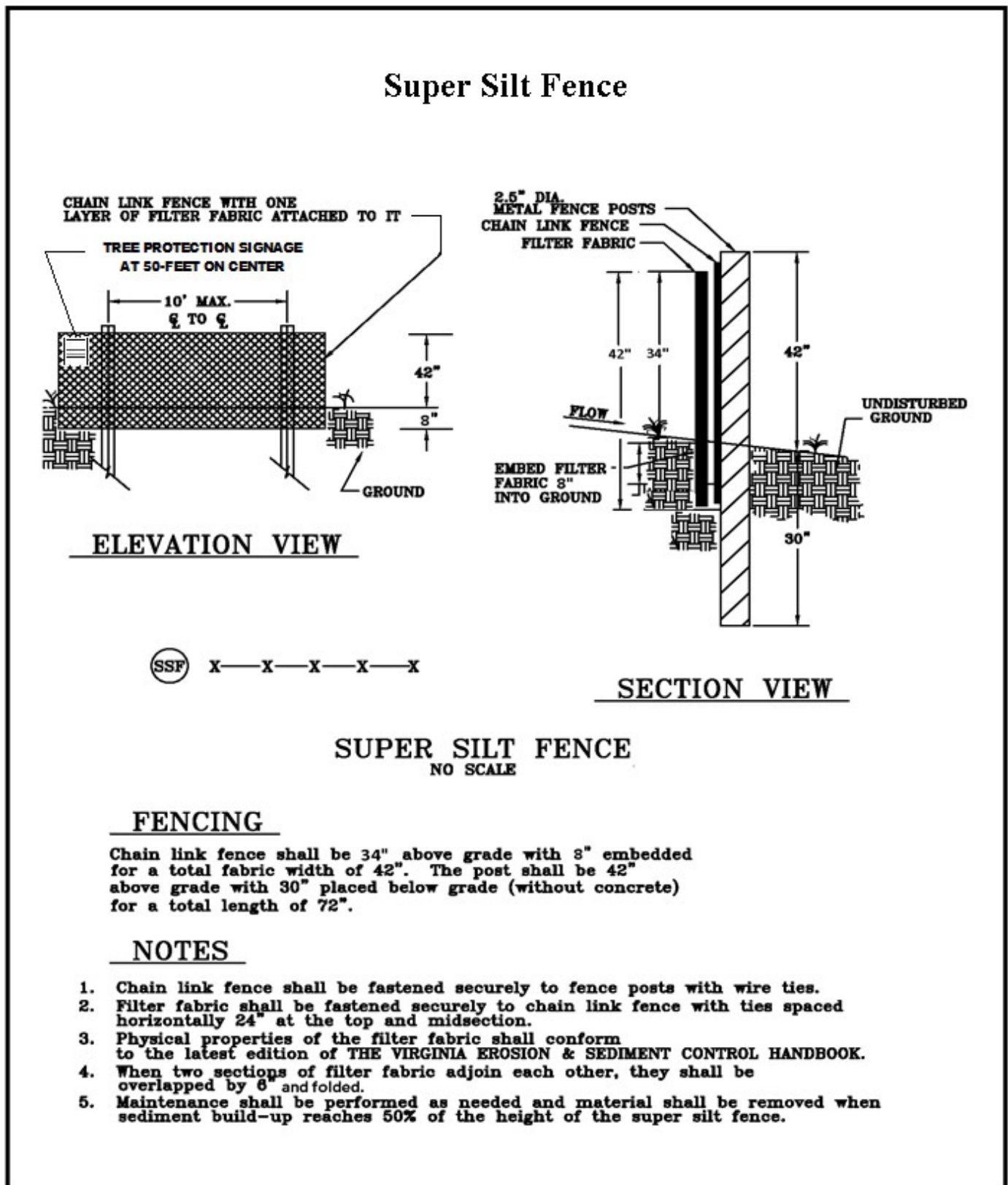


FIGURE 3

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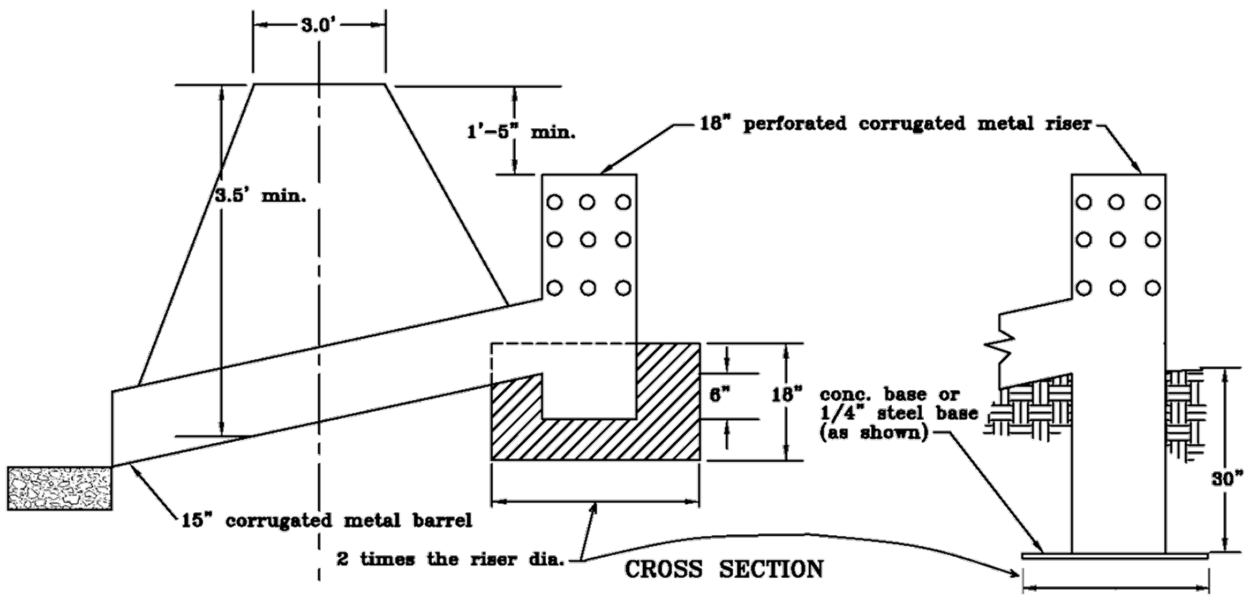
Section 7.600 – Erosion and Sediment Control
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Figure 4 - Pipe Outlet Sediment Trap

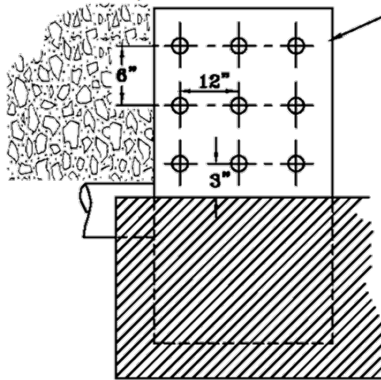
Pipe Outlet Sediment Trap

(D/A: 1 to 2.99 acres)

(Loudoun County Cod. Ord. 1220.01(c))

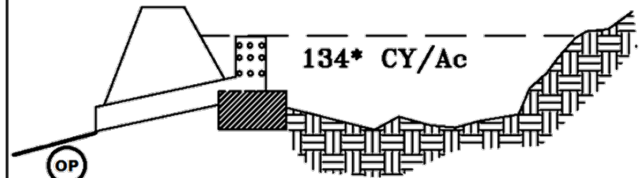


Gravel Cone
(VDOT #1 Convertibles)



3 rows of 1" holes spaced 6" apart vertically; and 12" horizontally. (9 holes total.) A gravel cone of VDOT #1 crushed aggregate shall be placed around the riser to prevent clogging of the perforations.

PERFORATED RISER DETAIL



STORAGE VOLUME REQUIRED

*67 CY/AC wet storage and 67 CY/AC dry storage.

FIGURE 4

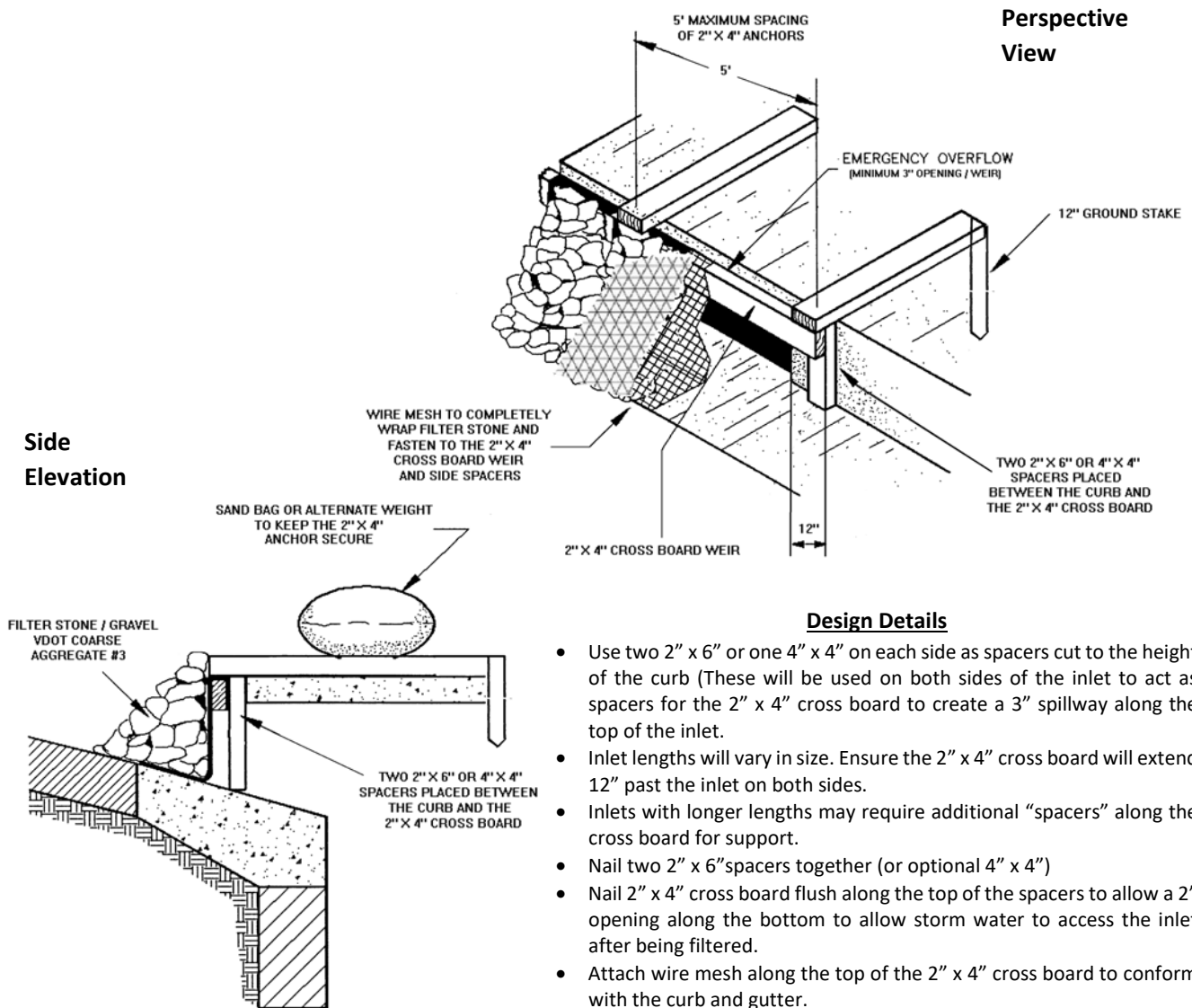
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Effective Date: 01/01/2020

Figure 5 - Recommended Curb Inlet Protection

Recommended Curb Inlet Protection



Design Details

- Use two 2" x 6" or one 4" x 4" on each side as spacers cut to the height of the curb (These will be used on both sides of the inlet to act as spacers for the 2" x 4" cross board to create a 3" spillway along the top of the inlet.
- Inlet lengths will vary in size. Ensure the 2" x 4" cross board will extend 12" past the inlet on both sides.
- Inlets with longer lengths may require additional "spacers" along the cross board for support.
- Nail two 2" x 6" spacers together (or optional 4" x 4")
- Nail 2" x 4" cross board flush along the top of the spacers to allow a 2" opening along the bottom to allow storm water to access the inlet after being filtered.
- Attach wire mesh along the top of the 2" x 4" cross board to conform with the curb and gutter.
- Apply filter stone the entire length of the cross board.
- Attach the mesh to the top of the cross board to secure the filter stone.
- Attach 2" x 4" anchors on top of each end of the cross board to anchor the inlet protection.
- Use sand bags on top of the 2" x 4" anchors to secure the inlet protection to the structure or drive stakes into the ground at the rear of the structure to attach the 2" x 4" anchors to.

FIGURE 5

Section 7.600

Section 7.600 – Erosion and Sediment Control
Effective Date: 01/01/2020

7.700 UTILITY PLACEMENT

Installation of new utilities, such as electric, telephone and cable television, shall be installed underground within new subdivision and site plan developments and to the extent possible in re-development projects. Such utilities shall be placed under the sidewalks or within the right-of-way when feasible.

7.800 ARCHAEOLOGY

7.810 ARCHAEOLOGICAL SURVEY

The purpose of an archaeological survey is to identify the locations of existing archaeological and historic resources, including cemeteries, burial grounds, and graves on a property subject to the application.

- A. All archaeological surveys required by this Section shall be conducted by a qualified professional meeting the Qualification Standards as set forth in “the Secretary of the Interior’s [Standards and Guidelines for Archaeology and Historic Preservation](#)” as defined in 36 CFR 61, Appendix A.
- B. Archaeological survey and reporting shall meet the standards set forth in the [Virginia Department of Historic Resources \(VDHR\)](#) “Guidelines for Conducting Historic Resources Survey in Virginia.”
- C. A Phase I archaeological survey is required for areas of proposed subsurface disturbance, including, but not limited to, the house/outbuilding footprints, drainfields, roads and paved areas, sidewalks, utility lines, borrow pits, staging areas, and stockpiling areas, but is recommended for the entire property. If areas of proposed subsurface disturbance are changed to include areas not previously tested, additional Phase I Archaeological testing of the non-tested areas will be required. A reconnaissance level (“walkover”) survey of any area of the property not subject to the Phase I Archaeological Survey shall be conducted to identify potential cemeteries, burial grounds, and/or graves. The results of the reconnaissance level survey shall be provided with the Phase I archaeological report.
- D. If the Phase I Archaeological Survey is limited only to areas of proposed subsurface disturbance or if multiple Phase I Archaeological Surveys are submitted for an application, a separate sheet for informational purposes only and not for recordation shall be submitted at a maximum 1:2400 scale (1 inch = 200 feet) delineating existing parcel boundaries, proposed development layout, and boundaries of the Phase I Archaeological Survey testing areas.
- E. The Director may approve a Phase I Archaeological Management Summary Report, in lieu of the reporting required by VDHR’s “Guidelines for Conducting Historic Resources Survey in Virginia,” if the Phase I archaeological survey does not result in the identification of archaeological sites, or results in the identification of archaeological resources that are determined by the consultant to warrant no further archaeological investigation. The Phase I Archaeological Management Summary Report must include the following:
 - 1. A brief description of the property with a vicinity map.

2. The testing methodology and rationale, including a summary of previously identified sites in the vicinity and results of historic map research.
 3. A topographic map of project area showing areas tested, with the shovel test locations delineated.
 4. The results of fieldwork including artifact inventory and brief description of any identified sites.
 5. The rationale for site recommendations if applicable.
 6. Results of the reconnaissance level survey.
- F. The Director may waive or modify the requirement for Phase I archaeological survey and reporting after determining that a site has little or no potential for cultural resources based on a finding such as (a) the site has been subject to prior significant grading or ground disturbance beyond normal agricultural use, or (b) the site contains environmental characteristics (such as slopes, wetlands, hydric soils) that would have rendered previous human occupation reasonably unlikely. Variations (WAIV) of the requirement for the reconnaissance level survey shall not be permitted.

7.820 PRESERVATION OF HISTORIC CEMETERIES, BURIAL GROUNDS, AND GRAVES

- A. In order to preserve existing cemeteries, burial grounds, and graves for human remains, all preliminary plats of subdivision, and all site plans and construction plans and profiles if not previously provided with a preliminary plat of subdivision, shall include a professionally prepared archaeological delineation of the perimeter boundary of all burials if any cemeteries, burial grounds, or graves are identified during the archaeological survey. The delineation shall be conducted in accordance with standard archaeological practices, such as, but not limited to, shallow mechanical trenching extending outward from location of the visible areas of the identified cemetery, burial ground, or grave to remove topsoil so that soil discolorations indicative of burials may be viewed, or systematic probing with rods to detect differences in soil compaction indicative of burials. The perimeter boundary of the cemetery, burial ground, or grave shall be delineated five (5) feet from the edge of the identified burials, and any future burial locations if applicable.
- B. The cemetery, burial ground, or grave and associated buffer area as required by the Zoning Ordinance shall be located within an easement granted to Loudoun County in a form approved by the County. The perimeter boundary of a cemetery, burial ground, or grave as determined by the archaeological delineation and the associated easement shall be indicated on the site plan, construction plans or profiles, preliminary plat of subdivision, and associated plat applications as required by Chapter 8. A digital file of the boundary of the cemetery, burial ground, or grave

prepared in accordance with the Office of Mapping and Geographic Information Digital Data Submission Guidelines for Cemeteries shall be submitted prior to approval of the site plan, construction plans or profiles, or preliminary plat of subdivision.

- C. Unimproved pedestrian access to the cemetery, burial ground, or grave shall be provided on the site plan, construction plans or profiles, preliminary plat of subdivision, and associated plat applications as required by Chapter 8, either by a minimum of 15 feet of frontage on a street or by an access easement that shall be a minimum of 15 feet wide from a street or other point of public ingress.
- D. Prior to any land disturbance, protective barriers, such as Super Silt Fence as shown in Figure 3, or welded wire fence as shown in Figure 6, shall be installed along the limits of clearing and grading proximate to the cemetery, burial ground, or grave.
- E. Subsections A. through D., above, shall not preclude exhumation and re-interment of burials in accordance with the Code of Virginia. The plan approved by the Virginia Department of Historic Resources for such exhumation and re-interment shall be provided to the County Archaeologist prior to exhumation.

7.830 CEMETERY, BURIAL GROUND, AND GRAVE TREATMENT PLAN

A Treatment Plan shall include the following:

- A. A map depicting the perimeter boundary of the cemetery, burial ground, or grave; all associated burial site elements (such as fences, walls, gates, landscape features, plantings associated with burials, fieldstones, and tombstones); the required and proposed Cemetery, Burial Ground, and Grave Buffers; existing vegetation to be preserved or conserved and proposed landscaping, opaque barriers, or hardscaping; proposed grading; proposed pedestrian access easement; and existing and proposed surrounding uses.
- B. An inventory of existing burial site elements depicted on the map and their condition.
- C. A description of the existing vegetation to be preserved or conserved, or removed, treatment of invasive species excluding any species planted in association with burials, and any proposed landscaping within the buffer.
- D. A description of the physical demarcation of the perimeter boundary.
- E. A description of any proposed opaque barriers, fencing, or hardscaping.
- F. A description of any proposed interpretive signage documenting the cultural and historical significance of the cemetery, burial grounds, or graves.

- G. A description of how the modified buffer will achieve the purpose and intent of the required Cemetery, Burial Ground, and Grave Buffers, and address how the cemetery, burial ground, or grave and its historic context is being preserved through alternative mitigation techniques.

7.900 REFERENCES FOR CHAPTER 7

[American National Standards Institute](#) (arboricultural operations standards).

[Codified Ordinances](#) of Loudoun County of Virginia.

["Guide Policy for Roadway Lighting Facilities and Security Lighting Facilities", \(VDOT\).](#)

[Virginia Erosion and Sediment Control Handbook](#), Division of Soil and Water Conservation

CHAPTER 8.000

ADMINISTRATIVE PROCEDURES

8.000 OPTIONAL PRE-SUBMISSION MEETINGS PRIOR TO PRELIMINARY SUBDIVISION, SITE PLAN, PLAT AND CONSTRUCTION PLAN AND PROFILE APPLICATIONS (PSUB)

8.100 DETAILS OF PLAT AND PLAN REQUIREMENTS

8.100.1 DIGITAL DATA

8.101 GENERAL STANDARDS

8.102 PRELIMINARY PLAT OF SUBDIVISION (SBPL)

8.103 PLATS FOR SUBDIVISION AND OTHER MISCELLANEOUS PLATS

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8.103.4 FAMILY SUBDIVISION (SBFM)

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8.103.6 EASEMENT PLATS – CREATION AND VACATION

8.103.7 DEDICATION/VACATION PLATS (DEDI)

8.103.8 AR-1 AND AR-2 DIVISION PLATS (SBBD)

8.104 FLOODPLAIN STUDY (FPST)

8.105 FLOODPLAIN ALTERATION (FPAL)

8.106 CONSTRUCTION PLANS AND PROFILES (CPAP)

8.107 SITE PLANS (STPL) AND RURAL ECONOMY SITE PLANS (REST)

8.108 RECORD DRAWINGS

8.109 PLAT AND PLAN REVISIONS

8.110 SITE PLAN AMENDMENTS (SPAM)

8.111 GRADING PERMIT APPLICATION

8.112 INDIVIDUAL LOT GRADING PLAN

8.113 LOCATION PLAT

8.114 PLOT PLANS FOR RESIDENTIAL ZONING PERMIT APPLICATIONS

8.200 REQUIREMENTS FOR START OF ANY CONSTRUCTION

8.300 PERFORMANCE AGREEMENT AND BONDING

8.301 PERFORMANCE AGREEMENT SUBMISSION REQUIREMENTS

8.302 TERM OF PERFORMANCE AGREEMENT

8.303 ACCEPTABLE FORMS OF PERFORMANCE BONDS

8.304 BOND ESTIMATE AND BOND AMOUNT

8.305 BOND PROCEDURES AND REQUIREMENTS

8.306 DEBARMENT OF SURETY

8.400 CERTIFICATE OF OCCUPANCY OR USE

8.500 INSPECTIONS

CHAPTER 8.000

ADMINISTRATIVE PROCEDURES

This chapter establishes certain criteria which must be met to allow a systematic approach to a comprehensive review process. In addition to the information below, it is the developer's responsibility to provide all necessary information to allow reviewing agencies to adequately determine if all requirements of pertinent ordinances and provisions of this manual have been met.

8.000 OPTIONAL PRE-SUBMISSION MEETINGS PRIOR TO PRELIMINARY SUBDIVISION, SITE PLAN, PLAT AND CONSTRUCTION PLAN AND PROFILE APPLICATIONS (PSUB)

In order to familiarize an applicant or landowner with the development review process; or to provide an applicant or landowner the opportunity to discuss development alternatives; or to provide an applicant or landowner the opportunity to discuss a particular property and any environmental and cultural resource issues; an applicant or landowner may request a pre-submission meeting prior to submission of Preliminary Subdivision, Site Plan, Plat, or Construction Plan and Profile applications. To facilitate discussion at the pre-submission meeting, a sketch plan, narrative of the proposed land use proposal, and existing site conditions in Loudoun County Geographic Information System (LOGIS) shall be submitted to the County.

Upon receipt of the above information, the County shall schedule a Pre-submission meeting to be held within ten (10) working days. During the Pre-submission meeting, the County and applicant shall collaborate and share design options to meet the proposed land use objectives while preserving and protecting the environmental and cultural resources identified on the subject site. Conclusions and agreements made at the Pre-submission meeting shall be documented for future reference by the applicant and the County during the land development application preparation, review and approval process. For Rural Economy Site Plans, such documentation shall include any approved modifications to Section 8.107.

8.100 DETAILS OF PLAT AND PLAN REQUIREMENTS

The information contained in the following subsections is required to be included on plats and plans reviewed by the Department of Building and Development.

8.100.1 DIGITAL DATA

If produced electronically, and if not previously provided, an electronic copy of required submission materials (i.e. plats, plans, exhibits, studies, reports, legal documents, and letters) shall be included with each plat and plan submission in PDF format or such other standard digital format as specified by the Director. The County will provide a release of liability, if requested.

8.101 GENERAL STANDARDS

The information in this section gives an explanation of standard plat and plan requirements. See the specific requirements of each plat or plan for the requirements of each document.

A. Standards:

1. Scale: The scale of the plat or plan shall be shown in feet.
2. Proposed Name of Subdivision or Development: No proposed names of subdivisions or developments shall duplicate or closely resemble the name of any existing or currently proposed subdivision or development in Loudoun County. Name should include Phase or Section Number, as applicable.
3. Revision Block: A revision block shall be shown on the Cover Sheet (or first sheet) of the plat set and all sheets of the plan set. The Cover Sheet revision block shall contain a summary of all revisions made to any sheet of the plat, or plan, in substantially the following form:

Rev. No.	Sheet Number and Revision Description	Date

All other sheets of the plan set shall include a revision block itemizing the revisions applicable to each sheet, in substantially the following form:

Rev. No.	Revision Description	Date

4. Source of Title: The source of title of the owner (the deed book and page number or instrument number of the last instrument in the chain of title for all included property).
5. Zoning Requirements:
 - a. Preliminary Plats, Site Plans, Construction Plans and Profiles: In tabular form show the specific zoning requirements, in accordance with the Zoning Ordinance including proffered or special exception conditions, for the subject property and the existing zoning districts, to include but not limited to: applicable version of the Zoning Ordinance (i.e. 1972, 1993, Revised 1993); Zoning district; overlay zoning districts; minimum lot area; minimum lot width; maximum length/width ratio; minimum front, side and rear yards; maximum floor area ratio; maximum lot coverage; maximum building heights; parking spaces required and provided (including standard and handicap accessible); open space requirements; proposed uses and proposed number of lots. For construction plans and profiles and site plans show floor area ratio or lot coverage calculations as required by the Zoning Ordinance. A note may be added to the plat stating that the zoning requirements are for depiction of current ordinance requirements only and may be subject to change.
 - b. Plats: In tabular form show the specific zoning requirements, in accordance with the Zoning Ordinance including proffered or special exception conditions, for the subject property and the existing zoning districts, to include but not limited to: applicable version of the Zoning Ordinance (i.e. 1972, 1993, Revised 1993); Zoning district; overlay zoning districts; minimum lot area; minimum lot width; maximum length/width ratio; minimum front, side and rear yards; maximum lot coverage; maximum building heights; open space requirements; proposed number of lots. A note may be added to the plat stating that the zoning requirements are for depiction of current ordinance requirements only and may be subject to change.
6. Associated Land Development Application Information: Reference to land development application numbers and corresponding approval dates for

land development applications preceding the subject application submission that involve the subject property. Land development applications involving only adjacent sections, or expired or superseded land development applications, do not need to be listed.

7. Vicinity Map: The plat or plan shall show the location of the proposed subdivision by an insert vicinity map, drawn to a scale 1 inch equals not more than 2000 feet or other appropriate scale as permitted by the Director.
 - a. The existing perimeter boundary line of the proposed subdivision and/or site plan and of any larger tract of which the subdivision and/or site plan forms a part.
 - b. Adjoining roads or principal access points with their names and route numbers.
 - c. Town boundary lines within one mile of the proposed subdivision.
 - d. North arrow.
8. Coordinate Grid Tics: Coordinate grid tics and values reflecting the North American Datum of 1983 (NAD 83 HARN) State Plane Virginia North (in US Survey Foot) coordinate grid system with at least three tics or intersection points shall be shown on each plan sheet, for informational purposes, in intervals of no less than 250 foot increments and no more than 1,000 foot increments. For record plats, grid system coordinates of at least two adjacent corners shall be included, if any point in the subdivision is within 1/2 mile of an NGS or equivalent triangulation or traverse station established within the standards for a second order geodetic monument. (Projects that were started prior to November 9, 2009, may use the previously required NAD 27 datum.)
9. Adjoining Property Information: MCPI (PIN), adjacent zoning district, and departing property lines shall be shown. For preliminary plats, construction plans and profiles, and site plans the existing adjacent land use shall be indicated for the purpose of determining buffer requirements per the Zoning Ordinance.
10. Zoning District and Jurisdictional Boundaries: The zoning district boundaries shall be shown when a property is located in more than one zoning district. Zoning overlay district boundaries shall be shown when a property is located within any zoning overlay district. Jurisdictional boundaries shall be shown for property located in Loudoun County and a town or another county, or which falls under the subdivision control of a town.

11. Yard and Setback Lines: Front, side and rear yard and setback lines required by the Zoning Ordinance and/or proffers shall be shown as dashed lines or in tabular form. The dimension from each lot line and the length of the front yard line shall be clearly illustrated and identified. A note may be added to the plat stating that the yard and setback lines are for depiction of current ordinance requirements only and may be subject to change.
12. Stakeout Note:

A note shall be provided stating that if requested by the Director, the approximate location of proposed entrances from State-maintained roads will be staked, and the name, address and telephone number of the party who will respond to the Director's request for field assistance, when required, to identify specific areas of proposed development as related to existing site conditions.
13. Approval Block: An approval block shall be provided per the following with appropriate application number provided within:

APPROVAL BLOCK	
LAND DEVELOPMENT APPLICATION NUMBER _____	
_____ Director of Building & Development	_____ Date

14. Fee Check: A fee check, payable to the County of Loudoun, shall be attached to the plat or plan submission. Fee schedules are available from the Director.
15. Land Development Application Form: A complete and executed Land Development Application Form with original signatures, as provided by the Director.
16. MCPI (PIN) Reference: The MCPI number is required for all properties that are a part of the application. Such references may be made in tabular form or shown on the plat or plan.
17. Topography: Topographic information, indicating when and by what means it was made, having contour intervals of 2 feet or less, showing all the area covered by the site, including a 50 foot overlap, and related to the North American Vertical Datum of 1988 (NAVD 88). Areas of forest or other vegetated cover shall also be shown. Champion trees as identified in

adopted Federal and State documents shall also be identified. (Projects that were started prior to November 9, 2009, may use the previously required NGVD 29 datum.)

18. Seal and Signature: The seal, signature, and date of the Licensed Professional Engineer (P.E.) or Surveyor who prepared this plat or plan shall be shown on each sheet.
19. Surveyor's Certificate: A certificate, endorsed by the Licensed Professional Engineer (P.E.) or Surveyor, setting forth the source of title of the owner of the property (deed book and page number or instrument number where owner acquired the property) and the place of record of the last instrument in the chain of title (deed book and page number or instrument number of the last instrument that vacated, relocated, or otherwise altered any boundary lines of the property, or subdivided the property), in accordance with Section 15.2-2262 of the Code of Virginia, as amended.
20. Source of Floodplain Note: A note shall be provided that describes the source of the existing floodplain information as follows:

"There is no floodplain on the property that is the subject of this application. The current Flood Insurance Rate Map (FIRM) of Loudoun County Community Panel Number for the property that is the subject of this application is *insert number*, effective *insert date*."

OR

"There is floodplain on the property that is the subject of this application. The current Flood Insurance Rate Map (FIRM) of Loudoun County Community Panel Number for the property that is the subject of this application is *insert number*, effective *insert date*." The depicted boundary of the existing floodplain is based on *select one* [if applicable, a site-specific floodplain study or floodplain alteration *provide application number and approval date*] [the FIRM] [*other source with description*]."

21. Archaeology Notes: A note shall be provided to describe each archaeology survey conducted for the property as follows. No note needs to be provided if a particular survey was not performed.

"A Phase I Archaeological Survey was completed for the property, *insert report title*, by *insert company name* in *insert month and year*."

"A Phase II Evaluation, *insert report title*, was completed for Site *insert number(s)* by *insert company name* in *insert month and year*."

"A Phase III Data Recovery, *insert report title*, was completed for Site *insert number(s)* by *insert company name* in *insert month and year*."

“A Cemetery Delineation, *{insert report title}*, was completed to identify the boundary of the cemetery associated with Site *{insert number(s)}* by *{insert company name}* in *{insert month and year}*.”

8.102 PRELIMINARY PLAT OF SUBDIVISION (SBPL)

The purpose of the preliminary plat of subdivision is to conceptually show the probable lot layout and location of streets and other necessary infrastructure to demonstrate geometric locations of all lots and improvements of such proposed subdivision.

A. Plat Requirements

The preliminary plat of subdivision shall be prepared by a Licensed Professional Engineer (P.E.) or Surveyor. These plats shall contain the data listed below, legibly drawn, on sheets of 24 inches by 36 inches in size, with appropriate matchlines, (if necessary). The following shall be included for each plat as appropriate. The failure to depict the following items on the preliminary plat of subdivision, shall not relieve the developer of any requirement to depict such items on subsequent application.

1. The title "Preliminary Plat of Subdivision".
2. Scale. (See 8.101)
 - a. Lots less than or equal to 3 acres: 1 inch equals no more than 100 feet.
 - b. Lots greater than 3 acres 1 inch equals no more than 200 feet.
3. North arrow.
4. Date. A date shall be shown on the cover sheet
5. The Proposed Name of Subdivision or Development. (See 8.101)
6.
 - a. The name and address of the owner of record.
 - b. The name of the applicant.
 - c. The Licensed Professional Engineer (P.E.) or Surveyor who prepared the plat.
7. The number of sheets included in the plat.
8. Revision Block. (See 8.101)
9. Source of Title. (See 8.101)
10. Zoning Requirements. (See 8.101)

In addition to the applicable zoning requirements, as stated in Section 8.101.A.5.a, the following note shall be provided on preliminary plats of subdivision which are preceded by a rezoning or special exception application:

"All development within this subdivision shall be in substantial conformance with (A) the requirements of the applicable concept development plan, proffers and special exception conditions in accordance with (insert specific reference to County application numbers), pursuant to which such concept development plan, proffers and special exception conditions were approved, and (B) any conditions set forth as conditions of approval of this preliminary plat."

11. Associated Land Development Application Information. (See 8.101)
12. Election District and Loudoun County, Virginia in Title Block.
13. Vicinity Map. (See 8.101)
14. Boundary lines and total acreage of the proposed subdivision and the acreage remaining in the original tract, if any.
15. Proposed lot lines, (showing approximate dimensions), proposed block and lot numbers, and the approximate area of each lot.
16. Coordinate Grid Tics. (See 8.101)
17. Adjoining Property Information. (See 8.101)
18. The Zoning District and Jurisdictional Boundaries. (See 8.101)
19. MCPI (PIN) Reference. (See 8.101)
20. The approximate location of existing buildings within the subdivision.
21. The proposed location, width, centerline and projected Average Daily Traffic (ADT's) of each road or other public or private way within the subdivision. Pedestrian circulation paths shall be shown, including proposed trails and sidewalks, if such improvement is required.
22. The approximate location, width, ADT's and centerline of adjoining roads, and access easements with their names and/or route numbers.
23. Proposed roads shall include approved and/or reserved road names per the [Codified Ordinances](#) of Loudoun County.

24. Proposed Yard and Setback Lines. (See 8.101)
25. The approximate location and approximate area of any land to be dedicated or reserved for public use, road right-of-way use, or common use of future property owners in the subdivision. The location of any existing and proposed conservation easements.
26. Approximate watercourse locations and names, if any, and the boundaries of the FOD, or the proposed boundaries of the floodplain as shown on a floodplain study or floodplain alteration which has been submitted and accepted by the County for review in accordance with Chapter 5 of this manual.
27. Source of Floodplain Note. (See 8.101)
28. General location of existing drainage ways, ponds, springs, onsite sewage disposal, onsite water supply systems and existing and proposed public water and sewer lines.
29. Archaeology Notes. (See 8.101)
30. The locations of archaeological sites, historic structures, human cemeteries, burial grounds, graves, historic districts, and historic landmarks on the site, if identified by the Archaeological Surveys performed for the property in accordance with Chapter 7 of this manual and the Phase II Evaluation and Phase III Data Recovery, if applicable.
31. Current topographic information, indicating when and by what means it was made, having contour intervals of 5 feet or less, showing all the area covered by the subdivision not including residue parcel(s) and related to the North American Vertical Datum of 1988 (NAVD 88). Loudoun County Geographic Information System (LOGIS), which depicts 4-foot contour intervals, may be used. Areas of forest or other vegetated cover shall also be shown. In cases where a Tree Survey has been performed for the property, identified cover type areas and specimen trees shall be depicted. Champion trees as identified in adopted Federal and State documents shall also be identified. (Projects that were started prior to November 9, 2009, may use the previously required NGVD 29 datum.)
32. Stakeout Note. (See 8.101)
33. Graphically shown on the plat, Ldn 65 and Ldn 60 aircraft noise contours and any area within one mile of the Ldn 60 aircraft noise contour, as defined by the Zoning Ordinance.
34. Approval Block. (See 8.101)

35. Proffered preservation areas shall be clearly delineated (e.g., trees, structures, etc.).
36. For lots less than 20,000 square feet in size a typical lot detail shall be provided at a scale of not less than 1 inch = 50 feet.
37. A tabulation of lot yield for those properties being developed pursuant to the Cluster Subdivision Option or Principal/Subordinate Option in the AR-1 or AR-2 Zoning Districts.
38. Wetlands data as follows:
 - a. Potential jurisdictional waters and wetlands as identified by the Loudoun County Predictive Wetlands Model or a consultant wetland delineation performed in accordance with Army Corps of Engineers (Corps) standards shall be depicted on the plat.
 - b. A note referencing the source of the wetland information depicted on the plat (including the Corps Jurisdictional Determination number and date, if it exists) and indicating that all applicable state and federal permits shall be obtained prior to disturbances within jurisdictional waters and wetlands shall be provided on the plat.
39. Very Steep Slope Areas and Moderately Steep Slope Areas, as defined and regulated in the Zoning Ordinance and as identified in Loudoun County Geographic Information System (LOGIS), or based on a topographic analysis where a contour interval of 5 feet or less is used.
40. The boundaries of Scenic Creek Valley Buffer and other applicable County environmental buffers.
41. A soils map certification in accordance with Chapter 6 of this manual.
42. Overlay Districts as established in the Zoning Ordinance.

B. Items to Accompany Preliminary Plats of Subdivision

The following items shall accompany the submission of a preliminary plat of subdivision:

1. For any subdivision to be served in accordance with the requirements of the LSDO section relating to onsite sewage disposal systems, written approval of the proposed locations of sewage disposal systems shall be obtained from the Health Director or his designee and submitted with the preliminary plat. For any subdivision proposed to be served by on site wells, the developer shall submit with the preliminary plat written verification from the Health

Director, or his designee, that the Hydrogeologic Report has been reviewed and approved in accordance with Chapter 6 of this manual.

2. Fee Check. (See 8.101)
 3. Land Development Application Form. (See 8.101)
 4. If not previously provided, an archaeological survey report prepared in accordance with Chapter 7 of this manual. If human cemeteries, burial grounds, or graves are identified, an archaeological delineation prepared in accordance with Chapter 7.
 5. If within the Limestone Overlay District or Mountainside Development Overlay District, documentation of the submission of an application for, or the submission of a private, Preliminary Soils Review in accordance with Chapter 6 of this manual.
 6. A letter from the Virginia Department of Conservation and Recreation, Division of Natural Heritage identifying occurrences of natural heritage resources on the property such as the habitat of rare, threatened, or endangered plant and animal species, unique or exemplary natural communities, and significant geologic formations. If an endangered and threatened species survey has been completed for the property, a copy of the report shall also be submitted.
 7. If applicable, plan and analysis of VDOT connectivity requirements and locations of stub out streets.
- C. The following items shall be required prior to approval of Preliminary Plats of Subdivision:
1. If not previously provided, a digital file of the boundary of any cemetery, burial ground, or grave prepared in accordance with the Office of Mapping Digital Data Submission Guidelines for Cemeteries.
- D. Preliminary Plat Review

Following the first review by the County, the Preliminary Plat may be conditionally approved. After the first review, the Director shall prepare and provide an Official Comment Letter setting forth the corrections and revisions that are required or recommended, including, by attachments, the referral comments from the referral agencies. When the Official Comment Letter is received by the applicant, applicant may submit a written response to the Director that it will comply with all County and referral comments as part of its Construction Plans and Profiles and record plat submissions. The Director will consider this response, and if the Director finds that the revision of the Preliminary Plat in accordance with the Official Comment Letter

will not substantially alter the conceptual layout of the Preliminary Plat, such Preliminary Plat shall be conditionally approved.

8.103 PLATS FOR SUBDIVISION AND OTHER MISCELLANEOUS PLATS

A. Plat Requirements

The plats shall be prepared by a Licensed Professional Engineer (P.E.) or Surveyor. These plats shall contain the data listed below, legibly drawn, on sheets of 18 inches by 24 inches in size, with appropriate matchlines (if necessary). The following shall be included for each plat as appropriate.

1. Scale. (See 8.101)
 - a. Lots less than 1/4 acre; 1 inch equals no more than 50 feet.
 - b. Lots 1/4 to 3 acres; 1 inch equals no more than 100 feet.
 - c. Lots greater than 3 acres; 1 inch equals no more than 200 feet.
2. North arrow.
3. Date.
4. The name of the subdivision. (See 8.101)
5.
 - a. The name of the owner(s) of record.
 - b. The name and address of the Licensed Professional Engineer (P.E.) or Surveyor who prepared the plat.
6. Number of sheets included in the plat.
7. Revision Block. (See 8.101)
8. MCPI (PIN) Reference. (See 8.101)
9. Seal and Signature. (See 8.101)
10. Surveyor's Certificate. (See 8.101)
11. The boundary survey with an error of closure within the limits established by the Commonwealth of Virginia.
12. Coordinate Grid Tics. (See 8.101)
13. The plat(s), as submitted for signature and recordation, shall be drawn legibly and accurately per [Virginia State Library and Archives Standards](#) for plats.

14. Zoning Requirements. (See 8.101)
15. Zoning District and Jurisdictional Boundaries. (See 8.101)
16. Associated Land Development Application Information. (See 8.101)
17. Election District and Loudoun County, Virginia in the Title Block.
18. Vicinity Map. (See 8.101)
19. The plat shall show parcel and lot lines, showing dimensions, block and lot numbers, and the area of each parcel or lot including area outside of major floodplain. Dimensions shall be shown in feet and decimals of a foot to the closest one-hundredth of a foot, and bearings in degrees, minutes, and seconds. The data for curves shall be shown in detail at the curve or in a curve data table containing the following: radius, delta, arc, tangent, chord, and chord bearing. Acreage shall be shown to the ten thousandth decimal place and square footage to the nearest whole foot and all of the remaining area in the original tract/residue parcels to the nearest one hundredth of an acre.
20. Roadways shall include approved and/or reserved names per the [Codified Ordinances](#) of Loudoun County. Existing public roadways shall include route numbers and road names.
21. The location, dimensions of easements, dimensions and area of roadways, public sites (schools, fire and rescue facilities, etc.), parks and other public areas shall be included.
22. Adjoining Property Information. (See 8.101)
23. Graphically shown on the plat, Ldn 65 and Ldn 60 aircraft noise contours and any area within one mile of the Ldn 60 aircraft noise contour, as defined by the [Zoning Ordinance](#).
24. Yard and Setback Lines. (See 8.101)
25. If land is being dedicated or reserved for public use for roads, parking areas for public use, or for common use of the future property owners of the subdivision, the record plat shall so state and illustrate such.
26. As applicable, the location, width, and centerline of existing/proposed roads, easements, and public or private rights-of-way within or immediately abutting the property. Instrument numbers or deed book and page numbers shall be provided, as applicable.

27. If not otherwise contained within the deed accompanying the plat, the plat shall contain a statement to the effect that the subdivision is with the free consent and in accordance with the desire of the undersigned owners and trustees of the property and shall be duly acknowledged in accordance with Section 15.2-2264 of the Code of Virginia of 1950, as amended.
28. The plat shall indicate Health Director approved sewerage disposal systems and water supply systems, as specified in the Loudoun County [Codified Ordinances](#).
29. The plat shall contain a statement setting forth the persons or entities responsible for maintenance of stormwater detention, drainage facilities, easements, sidewalks, trails, lighting and other facilities, as applicable.
30. In the AR-1, AR-2, A-10 and A-3 Zoning Districts, record plats shall contain the following statement:

"In all areas within the AR-1, AR-2, A-10 or A-3 Zoning Districts, agricultural and rural economy activities are the preferred land uses. Owners of land within AR-1, AR-2, A-10 or A-3 Zoning Districts are hereby notified that agricultural and rural economy activities shall be given preference by the County when conflicts arise concerning the compatibility of such farm or rural economy uses with adjacent or nearby non-farm or non-rural economy uses. The County shall not restrict or interfere with farming and rural economy activities in AR-1, AR-2, A-10 or A-3 Zoning Districts. The farming and rural economy activities, including such effects as noise, odors, and machinery traffic, shall not be recognized or accepted by the County as valid or proper cause for complaints from adjacent or nearby residential neighbors."
31. Watercourses and names, if any.
32. Source of Floodplain Note. (See 8.101)
33. A floodplain easement in accordance with Chapter 5 of this manual.
34. Archaeology Notes. (See 8.101)
35. The boundaries of any archaeological delineation of human cemeteries, burial grounds, or graves, and the associated easement and pedestrian access easement.
36. Restrictive covenants. Instrument or deed book and page numbers shall be provided, as applicable.
37. An Approval Block. (See 8.101)

38. If private roads or access easements are proposed, the following notes shall be provided:

- a. “Construction of the private road(s) and/or access easement(s) shown hereon shall conform to the standards set forth in the Loudoun County Land Subdivision and Development Ordinance and Chapter 4 of the Facilities Standards Manual.”

AND

- b. One of the following notes, as applicable:
 - i. “The streets in this subdivision do not meet the standards necessary for inclusion in the system of state highways and will not be maintained by the Virginia Department of Transportation or the County and are not eligible for rural addition funds or any other funds appropriated by the General Assembly and allocated by the Commonwealth Transportation Board.”

OR

Where streets are required to meet VDOT standards for design and construction, but which are not intended for acceptance as part of the secondary system of state highways.

- ii. “Although the streets in this subdivision are required to meet VDOT standards for design and construction, such streets are not intended for inclusion in the system of state highways and will not be maintained by the Department of Transportation or the County and are not eligible for rural addition funds or any other funds appropriated by the General Assembly and allocated by the Commonwealth Transportation Board.”

AND

- c. “The access serving these lots is private and its maintenance, including snow removal, is NOT a public responsibility.”

39. The location of structures (e.g., buildings, barns, sheds) to be retained, including stone walls within areas to be dedicated for public right-of-way.

40. Designation of ADU lots in accordance with Zoning Ordinance.

41. If the property is being developed pursuant to the Principal/Subordinate Subdivision Option, the following as appropriate:

- a. Tabulations showing the lot yield originally calculated for the Originating Tract, all prior subdivisions from the Originating Tract, and all resulting Principal Lots and number of Subordinate Lots created pursuant to each such subdivision.
 - b. Labels clearly identifying the Principal and Subordinate lot (s).
 - c. A note stating that “Subordinate lots are ineligible for further subdivision.”
- 42. If the property is being developed pursuant to the Cluster Subdivision Option in the AR-1 or AR-2 Zoning District, the following as appropriate:
 - a. A tabulation of density for such cluster subdivision.
 - b. Inclusion of note on the record plat and documentation within the deed stating that all lots are ineligible for further subdivision.
- 43. All subdivisions which include AR or TR zoned property shall include a note on the record plat and within the deed indicating that agricultural operations enjoy the protection of the Right to Farm Act.

B. Items to Accompany Plats

The following items shall accompany the submission of the plat.

- 1. Verification of Water Supply and Sewage Disposal.
 - a. If not already provided as part of a Preliminary Subdivision:
 - i. A letter signed by the Health Director evidencing conformance with applicable requirements of the County Health Department.
 - ii. If public water or public sewerage is to be provided by an entity other than Loudoun Water, a letter signed by an authorized official of that entity shall be submitted indicating that service can and will be provided.
- 2. Fee Check. (See 8.101)
- 3. Land Development Application Form. (See 8.101)
- 4. If not previously provided with a Preliminary Plat of Subdivision or Construction Plans and Profiles, Steep Slopes data as follows:

- a. For any proposed parcel of land or road that includes within its boundaries Very Steep Slope Areas and/or Moderately Steep Slope Areas, as defined and regulated in the Zoning Ordinance, the following shall be depicted on a separate sheet for informational purposes only and not for recordation: topographic information at contour intervals of 5 feet or less and the location and extent of Very Steep Slope Areas and Moderately Steep Slope Areas; land disturbing activities including, but not limited to, any proposed building and structure sites, driveways and paved areas, drainfields and associated septic lines, wells and associated water lines, minor utilities, and public sanitary sewer and water lines; and mitigation measures. Such information shall satisfy Locational Clearance submission requirements for Steep Slope Areas.

C. Final Documents

Prior to plat approval, the following items must be submitted for review and approval to the Director:

1. If improvements for which a performance bond is required under Section 8.300 of this chapter are not completed, a performance bond in the form of a cash escrow, letter of credit, or corporate surety bond, along with the appropriate performance agreement, shall be submitted. Such performance bond must be accepted by the Board of Supervisors or designee prior to plat approval.
2. An unexecuted copy of the deed. Such deed shall:
 - a. Contain a correct description of the land subdivided or adjusted and state that such subdivision or adjustment is with the free consent and in accordance with the desire of the undersigned owners and trustees of the property and shall be duly acknowledged in accordance with Section 15.2-2264 of the Code of Virginia, as amended.
 - b. Contain language such that, when the deed is recorded, it shall operate to transfer, in fee simple, to the Board of Supervisors such portion of the premises platted as is on the plat set apart for roadways or other public use, and transfer to the Board of Supervisors, or to such association or public authority as the Board of Supervisors may provide, any easement indicated on the plat as the Board of Supervisors may require.
 - c. Contain protective or restrictive covenants, if applicable.
 - d. Contain, when applicable, provisions for maintenance and indemnification by the property owner with respect to any structure,

including permanent fences and stone walls, within the proposed and future public right-of-way.

3. When the developer is required to establish an owners' association prior to approval of the plat to satisfy proffer or other zoning or regulatory requirements, or in cases where land or facilities are to be conveyed to and owned in perpetuity by an owner's association, copies of the owner's association's documents shall be submitted.

For properties located within the Goose Creek Reservoir Protection area as defined in Chapter 5 of this manual, such owner's association documents shall include covenants requiring the association to maintain the storm drainage inlet structure markings described in Chapter 5 and covenants restricting the use of pesticides, herbicides and fertilizers to those materials which are labeled safe for aquatic use.

4. A letter from the obligor acknowledging that a maintenance and indemnification agreement satisfactory to the Board of Supervisors to provide for public facilities maintenance must be executed and delivered to the Director prior to final release of the financial guarantee.
5. Certificate by subdivider that structures subject to Zoning Ordinance minimum yard requirements, which are not shown on the plat, will be removed, unless satisfactory alternate arrangements have been approved by the Director.
6. Paper copies as requested by the County.
7. If not included in the deed:
 - a. A Deed of Release if there are deed of trust trustees who are not parties and signatories to the deed; or
 - b. A letter or other documentation from the owner which certifies that there is no deed of trust lien on the property.
8. Water or sewerage facility documentation:
 - a. For development(s) served by public water or sewerage facilities, documentation from the [Loudoun County Sanitation Authority \(Loudoun Water\)](#), or appropriate town, indicating that a performance bond adequate to assure the installation of water or sewerage facilities in a manner which will satisfy its requirements has been approved.

- b. For development(s) served by private well or septic facilities, documentation from the Loudoun County Health Department indicating that such facilities have been approved.
9. A copy of the document establishing the funding mechanism providing maintenance of the common facilities in accordance with the Zoning Ordinance (AR Districts only).
10. A copy of a minimum two year maintenance contract if a communal water and/or sewage disposal system is to be maintained by an entity other than the Loudoun County Sanitation Authority (Loudoun Water) (AR Districts only).

D. Standard Process

The following process is required for plat applications (“Plats”) that are based on construction plans and profiles or site plans (“Plans”). It does not apply to any easement, dedication, boundary line adjustment, family subdivision, subdivision waiver, preliminary/record plat application that does not involve construction plans, or other plats as approved by the Director. Any application that fails to provide all the information required in this section will be returned without review and, upon resubmission, placed after all other applications that have been submitted prior to such resubmission.

1. The first submission of the Plat shall not be submitted prior to the second submission of the Plans. The first submission of the Plat shall address, as appropriate, all of the County’s first review comments on the Plans. The first submission of the Plat shall be submitted without Legal Documents, except that the Deed of Subdivision, Dedication and Easements may be submitted.
2. The second submission of the Plat shall address all of the first submission Plat referral comments. The second submission of the Plat shall be accompanied by the submission of the Legal Documents which shall have been prepared based upon the second submission Plat and in conformance with any applicable proffers or conditions. For the purpose of this process, Legal Documents shall include, as applicable, Deed of Subdivision, Dedication and Easements, Deed of Open Space Easement, ADU Covenants, and Declaration of Covenants or Supplementary Declaration of Covenants. Legal Documents shall be forwarded by the project planner to the Office of the County Attorney for review. Review comments regarding the Legal Documents shall be provided to the project planner by the Office of the County Attorney. The review comments associated with the second submission Plat and first submission Legal Documents will be forwarded to the applicant upon completion.

3. The third submission of the Plat and second submission of the Legal Documents shall address all of the second submission Plat and first submission Legal Documents referral comments. The second and all subsequent submissions of the Legal Documents shall each be highlighted by the document preparer to reflect all revisions to the immediately prior submission. It is also encouraged that, where appropriate, Plats be highlighted to reflect all revisions to the plat. The third submission Plat and second submission Legal Documents shall not be submitted until the Plans upon which the Plat is based have been approved and the bond amount approved. A copy of the County staff bond estimate approval letter shall be submitted with the third submission of the plat (second submission of Legal Documents).
4. Staff will complete review of the third submission Plat and second submission Legal Documents within 3 weeks and forward comments on both Plat and documents within 5 working days after receipt of comments from the Office of the County Attorney.
5. Required associated documents such as Performance Agreements and Bonds and Cash Contribution Agreements, shall be submitted separately. These documents should be submitted at least four weeks prior to the anticipated Plat approval. The review of these documents will follow the current procedures and timelines. In any event, bonding documents, when required, must be posted and accepted prior to formal Plat Approval.
6. After review of the third submission Plat and second submission Legal Documents, both plat and documents should be able to be approved or near approval. However, if the applicant fails to properly address previous comments such that a subsequent submission of either the plat or the documents is necessary, subsequent submissions will be reviewed after all other applications that have been submitted prior to such subsequent submission.
7. The primary review agencies may include [Loudoun Water](#) and the Loudoun County Health Department (LCHD). The County does not exercise direct control over Loudoun Water, which is a separate Authority, or LCHD, which is a State Agency, and cannot therefore commit Loudoun Water or LCHD to any time line or comment period. Regardless of whether or not the County has received Loudoun Water or LCHD comments, County comments will be forwarded as soon as they are completed. Loudoun Water and LCHD referral comments will not be required prior to resubmission of an Application (but will ultimately need to be addressed in order to obtain final approval).

8.103.1 RECORD PLATS (SBRD)

In addition to the requirements within Section 8.103, the application for a record plat shall also include the following:

A. Plat Requirements

1. The title "Record Plat".

8.103.2 BOUNDARY LINE ADJUSTMENT (BLAD)

In addition to the requirements within Section 8.103, the application for a boundary line adjustment shall also include the following:

A. Plat Requirements

1. The title "Boundary Line Adjustment".
2. Exterior boundary dimensions shall be shown and may be taken from existing surveys of record or new surveys. In all cases, new interior boundary lines shall include the dimensions shown in feet and decimals of a foot to the closest one-hundredth of a foot, and all bearings in degrees, minutes, and seconds. The data for curves shall be shown in detail at the curve or in a curve data table containing the following: radius, delta, arc, tangent, chord, and chord bearing. Old property lines will be shown as dashed lines, and labeled "Old Property Line Hereby Deleted". New property lines shall be shown as bold lines and labeled "New Property Line Hereby Created".
3. Old acreages prior to the boundary line adjustment and new acreages clearly identified and differentiated.
4. The requirement of Section 8.103.A.39 is modified as follows: Building footprints within the area of adjustment or whose proximity to the area of adjustment is less than or equal to the applicable minimum yard requirement for the Zoning district of the subject property. If the yard requirement has been modified or varied, state the application number and approval date.
5. Where appropriate, show proposed/existing septic, on-site sewage disposal and water supply systems, sanitary, storm sewer and water lines, or the appropriate plat note as required by Chapter 1243 of the LSDO.
6. The requirement of Section 8.103.A.37 is modified as follows: "Approved in accordance with Chapter 1243 of the Loudoun County Land Subdivision and Development Ordinance to which reference is hereby made for limitations of such review and approval.

Director

Date

B. Items to Accompany Boundary Line Adjustments

1. Where boundary adjustments are being made to properties under separate ownership, an unexecuted deed shall be provided which contains a correct description of the land being adjusted, and a statement of the owners,

proprietors and trustees (if any), in accordance with Section 15.2-2264 of the Code of Virginia.

2. When necessary, the appropriate documentation as required by Chapter 1243 of the LSDO.

8.103.3 PRELIMINARY/RECORD SUBDIVISION (SBPR)

In addition to the requirements within Section 8.103, the application for a preliminary/record subdivision shall also include the following:

A. Plat Requirements

1. The title "Preliminary/Record Plat".
2. In accordance with LSDO, Chapter 1243, on separate sheets, for informational purposes only and not for recordation, the applicant shall submit the information required by Section 8.102 but not otherwise provided on the plat.

B. Items to Accompany Preliminary/Record Subdivisions

1. In accordance with LSDO, Chapter 1243, the applicant shall submit the items required by Section 8.102.B in addition to the items required pursuant to Section 8.103.B.

8.103.4 FAMILY SUBDIVISION (SBFM)

In addition to the requirements in Section 8.103, the application for a family subdivision shall also include the following:

A. Plat Requirements

1. The title "Family Subdivision Plat".
2. The requirement of Section 8.103.A.35 is modified as follows:

"Approved for recordation as a FAMILY SUBDIVISION under the Land Subdivision and Development Ordinance of Loudoun County, Virginia which provides for such subdivision ONLY for the purpose of sale or gift to certain eligible family members specified in the Ordinance and not for the purpose of circumventing the Land Subdivision and Development Ordinance or any other ordinance of Loudoun County. This approval shall automatically terminate if this plat and the approved deed or deeds referenced in Note _____ on this plat have not been recorded within six (6) months of the date written below, and thereafter, this plat shall be NULL and VOID:

Director

Date

3. The following notes shall appear on the plat:
 - a. "This plat shall be NULL and VOID unless this plat and the deed or deeds conveying lot(s) _____ to _____ shall have been recorded within six (6) months after the date of approval of this plat by the County as indicated hereon."
 - b. "The lots shown hereon are being conveyed to members of the immediate family of the owner. If any grantee of any such lot conveys such lot within one (1) year after the date of approval of this plat, such conveyance may subject this subdivision to be vacated in whole or in part."

If in accordance with Section 1243.04(2) of the LSDO, the applicant elects not to extend public water to all lots or to provide an approved location on each lot for a well, then one of the following notes, whichever is applicable, shall be placed on the plat:

- c. "The lots on this plat have **NOT** been tested or approved for wells and there is no guarantee that an approvable well can be located on

any lot. No zoning permit or building permit will be issued for any lot until a well has been approved for such lot by the Health Director."

OR

"The lots on this plat are required to be served by public water. However, such service has **NOT** been extended to such lots. No zoning permit or building permit will be issued for any lot until public water has been extended to such lot in accordance with regulations and specifications of the Facilities Standards Manual and Loudoun Water or other applicable federal, state, or local agency. The owner of each lot on this plat shall grant, without compensation, such reasonable easements as are necessary to permit such extension of public water to all lots."

If the public water note is required on the plat, then the deeds of conveyance, or a separate deed of subdivision, must create and establish appropriate easements to permit the future extension of public water to all lots.

B. Items to Accompany Family Subdivisions

1. A copy of the deed(s) of conveyance and an affidavit certifying the division is being made for the purpose of a family subdivision under the Land Subdivision and Development Ordinance.
2. An executed and notarized Affidavit of Family Subdivision shall accompany each deed.
3. A copy of the recorded Deed or other document of title which establishes that the current owner of record has held fee simple title to the property for more than one (1) year.
4. On a separate sheet for informational purposes only and not for recordation, topographic information at contour intervals of 5 feet or less with the proposed development layout, including proposed driveway locations, site entrances, opposing entrances, and median breaks on adjacent roads. The plan shall also illustrate that adequate sight distance requirements can be achieved where on-site roads/easements will intersect existing roads.

8.103.5 SUBDIVISION WAIVER (SBWV)

In addition to the requirements within Section 8.103, the application for a subdivision waiver shall also include the following:

A. Plat Requirements

1. The title "Subdivision Waiver Plat."
2. A note similar to the following:

"Both lots are ineligible for further waiver subdivision for a period of one year after approval in accordance with Section 1243.05.1 of the LSDO."

B. Items to Accompany Subdivision Waivers

1. On a separate sheet for informational purposes only and not for recordation, topographic information at contour intervals of 5 feet or less with the proposed development layout, including proposed driveway locations, site entrances, opposing entrances, and median breaks on adjacent roads. The plan shall also illustrate that adequate sight distance requirements can be achieved where on-site roads/easements will intersect existing roads.

8.103.6 EASEMENT PLATS – CREATION AND VACATION

These are the requirements for all easement plat applications, including ESMT applications and easements pursuant to site plan applications. Easement plat applications shall not include dedication of property to the County for public street purposes or vacation of property previously dedicated to the County for public street purposes.

A. Plat Requirements

The plats shall be prepared by a Licensed Professional Engineer (P.E.) or Surveyor. These plats shall contain the data listed below, legibly drawn, on sheets of 8½ inches by 14 inches or 18 inches by 24 inches in size, with appropriate matchlines (if necessary). The following shall be included for each plat as appropriate.

1. Titled with type of easement(s).
2. North arrow.
3. Date.
4. The name of the subdivision. (See 8.101)
5.
 - a. The name of the owner(s) of record.
 - b. The name and address of the Licensed Professional Engineer (P.E.) or Surveyor who prepared the plat.
6. Source of Title. (See 8.101)
7. Number of sheets included in the plat.
8. MCPI (PIN) Reference. (See 8.101)
9. The plat(s) as submitted for signature and recordation shall be drawn legibly and accurate per Virginia State Library and Archives Standards for plats.
10. Election District and Loudoun County, Virginia within the Title Block.
11. The plat shall show parcel and lot lines, including dimensions. Dimensions shall be shown in feet and decimals of a foot to the closest one-hundredth of a foot, and bearings in degrees, minutes and seconds. The data for curves shall be shown in detail at the curve or in a curve data table containing the following: radius, delta, arc, tangent, chord, and chord bearing. If land is being dedicated or reserved for public use for roads, parking areas or for common use of the future property owners, the plat shall so state and dimension such.

12. The location and dimensions of new easements with dimensions to appropriate boundary, parcel or lot lines.
13. The plat shall contain a statement setting forth the persons or entities responsible for maintenance of stormwater detention and drainage facilities and easements.
14. Revision Block. (See 8.101)
15. As applicable, the location, width and/or centerline of existing/proposed roads, easements, and public or private rights-of-way within or immediately abutting the property. Instrument or deed book and page numbers shall be provided, as applicable.
16. If private roads or access easements are proposed, the notes set forth in Section 8.103.A.38 shall be added as appropriate.
17. Seal and Signature. (See 8.101)
18. Scale. (See 8.101)
19. Land Development Application number.

B. Items to Accompany Easement Plats

1. An unexecuted copy of the Deed of Easement, with maintenance agreement language per Chapter 1245 of the Land Subdivision and Development Ordinance where applicable, shall be submitted for review and approval concurrent with the associated easement plat. Such deed shall:
 - a. Contain language such that, when the deed is recorded, it shall transfer to the Board of Supervisors, or to such association or public authority as the Board of Supervisors may provide, any easements indicated on the plat as the Board of Supervisors may require.
2. If not previously provided pursuant to the requirements for a Site Plan, Construction Plans and Profiles, Grading Permit, Preliminary Plat of Subdivision, Plat for Subdivision or Other Miscellaneous Plats, Steep Slopes data shall be provided in accordance with Section 8.103.B.4.a. This information shall not be required if the application only proposes the vacation of easements.

C. Additional Items to Accompany Easement Plats Not Pursuant to a Site Plan Application.

1. Fee Check. (See 8.101).

2. Land Development Application Form. (See 8.101).

8.103.7 DEDICATION/VACATION PLATS (DEDI)

Any plat, other than one covered by Section 8.103.1 through 8.103.5, or 8.103.8, upon which property is dedicated to the County for public street purposes or property previously dedicated to the County for public street purposes is vacated shall be considered a dedication plat. In addition to dedicating property for public street purposes, dedication plats may include grants of easements as necessary.

A. Plat Requirements

The plat shall be prepared by a Licensed Professional Engineer (P.E.) or Surveyor. These plats shall contain the data listed below, legibly drawn, on sheets of 18 inches by 24 inches in size, with appropriate matchlines (if necessary). The following shall be included for each plat as appropriate.

1. The title "Dedication Plat" with type of easement(s) if applicable.
2. North arrow.
3. Date.
4. The name of the subdivision (if applicable).
5.
 - a. The name of the owner(s) of record.
 - b. The name and address of the Licensed Professional Engineer (P.E.) or Surveyor who prepared the plat.
6. Surveyor's Certificate. (See 8.101).
7. Number of sheets included in the plat.
8. MCPI (PIN) Reference. (See 8.101).
9. The plat(s) as submitted for signature and recordation shall be drawn legibly and accurate per Virginia State Library and Archives Standards for plats.
10. Election District and Loudoun County, Virginia within the Title Block.
11. The plat shall show parcel and lot lines, including dimensions. Dimensions shall be shown in feet and decimals of a foot to the closest one-hundredth of a foot, and bearings in degrees, minutes and seconds. The data for curves shall be shown in detail at the curve or in a curve data table containing the following: radius, delta, arc, tangent, chord, and chord bearing. If land is being dedicated or reserved for public use for roads, parking areas or for common use of the future property owners, the plat shall so state and dimension such. Acreage shall be shown to the ten thousandth decimal

place and square footage to the nearest whole foot and all of the remaining area in the original tract/residue parcel to the nearest one hundredth of an acre.

12. The location and dimensions of new easements with dimensions to appropriate boundary, parcel or lot lines (if applicable).
13. The plat shall contain a statement setting forth the persons or entities responsible for maintenance of stormwater detention and drainage facilities and easements (if applicable).
14. Revision Block. (See 8.101).
15. Vicinity Map. (See 8.101).
16. As applicable, the location, width and/or centerline of existing/proposed roads, easements and public or private rights-of-way within or immediately abutting the property. Instrument number or deed book and page numbers shall be provided, as applicable.
17. If private roads or access easements are proposed, the notes set forth in Section 8.103.A.36 shall be added as appropriate (if applicable).
18. Seal and Signature. (See 8.101).
19. Scale. (See 8.101)
20. Coordinate Grid Tics. (See 8.101)
21. Approval Block. (See 8.101)
22. Jurisdictional boundaries shall be shown for property located in Loudoun County and a town or another county, or which falls under the subdivision control of a town.
23. Roadways shall include approved and/or reserved names per the [Codified Ordinances](#) of Loudoun County. Existing public roadways shall include route numbers and road names.
24. If not otherwise contained within the deed accompanying the plat, the plat shall contain a statement to the effect that the platting or dedication is with the free consent and in accordance with the desire of the undersigned owners and trustees of the property and shall be duly acknowledged in accordance with Section 15.2-2264 of the Code of Virginia of 1950, as amended.

25. The location of structures (e.g., buildings, barns, sheds) to be retained within areas to be dedicated, including stone walls.
26. Front yard and setback lines and any structures (e.g., buildings, barns, sheds) to be retained within the front yard and setback line. A note shall be added to the plat stating that the yard and setback lines are for depiction of current ordinance requirements only and may be subject to change.

B. Items to Accompany Dedication Plats

1. An unexecuted copy of the Deed, with maintenance agreement language per Chapter 1245 of the Land Subdivision and Development Ordinance where applicable, shall be submitted for review and approval concurrent with the associated dedication plat. Such deed shall:
 - a. Contain a correct description of the land developed and state that such development is with the free consent and in accordance with the desire of the undersigned owners, proprietors, and trustees, if any.
 - b. Contain language such that, when the deed is recorded, it shall operate to transfer, in fee simple, to the Board of Supervisors such portion of the premises platted as is on the plat set apart for roadways or other public use, and transfer to the Board of Supervisors, or to such association or public authority as the Board of Supervisors may provide, any easement indicated on the plat as the Board of Supervisors may require.
2. Fee Check. (See 8.101)
3. Land Development Application Form. (See 8.101)
4. If not included in the deed:
 - a. A Deed of Release if there are deed of trust trustees who are not parties and signatories to the deed; or
 - b. A letter or other documentation from the owner which certifies that there is no deed of trust lien on the property.
5. If improvements for which a performance bond is required under Section 8.300 of this chapter are not completed, a performance bond in the form of a cash escrow, letter of credit, or corporate surety bond, along with the appropriate performance agreement, shall be submitted. Such performance bond must be accepted by the Board of Supervisors or designee prior to plat approval.

6. If not previously provided pursuant to the requirements for a Site Plan, Construction Plans and Profiles, Grading Permit, Preliminary Plat of Subdivision, Plat for Subdivision or Other Miscellaneous Plats, Steep Slopes data shall be provided in accordance with Section 8.103.B.4.a. This information shall not be required if the application only proposes the vacation of right-of-way.

8.103.8 AR-1 AND AR-2 DIVISION PLATS (SBBD)

A. Plat Requirements

The plats prepared under the base density option shall be prepared by a Licensed Professional Engineer (P.E.) or Surveyor. These plats shall contain the data listed below, legibly drawn, on sheets of 18 inches by 24 inches in size, with appropriate matchlines (if necessary). The following shall be included for each plat as appropriate.

1. The title “AR Division Plat”.
2. North arrow.
3. Date.
4. The name of the Division. (See 8.101)
5.
 - a. The name of the owner(s) of record.
 - a. The name and address of the Licensed Professional Engineer (P.E.) or Surveyor who prepared the plat.
6. Surveyor’s Certificate. (See 8.101)
7. Number of sheets included in the plat.
8. MCPI (PIN) Reference. (See 8.101)
9. The plat(s) as submitted for signature and recordation shall be drawn legibly and accurate per Virginia State Library and Archives Standards for plats.
10. Election District and Loudoun County, Virginia within the Title Block.
11. The plat shall show parcel and lot lines, including dimensions. Dimensions shall be shown in feet and decimals of a foot to the closest one-hundredth of a foot, and bearings in degrees, minutes and seconds. The data for curves shall be shown in detail at the curve or in a curve data table containing the following: radius, delta, arc, tangent, chord, and chord bearing. If land is being dedicated or reserved for public use for roads, parking areas or for common use of the future property owners, the plat shall so state and dimension such.
12. If not otherwise contained in the deed accompanying the plat, the plat shall contain a statement to the effect that the Division is with the free consent and in accordance with the desire of the undersigned owners of the property

and shall be duly acknowledged in accordance with Section 15.2-2264 of the Code of Virginia of 1950 as amended.

13. Seal and Signature. (See 8.101)
14. Approval Block. (See 8.101)
15. If private roads or access easements are proposed, the following notes shall be provided:
 - a. “Construction of the private road(s) and/or access easement(s) shown hereon shall conform to the standards set forth in the Loudoun County Land Subdivision and Development Ordinance and Chapter 4 of the Facilities Standards Manual.”

AND

- b. One of the following notes, as applicable:
 - i. “The streets in this subdivision do not meet the standards necessary for inclusion in the system of state highways and will not be maintained by the Virginia Department of Transportation or the County and are not eligible for rural addition funds or any other funds appropriated by the General Assembly and allocated by the Commonwealth Transportation Board.”

OR

Where streets are required to meet VDOT standards for design and construction, but which are not intended for acceptance as part of the secondary system of state highways.

- ii. “Although the streets in this subdivision are required to meet VDOT standards for design and construction, such streets are not intended for inclusion in the system of state highways and will not be maintained by the Department of Transportation or the County and are not eligible for rural addition funds or any other funds appropriated by the General Assembly and allocated by the Commonwealth Transportation Board.”

AND

- c. “The access serving these lots is private and its maintenance, including snow removal, is NOT a public responsibility.”

16. Watercourses and names, if any.
17. Source of Floodplain Note. (See 8.101)
18. A floodplain easement in accordance with Chapter 5 of this manual.

B. Items to accompany AR-1 and AR-2 Division Plats

1. If applicable, an unexecuted copy of the private roads maintenance agreement with maintenance agreement language per Chapter 1245 of the Land Subdivision and Development Ordinance where applicable, shall be submitted for review and approval concurrent with the associated Division plat.
2. A letter signed by the Health Director evidencing conformance with applicable requirements of the County Health Department.
3. If applicable, an unexecuted Deed of Easement establishing ingress/egress rights, maintenance and construction responsibilities including snow removal.
4. Fee Check. (See 8.101)
5. Land Development Application Form. (See 8.101)
6. If not included in the deed:
 - a. A Deed of Release if there are deed of trust trustees who are not parties and signatories to the deed; or
 - b. A letter or other documentation from the owner which certifies that there is no deed of trust lien on the property.
7. If not previously provided pursuant to the requirements for a Construction Plans and Profiles or Preliminary Plat of Subdivision, Steep Slopes data shall be provided in accordance with Section 8.103.B.4.a.

8.104 FLOODPLAIN STUDY (FPST)

A. Floodplain studies shall be prepared by a Licensed Professional Engineer (P.E.) or Surveyor. The plans shall contain the following data, legibly drawn, on sheets of 24 inches by 36 inches in size, with appropriate match lines (if necessary).

1. Title "Floodplain Study".
2. Scale. (See 8.101)
3. North arrow.
4. Date.
5. Name of subdivision or development. (See 8.101)
6.
 - a. Name and address of owner of record.
 - b. Name of the Licensed Professional Engineer (P.E.) or Surveyor who prepared the plan.
7. Number of sheets comprising the plan.
8. Revision Block. (See 8.101)
9. Election District and Loudoun County, Virginia, in the Title Block.
10. MCPI (PIN) Reference. (See 8.101)
11. Vicinity Map. (See 8.101)
12. Coordinate Grid Tics. (See 8.101)
13. Seal and Signature. (See 8.101)
14. Source of Floodplain Note. (See 8.101)
15. Approval block, as shown below:

APPROVED IN ACCORDANCE WITH THE ZONING ORDINANCE AND THE FACILITIES STANDARDS MANUAL OF LOUDOUN COUNTY.

Director, Building and Development (Date)

Zoning Administrator (Date)

16. An exhibit, drawn to a scale of 1 inch to not more than 1,000 feet, showing drainage divides, subwatershed(s), hydrologic soil group(s), and planned land use depicted in the Comprehensive Plan or the current zoning for the entire watershed draining to the site, whichever represents the most intense use.
17. A plan, drawn to a scale of 1 inch to not more than 100 feet, showing the following:
- a. The boundaries of the parcels for which the study is submitted and an approximate floodplain acreage for each parcel.
 - b. Topography, including scale and source of information. (See 8.101).
 - c. The location of streams, ponds, and prominent existing land features pertinent to the study (e.g. existing and proposed road crossings, manholes).
 - d. Location of cross-sections and/or vertical traverse points with annotations of the cross-section and/or point identifiers, and the base flood elevation.
 - e. The existing and proposed boundaries of the floodplain, and calculated base flood elevations at and between each cross section.
 - f. In transition areas between major and minor floodplains, the maximum base flood elevation provided in the Flood Insurance Study (FIS).

Other information may be supplied at the discretion of the developer.

18. Profiles, drawn to a scale of 1 inch to not more than 10 feet vertically and 1 inch to not more than 100 feet horizontally, showing the following:
- a. Stream invert and computed water surface elevation(s).

- b. Cross-section stations annotated with 100-year water surface elevation(s).
 - c. Existing and proposed road crossings.
 - 19. Delineation of existing floodplain easements located on the property that is the subject of the floodplain study.
 - 20. Hydrologic documentation and calculations, as specified in Chapter 5 of this Manual.
- B. Documents to Accompany Floodplain Studies
- 1. Fee Check. (See 8.101)
 - 2. Land Development Application Form. (See 8.101)
 - 3. Digital files of hydraulic model.
 - 4. Upon recommendation for approval, the developer shall submit 5 paper copies of the plan, a PDF of the plan, and a DXF of the floodplain boundary, cross section locations/stations, topography, and stream boundary. The County will provide release of liability, if requested.
- C. Documents to be Submitted to FEMA
- 1. Upon approval of a floodplain study that changes the boundary of the FOD (Major Floodplain), a Letter of Map Revision (LOMR).

8.105 FLOODPLAIN ALTERATION (FPAL)

- A. In addition to the application requirements within the Floodplain Study section of this chapter, 8.104.A, a floodplain alteration application shall also include the following:
1. Title "Floodplain Alteration".
 2. Detailed description and drawings of the proposed alteration.
 3. Hydraulic model that shows how the 100-year flows will be conveyed and hydraulic effects on the existing conditions floodplain. Measures shall be provided to maintain pre-alteration discharge velocities.
 4. The hydraulic model will need to be supported with engineering computations in areas where the model cannot adequately address the hydraulic effects.
 5. Floodplain alterations shall comply with the Zoning Ordinance.
 6. The pre-alteration and post-alteration base flood elevations shall be illustrated on plan view, profile view and cross-section view.
 7. Detailed construction plans of the proposed alteration.
 8. If a relocation or alteration of the natural active_channel is proposed, a detailed stream stabilization and erosion and sediment control plan.
 9. A narrative assessing the need for any State or Federal permits required for the proposed alteration.
 10. The developer shall provide a certification by a Licensed Professional Engineer (P.E.) or Surveyor within the floodplain alteration application stating that to the best of his knowledge and belief all applicable federal, state and local laws relative to the protection of the environment, historical or archaeological features have been or will be met.
- B. Documents to accompany a floodplain alteration application.
1. Fee Check. (See 8.101)
 2. Land Development Application Form. (See 8.101)
 3. Digital files of hydraulic model.
 4. Upon recommendation for approval, the developer shall submit 5 paper copies of the plan, a PDF of the plan, and a DXF of the floodplain boundary,

cross section locations/stations, topography, and stream boundary. The County will provide release of liability, if requested.

C. Documents to be Submitted to FEMA

1. Prior to approval of a floodplain alteration that proposes any increase in the base flood elevation within the FOD (Major Floodplain), a Conditional Letter of Map Revision (CLOMR).
2. Upon approval of a floodplain alteration that proposes an increase in the base flood elevation of the FOD (Major Floodplain) or changes the boundary of the FOD (Major Floodplain), a Letter of Map Revision (LOMR).

8.106 CONSTRUCTION PLANS AND PROFILES (CPAP)

A. The construction plans and profiles shall be prepared by a Licensed Professional Engineer (P.E.) or Surveyor. The plans shall contain the following data, legibly drawn, on sheets of 24 inches by 36 inches in size, with appropriate match lines (if necessary).

1. The following shall be included on the Cover Sheet of the plan set:

- a. Title "Construction Plans and Profiles".
- b. Name and address of the owner of record.
- c. Name and address of the Applicants.
- d. Name of the Licensed Professional Engineer (P.E.) or Surveyor who prepared the plan.
- e. Sheet Index, including the number of sheets in the plan.
- f. MCPI (PIN) Reference. (See 8.101)
- g. Vicinity Map. (See 8.101)
- h. Approval Block. (See 8.101)
- i. Revision Block. (See 8.101)
- j. Original Plan Date.
- k. Source of Title. (See 8.101)
- l. Source of Floodplain Note. (See 8.101)
- m. Archaeology Notes. (See 8.101)

2. The following shall be included on each sheet of the plan set:

- a. Scale. (See 8.101)
- b. North arrow, if applicable.
- c. Original Plan Date.
- d. Proposed Name of Subdivision or Development. (See 8.101)
- e. Revision Block. (See 8.101).

- f. Election District and Loudoun County, Virginia, within the Title Block.
 - g. Seal and Signature (See 8.101), if applicable.
- 3. Zoning District and Jurisdictional Boundaries. (See 8.101)
- 4. Zoning Requirements. (See 8.101)
- 5. Associated Land Development Application Information. (See 8.101). Proffers, conditions of approval, or modifications associated with rezoning, special exception, and variance applications shall be included either as part of the plans or as a separate document.
- 6. Key map, if more than three plan and profile sheets are required.
- 7. Note(s) on plans where land or facilities are to be dedicated to and held in perpetuity by a lot-owner's association, condominium association, or similar entity.
- 8. Proposed and existing property lines and Adjoining Property Information (See 8.101) and use.
- 9. Roads shall include approved and/or reserved road names and sign locations per the [Codified Ordinances](#) of Loudoun County.
- 10. Numbered archaeological sites and structures; human cemeteries, burial grounds, and graves; and historic landmarks on the site to be preserved, as identified by archaeological surveys performed for the property.
- 11. Pollution sources (including without limitation dump sites, drainfields, buried fuel tanks, hazardous material storage facilities, solid and liquid disposal sites, etc.), wells, and springs that are known or as identified in LOGIS.
- 12. Existing open space and conservation easements with deed book and page number or instrument number. Other known existing easements with deed book and page number or instrument number.
- 13. Environmental Impact (Overlay) Districts, as established in the [Zoning Ordinance](#), on the grading plan and the erosion and sediment control plan.
- 14. The boundaries of the Scenic Creek Valley Buffer and other required environmental buffers.
- 15. Topography. (See 8.101)

16. Very Steep Slope Areas and Moderately Steep Slope Areas, as defined and regulated in the Zoning Ordinance, on the grading plan and the erosion and sediment control plan.
17. Location, type, and dimensions of vehicular ingress and egress to the site, and clear zones as applicable.
18. Design speed for all proposed roadways.
19. Roadway and transportation facilities shall be designed in accordance with Chapter 4 of this manual. Roadway and utility improvement plans are to consist of plan and profile, drawn to a minimum scale of 1 inch to not more than 50 feet horizontally and 1 inch to not more than 5 feet vertically. The plan portion of the roadway plan shall show the location of roads, lots, and storm drainage, sanitary sewer, and water distribution systems. The profile portion of the roadway plan shall show the existing and proposed roadway improvements, and sanitary sewer, water distribution, and storm drainage systems. Details of standard road sections, curb and gutter type, and miscellaneous construction items shall appear within the plan, as well as any construction notes pertaining to the proposed improvements. Roadway plans shall include the following:
 - a. Average Daily Trip (ADT) projections for all existing and proposed roadways.
 - b. Stations indicated every 100 feet on centerline; at points of curvature, points of intersection and points of tangency; at centerline of entrances and intersections, at subdivision or section limits, and at turnaround radius points.
 - c. When a proposed roadway or entrance intersects with an existing roadway, the centerline profile of the existing roadway shall be shown for adequate sight distance, to the right and the left of the proposed connection, per VDOT standards. Dimensions for sight lines and sight distances shall be shown at entrances onto the road system and for intersections on both plan and profiles. Where the line of sight departs the established right-of-way or private access easement, a separate sight distance easement shall be provided. The profile along the line of sight shall be shown reflecting existing and proposed grades as well as any obstacles that may obstruct the driver's vision (e.g., plantings, utility structures, entrance features, fences, etc.).
 - d. The centerline profile shall extend 300 feet beyond the property line or boundary on roadways that may provide access to adjoining property.

- e. A grade line of road construction to include:
 - i. Percent of grade.
 - ii. Elevations at the beginning and the end of all vertical curves.
 - iii. The length of vertical curves with sight distances and stations of vertical points of intersection.
 - iv. Elevations computed every 50 feet on all tangent sections and every 25 feet on vertical curves.
 - v. Elevations at:
 - a) centerline intersections of roads.
 - b) road centerline intersections with the boundaries of a subdivision.
 - c) curb returns.
 - d) culvert and storm sewer crossings.
 - e) curb inlets.
 - f) beginning and ending of superelevation transition sections.
 - vi. The point of finished grade on typical section (i.e., centerline, top of curb, etc.).
- f. The locations of curb-cut ramps for the handicapped.
- g. The proposed location of multiple mailbox groupings and other uses requiring a vehicle staging area.
- h. Proposed roadside ditches indicated in the profile where the ditch varies from running parallel to the road centerline.
- i. The horizontal and vertical location of proposed and existing culverts, storm sewer crossings, sanitary sewer crossings, and utility crossings shown on roadway profiles.
- j. Utility easements and proposed relocations.
- k. When a proposed roadway parallels or is located near an existing stream or a natural or manmade open channel, profiles of the top of

the bank of the stream, computed water elevations and invert (or flowline) of the stream or natural or manmade open channel shall be provided. The relationship of the proposed roadway grade to existing profiles of the stream or natural or manmade open channel shall be shown. Road construction shall not encroach on the approved floodplain limit of the stream, except as permitted by applicable floodplain requirements of Chapter 5 of this manual and the Zoning Ordinance.

- l. Grade profiles of curb and gutter construction in cul-de-sacs are to be computed along the top elevation of the face of the curb starting at the beginning of the curb return, following the face of curb around the cul-de-sac and thence to the end of return or curve on the opposite side of the cul-de-sac:
 - i. Grade ties of the road, before entering the cul-de-sac grade, shall be shown on each end of the cul-de-sac grade profile.
 - ii. Other acceptable methods may be used subject to the approval of the Director and the Virginia Department of Transportation.
- m. If a difference exists in elevations on proposed curb grades, curb elevations showing top of curb right and top of curb left shall be shown on the plans.
- n. Landings shown on plans and profiles.
- o. Driveway locations (both individual and common).
- p. Traffic control signage and structures (e.g., road delineators, barricades, and stop signs), and road signs, shall be shown on the plans. Signage shall conform to VDOT requirements.
- q. Right-of-way and easements shall be identified.
- r. Typical roadway cross sections shall be provided on the plans.
- s. Sidewalks, trails, and proffered pedestrian improvements shall be shown and maintenance responsibilities shall be indicated.
- t. For informational purposes only, for road sections consisting of more than two lanes, illustrative pavement striping indicating the travelways, tapers, turn lanes, directional markings (e.g., turn and through arrows, solid and dashed line delineators, etc.), and pedestrian crosswalks shall be provided. VDOT may require a separate application for permitting purposes.

20. Utility Plan and Profile Standards: The profile of the utilities is required for storm drainage, sanitary sewer, and water distribution systems. Utility profiles are to be drawn to a scale of 1 inch to not more than 50 feet horizontally and 1 inch to not more than 5 feet vertically. The profiles shall show the following:
- a. Public water and sewer profiles shall conform with the Loudoun Water Design Manual or applicable water and sewer standards if outside the Loudoun Water service area.
 - b. Storm Sewer and Culvert profiles in accordance with Chapter 5 of this manual.
21. The following standard notes shall appear on all construction plans:
- a. "Sub-base depth is based on a CBR value of 4, which may be revised once soil tests of subgrade are performed."
- OR
- "Sub-base depth is based on a CBR value of _____ based on an actual determination per soils tests."
- b. "A smoothing grade shall be maintained from the centerline of the existing road to the curb and gutter, to preclude the forming of false gutters and/or the ponding of any water on the roadway."
 - c. "Standard guardrail and handrail shall be installed at those locations as designated during final field inspections by Loudoun County or VDOT."
 - d. "The approval of these plans shall in no way relieve the owner of complying with other applicable local, State and Federal requirements."
22. Grading and drainage plans, drawn to a scale of 1 inch to not more than 50 feet. The grading plan shall include the following:
- a. Proposed grading shown by proposed contour lines, supplemented with spot elevations.
 - b. Storm sewers and culverts and their sizes and top and invert elevations. Overland relief paths, relief points, spot elevations, and easements.
 - c. Limits of clearing and grading, areas of tree canopy and vegetation preserved or conserved as part of a proffer or condition of approval

or to meet BMP requirements, floodplains, wetlands, conservation easements, or other easements, if known, that restrict grading.

- d. Natural and manmade open channels and swales.
- e. Proposed easements.
- f. Proposed roadway layout.
- g. Proposed lot layout and information, as follows:
 - i. For residential lots less than one acre in size, all Grading Criteria in Chapter 5 of this manual, including spot elevations for the proposed basement floor, first floor, garage slab, and finished grade at the building corners.
 - ii. For residential lots one acre or greater in size:
 - a) The house, driveway, drainfield, and well location, the limits of clearing and grading, and the proposed grading for each lot.

OR

- b) The potential limits of clearing and grading and a typical detail for on-lot erosion and sediment control applicable to all lots.

If any part of a lot is located within the Mountainside Development Overlay District and/or Limestone Overlay District, or contains areas of steep slopes, the requirements of subsection a) shall apply.

- h. Retaining walls with the elevations proposed for the top and bottom of the wall.
- 23. A stormwater management plan in accordance with Chapter 1096 of the [Codified Ordinances](#) and Chapter 5 of this manual.
- 24. Storm drainage calculations, in accordance with Chapter 5 of this manual, and drainage area map showing individual and cumulative drainage area contributing to each point of concentration. Runoff characteristics supporting the hydrologic method, such as time of concentration, Runoff Coefficient (C), Curve Number (CN), slope, underlying hydrologic soil group, and cover type also shall be shown.
- 25. Watercourses and names, if any, and floodplain easement(s) in accordance with Chapter 5 of this Manual. Wetlands data as follows:

- a. Potential jurisdictional waters and wetlands as identified by a consultant wetland delineation performed in accordance with Army Corps of Engineers (Corps) standards shall be depicted on the plan.
 - b. A note referencing the source of the wetland information depicted on the plan (including the Corps Jurisdictional Determination number and date, if it exists) and indicating that all applicable state and federal permits shall be obtained prior to disturbances within jurisdictional waters and wetlands shall be provided on the plan.
- 26. A soils map and certification in accordance with Chapter 6 of this manual.
 - 27. An erosion and sediment control plan in accordance with the [Virginia Erosion and Sediment Control Handbook](#) and Chapter 7 of this manual.
 - 28. A Tree Conservation and Landscape Plan, in accordance with the Zoning Ordinance and Chapter 7 of this manual.
 - 29. Lighting plans, in accordance with Chapter 7 of this manual.
 - 30. Regulatory signage and street name signs.
 - 31. For single family attached developments, the following shall be shown:
 - a. Location, type, size, and height of fencing, screening, and retaining walls.
 - b. Parking, loading spaces, walkways, and bike paths, indicating type of surfacing, size, angle of stalls, width of aisles, and number of parking and loading spaces provided.
 - c. The number of floors, floor area, height, exterior dimensions, location, and proposed use of each building.
 - 32. Designation of ADU units in accordance with the Zoning Ordinance.
 - 33. Dimensions required to demonstrate compliance with regulations, proffers, and conditions.
 - 34. Fire Apparatus Access Roads and Signs in accordance with Chapter 4.

B. Items to Accompany Construction Plans and Profiles

- 1. The following items shall accompany the initial submission of construction plans and profiles:
 - a. Fee Check. (See 8.101)

- b. Land Development Application Form. (See 8.101)
 - c. Bond estimate as required by Section 8.304 of this Chapter.
 - d. If the construction plans and profiles are being submitted pursuant to Section 1243.10(1) of the Land Subdivision and Development Ordinance, a copy of the first submission comments for the corresponding Preliminary Plat of Subdivision.
 - e. If a stormwater management plan is required pursuant to Chapter 1096 of the Codified Ordinances, an unexecuted copy of the deed, and if available a plat, establishing long-term maintenance responsibility and necessary easements for storm drainage and stormwater management purposes.
 - f. A completed [Proffer/Condition Status Update form](#), as applicable.
 - g. If not previously provided, an archaeological survey report prepared in accordance with Chapter 7 of this manual. If human cemeteries, burial grounds, or graves are identified, an archaeological delineation prepared in accordance with Chapter 7.
2. The following items shall be required prior to construction plans and profiles approval:
- a. A geotechnical study in accordance with the requirements Chapter 6 of this manual.
 - b. If not provided with a previous Preliminary Plat of Subdivision: a letter from the Virginia Department of Conservation and Recreation, Division of Natural Heritage identifying occurrences of natural heritage resources on the property such as the habitat of rare, threatened, or endangered plant and animal species, unique or exemplary natural communities, and significant geologic formations; and if an endangered and threatened species survey has been completed for the property, a copy of the report shall also be submitted.
 - c. If not previously provided, a digital file of the boundary of any cemetery, burial ground, or grave prepared in accordance with the Office of Mapping Digital Data Submission Guidelines for Cemeteries.

8.107 SITE PLANS (STPL) AND RURAL ECONOMY SITE PLANS (REST)

Rural Economy Site Plans shall meet all the requirements of Section 8.107 except as modified as a result of a pre-submission meeting pursuant to Section 8.000 of this manual.

A. The site plan shall be sealed by a Licensed Professional Engineer (P.E.) or Surveyor. The site plan shall contain the following applicable data, legibly drawn, on sheets of 24 inches by 36 inches in size, with appropriate matchlines, (as necessary).

1. The following shall be included on the Cover Sheet of the plan set:
 - a. The Title "Site Plan".
 - b. Name and address of the owner of record.
 - c. Name and address of the Applicant.
 - d. Name of the Licensed Professional Engineer (P.E.) or Surveyor who prepared the plan.
 - e. Sheet Index, including the number of sheets in the plan.
 - f. MCPI (PIN) Reference. (See 8.101)
 - g. Vicinity Map. (See 8.101)
 - h. Approval Block. (See 8.101)
 - i. Revision Block. (See 8.101)
 - j. Original Plan Date.
 - k. Source of Title. (See 8.101)
 - l. Source of Floodplain Note. (See 8.101)
 - m. Archaeology Notes. (See 8.101)
2. The following shall be included on each sheet of the plan set:
 - a. Scale. (See 8.101)
 - b. North Arrow, if applicable.
 - c. Proposed Name of Subdivision or Development. (See 8.101)

- d. Revision Block. (See 8.101)
 - e. Original Plan Date.
 - f. Election District and Loudoun County, Virginia, within the Title Block.
 - g. Seal and Signature (See 8.101), if applicable.
- 3. Zoning District and Jurisdictional Boundaries. (See 8.101)
 - 4. Zoning Requirements. (See 8.101)
 - 5. Associated Land Development Application Information. (See 8.101). Proffers, conditions of approval, and modifications associated with rezoning, special exception, and variance applications shall be included either as part of the plans or as a separate document.
 - 6. The number of floors, floor area, height, exterior dimensions, location, and proposed use of each building.
 - 7. Dimensions required to demonstrate compliance with regulations, proffers, and conditions.
 - 8. Note(s) on plans where land or facilities are to be dedicated to, and held in perpetuity by, a lot-owner's association, condominium association, or similar entity.
 - 9. Property lines, Adjoining Property Information (See 8.101), and use.
 - 10. Roads shall include approved and/or reserved street names and sign locations per the [Codified Ordinances](#) of Loudoun County.
 - 11. Numbered archaeological sites and structures; human cemeteries, burial grounds, and graves; and historic landmarks on the site to be preserved, as identified by archaeological surveys performed for the property.
 - 12. Pollution sources (including without limitation dump sites, drainfields, buried fuel tanks, hazardous material storage facilities, solid and liquid disposal sites, etc.), wells, and springs that are known or as identified in LOGIS.
 - 13. Existing open space and conservation easements with deed book and page number or instrument number. Other known existing easements with deed book and page number or instrument number.

14. Environmental Impact (Overlay) Districts, as established in the Zoning Ordinance, on the grading plan and the erosion and sediment control plan.
15. The boundaries of the Scenic Creek Valley Buffer and other required environmental buffers.
16. Topography. (See 8.101)
17. Very Steep Slope Areas and Moderately Steep Slope Areas, as defined and regulated in the Zoning Ordinance, on the grading plan and the erosion and sediment control plan.
18. Location, type, and dimensions of vehicular ingress and egress to the site, and clear zones as applicable.
19. Design speed for all proposed roadways.
20. Roadway and transportation facilities shall be designed in accordance with Chapter 4 of this manual. If applicable, roadway plans are to consist of plan and profile, drawn to a minimum scale of 1 inch to not more than 50 feet horizontally and 1 inch to not more than 5 feet vertically. The plan portion of the roadway plan shall show the location of roads, lots, and storm drainage, sanitary sewer, and water distribution systems. The profile portion of the roadway plan shall show the existing and proposed roadway improvements, and sanitary sewer, water distribution, and storm drainage systems. Details of standard road sections, curb and gutter type, and miscellaneous construction items shall appear within the plan, as well as any construction notes pertaining to the proposed improvements. Roadway plans shall include the following:
 - a. Average Daily Trip (ADT) projections for all existing and proposed roadways.
 - b. Stations indicated every 100 feet on centerline; at points of curvature, points of intersection and points of tangency; at centerline of entrances and intersections, at subdivision of section limits, and at turnaround radius points.
 - c. When a proposed roadway or entrance intersects with an existing roadway, the centerline profile of the existing roadway shall be shown for adequate sight distance, to the right and the left of the proposed connection, per VDOT standards. Dimensions for sight lines and sight distances shall be shown at entrances onto the road system and for intersections on both plan and profiles. Where the line of sight departs the established right-of-way or private roadway easement, a separate sight distance easement shall be provided. The

profile along the line of sight shall be shown reflecting existing and proposed grades as well as any obstacles that may obstruct the driver's vision (e.g., plantings, utility structures, entrance features, fences, etc.)

- d. The centerline profile shall extend 300 feet beyond the property line or boundary on roadways that may provide access to adjoining property.
- e. A grade line of road construction to include:
 - i. Percent of grade.
 - ii. Elevations at the beginning and the end of all vertical curves.
 - iii. The length of vertical curves with sight distances and stations of vertical points of intersection.
 - iv. Elevations computed every 50 feet on all tangent sections and every 25 feet on vertical curves.
 - v. Elevations at:
 - a) centerline intersections of roads
 - b) road centerline intersections with the boundaries of a subdivision
 - c) curb returns
 - d) culvert and storm sewer crossings
 - e) curb inlets
 - f) beginning and ending of super elevation transition sections
 - vi. The point of finished grade on typical section (i.e., centerline, top of curb, etc.)
- f. The locations of curb-cut ramps for the handicapped.
- g. The proposed location on of multiple mailbox groupings and other uses requiring a vehicle staging area.

- h. Proposed roadside ditches indicated in the profile where the ditch varies from running parallel to the road centerline.
- i. The horizontal and vertical location of proposed and existing culverts, storm sewer crossings, sanitary sewer crossings, and utility crossings shown on roadway profiles.
- j. Utility easements and proposed relocations.
- k. When a proposed roadway parallels or is located near an existing stream or a natural or manmade open channel, profiles of the top of the bank of the stream, computed water elevations and invert (or flowline) of the stream or natural or manmade open channel shall be provided. The relationship of the proposed roadway grade to existing profiles of the stream or natural or manmade open channel shall be shown. Road construction shall not encroach on the approved floodplain limit of the stream, except as permitted by applicable floodplain requirements of Chapter 5 of this manual and the Zoning Ordinance.
- l. Grade profiles of curb and gutter construction in cul-de-sacs are to be computed along the top elevation of the face of the curb starting at the beginning of the curb return, following the face of curb around the cul-de-sac and thence to the end of return or curve on the opposite side of the cul-de-sac:
 - i. Grade ties of the road, before entering the cul-de-sac grade, shall be shown on each end of the cul-de-sac grade profile.
 - ii. Other acceptable methods may be used subject to the approval of the Director and the Virginia Department of Transportation.
- m. If a difference exists in elevations on proposed curb grades, curb elevations showing top of curb right and top of curb left shall be shown on the plans.
- n. Landings shown on plans and profiles.
- o. Driveway locations (both individual and common).
- p. Traffic control signage and structures (e.g., road delineators, barricades, and stop signs), and road signs, shall be shown on the plans. Signage shall conform to VDOT requirements.
- q. Right-of-way and easements shall be identified.

- r. Typical roadway cross sections shall be provided on the plans.
 - s. Sidewalks, trails, and proffered pedestrian improvements shall be shown and maintenance responsibilities shall be indicated.
 - t. For informational purposes only, for road sections consisting of more than two lanes, illustrative pavement striping indicating the travelways, tapers, turn lanes and directional markings (e.g., turn and through arrows, solid and dashed line delineators, etc.), and pedestrian crosswalks shall be provided. VDOT may require a separate application for permitting purposes.
21. Utility Plan and Profile Standards: The profile of the utilities is required for storm drainage, sanitary sewer, and water distribution systems. Utility profiles are to be drawn to a scale of 1 inch to not more than 50 feet horizontally and 1 inch to not more than 5 feet vertically. The profiles shall show the following:
- a. Public water and sewer profiles shall conform with the Loudoun Water Design Manual or applicable water and sewer standards if outside the Loudoun Water service area.
 - b. Storm Sewer and Culvert profiles in accordance with Chapter 5 of this manual.
22. The following standard notes shall appear on all site plans:
- a. "Sub-base depth is based on a CBR value of 4, which may be revised once soil tests of subgrade are performed."
- OR
- "Sub-base depth is based on a CBR value of _____ based on an actual determination per soils tests."
- b. "A smoothing grade shall be maintained from the centerline of the existing road to the curb and gutter, to preclude the forming of false gutters and/or the ponding of any water on the roadway."
 - c. "Standard guardrail and handrail shall be installed at those locations as designated during final field inspections by Loudoun County or VDOT."
 - d. "The approval of these plans shall in no way relieve the owner of complying with other applicable local, State and Federal requirements."

23. Grading and drainage plans, drawn to a scale of 1 inch to not more than 50 feet and showing the proposed roadways, structures, buildings, and site improvements. The grading plan shall include the following:
 - a. Proposed grading shown by proposed contour lines, supplemented with spot elevations.
 - b. Storm sewers and culverts and their sizes and top and invert elevations. Overland relief paths, relief points, spot elevations, and easements.
 - c. Limits of clearing and grading, areas of tree canopy and vegetation preserved or conserved as part of a proffer or condition of approval or to meet BMP requirements, floodplains, wetlands, conservation easements, or other easements, if known, that restrict grading.
 - d. Open channels and swales.
 - e. Proposed easements.
 - f. Elevations for the proposed basement floor, first floor, and garage slab for all buildings. In addition, spot elevations of the finished grade at the building corners shall be shown.
 - g. Retaining walls with the elevations proposed for the top and bottom of the wall.
24. A stormwater management plan in accordance with Chapter 1096 of the [Codified Ordinances](#) and Chapter 5 of this manual.
25. Storm drainage calculations, in accordance with Chapter 5 of this manual, and drainage area map showing individual and cumulative drainage area contributing to each point of concentration. Runoff characteristics supporting the hydrologic method, such as time of concentration, Runoff Coefficient (C), Curve Number (CN), slope, underlying hydrologic soil group, and cover type also shall be shown.
26. Watercourses and names, if any, and floodplain easement(s) in accordance with Chapter 5 of this manual. Wetlands data as follows:
 - a. Potential jurisdictional waters and wetlands as identified by a consultant wetland delineation performed in accordance with Army Corps of Engineers (Corps) standards shall be depicted on the plan.

- b. A note referencing the source of the wetland information depicted on the plan (including the Corps Jurisdictional Determination number and date, if it exists) and indicating that all applicable state and federal permits shall be obtained prior to disturbances within jurisdictional waters and wetlands shall be provided on the plan.
- 27. A soils map and certification in accordance with Chapter 6 of this manual.
- 28. An erosion and sediment control plan in accordance with the [Virginia Erosion and Sediment Control Handbook](#) and Chapter 7 of this manual.
- 29. A Tree Conservation and Landscape Plan, in accordance with the Zoning Ordinance and Chapter 7 of this manual.
- 30. Lighting plans in accordance with Chapter 7 of this manual.
- 31. Regulatory signage and street name signs.
- 32. Location, type, size, and height of fencing, screening, and retaining walls.
- 33. Parking, loading spaces, walkways, and bike paths, indicating type of surfacing, size, angle of stalls, width of aisles, and number of parking and loading spaces provided.
- 34. Designation of ADU units in accordance with Zoning Ordinance.
- 35. Fire Apparatus Access Roads and Signs in accordance with Chapter 4.

B. Documents to Accompany Site Plans

- 1. The following items shall accompany the initial submission of a site plan:
 - a. Fee Check. (See 8.101)
 - b. Land Development Application Form. (See 8.101)
 - c. Bond estimate as required by Section 8.304 of this Chapter.
 - d. If a stormwater management plan is required pursuant to Chapter 1096 of the [Codified Ordinances](#), an unexecuted copy of the deed, and if available a plat, establishing long-term maintenance responsibility and necessary easements for storm drainage and stormwater management purposes.
 - e. A completed [Proffer/Condition Status Update form](#), if applicable.

- f. If not previously provided, an archaeological survey report prepared in accordance with Chapter 7 of this manual. If human cemeteries, burial grounds, or graves are identified, an archaeological delineation prepared in accordance with Chapter 7.
- 2. The following items shall be required prior to site plan approval:
 - a. A letter signed by the Health Director evidencing conformance with applicable requirements of the County Health Department.
 - b. Performance Agreements and Bonds, as required by Section 8.300 of this Chapter shall be submitted for review. Such Performance Agreements and Bonds shall be approved by the Board of Supervisors or designee prior to site plan approval.
 - c. A geotechnical study in accordance with the requirements of Chapter 6 of this Manual.
 - d. An approved and recorded:
 - i. Easement Plat (and deed) prepared in accordance with this Chapter if easements are shown on the site plan. Easement plats shall not include dedication of property to the County for public street purposes.
 - ii. Dedication/Vacation Plat (and deed) prepared in accordance with this Chapter if dedication of property to the County for public street purposes, or vacation of property previously dedicated to the County for public street purposes, is shown on the site plan. This plat may include easements.
 - iii. Declaration of protective or restrictive covenants, if applicable.
 - e. If not included in the deed:
 - i. A Deed of Release if there are deed of trust trustees who are not parties and signatories to the deed; or
 - ii. A letter or other documentation from the owner which certifies that there is no deed of trust lien on the property.
 - f. If not provided with a previous Preliminary Plat of Subdivision or Construction Plan and Profile: a letter from the Virginia Department of Conservation and Recreation, Division of Natural Heritage identifying occurrences of natural heritage resources on the property

such as the habitat of rare, threatened, or endangered plant and animal species, unique or exemplary natural communities, and significant geologic formations; and if an endangered and threatened species survey has been completed for the property, a copy of the report shall also be submitted.

- g. If not previously provided, a digital file of the boundary of any cemetery, burial ground, or grave prepared in accordance with the Office of Mapping Digital Data Submission Guidelines for Cemeteries.

8.108 RECORD DRAWINGS

A. Filing Requirements:

Upon satisfactory completion of the installation of the required improvements shown on the approved site plan or construction plans and profiles, whichever is applicable, the developer shall submit to the Director two (2) copies of the completed record drawings, prepared and signed by a Licensed Professional Engineer (P.E.) or Surveyor, of such plans. Such record drawings shall be submitted at least two (2) weeks prior to the anticipated date of occupancy of any building for site plan applications. In the case of construction plans and profiles, the record drawings shall accompany the request for bond release in accordance with Section 8.300 of this manual or be submitted prior to record plat approval per Section 8.305 H of this manual, whichever is applicable. Such record drawings shall be reviewed for conformance with the approved plans and the ordinances and regulations of County and State agencies.

B. Record Drawings

The term "record drawings" shall be deemed to include what is sometimes referred to as "as built" drawings and shall be prepared in accordance with this Subparagraph. The following items shall be surveyed to determine actual field conditions, and the approved site plans or construction plans and profiles as annotated to reflect such actual field conditions shall constitute the record drawings.

1. Storm Sewer Systems

- a. The general location of drainage structure(s) within their easements shall be observed and noted if the structure is outside the easement. Included in this location requirement are inlet or outlet end sections. Manholes wherever located shall have at least two measurements to permanent physical features provided.
- b. The structure top and pipe invert elevations, including end sections, shall be provided.
- c. Pipe size and the percent grade between inverts from structure to structure shall be noted.
- d. Spot elevations of the invert of manmade open channels shall be provided on 100-foot centers.
- e. On residential lots less than one acre in size, spot elevations located within overland relief flow paths and lowest point of entry. If the elevation of the overland relief point is higher than the design elevation, overland relief shall be verified for all affected structures

and updated information/plans shall be provided showing how overland relief is now achieved.

2. Pavement

- a. The width of pavement shall be verified once for each width and at transitions.

3. Stormwater Management

- a. The elevations and lengths of dams and spillways shall be noted.
- b. The width of dams and spillways shall be noted.
- c. Stand pipe structure sizes and heights shall be noted.
- d. The volume of the impoundment area shall be calculated.

4. Buildings Shown on Site Plan

- a. Exterior dimensions of buildings shall be noted.
- b. Setback dimensions to buildings shall be noted.

C. Checklist

The developer submitting the record drawings shall also submit a letter with the record drawings certifying that the following items have been inspected and found to be in general conformance with the approved construction plans and profiles or site plans, as applicable.

- 1. Curb and Gutter. Confirm that the curbs are the proper type.
- 2. Sidewalk/Trail. Confirm that the sidewalk/trail is correctly situated with relation to the rights-of-ways or easement. Confirm that the sidewalk/trail maintenance responsibilities have been adequately provided for and specify the entity or entities that will bear such responsibilities. Verify that the construction material used is as approved.
- 3. Drainage. Confirm that the drainage patterns have been established in conformance with the grading plans. Confirm that slopes and swales are properly located and graded. Confirm that positive drainage exists.
- 4. Pavement. Provide a copy of the approved pavement design. Confirm that all pavement was placed in accordance with the approved pavement design. Confirm that all material was compacted to required standards. Provide a copy of the approved striping and signage plan.

5. Visibility triangle, as required by the Zoning Ordinance, and clear zones. Confirm that there are no encroachments.
6. Utility placement within roads. Provide a statement that all utilities located within roads are within recorded easements, or if in public right-of-way, located as approved and per the [VDOT permit manual](#).
7. Landscaping and Buffering
 - a. Developer certifies that the tree conservation and landscaping are in general conformance as to location with the approved Tree Conservation and Landscape Plan. Confirm plantings conform to approved quantities for each category (large deciduous, small deciduous, shrub, or evergreen). If plantings do not conform to approved quantities for each category, a redline Tree Conservation and Landscape Plan identifying all changes also shall be included in the Record Drawing.

8.109 PLAT AND PLAN REVISIONS

A. Revisions to Plats or Plans Under Review/Pending Approval

1. Minor revisions to the plats or plans which are not prompted by County and/or referral review comments may be made at the same time as the application is being revised to address outstanding comments transmitted by the Director. Such revisions shall be highlighted on the plats or plans and identified within the resubmission narrative.
2. Major revisions to plans pending approval by the Director which are not prompted by County and/or referral review comments shall require withdrawal of the plan under review and a new land development application submission. For the purposes of this manual, a major revision shall be defined as changes to the original plan which alter the infrastructure configuration and design to the extent which will require a complete re-review of the project.

B. Revisions to Previously Approved Construction Plans and Profiles (CPAR)

1. Revisions to previously approved plans shall require a formal submission process consistent with the initial plan submission requirements as stated within this chapter.
2. The cover sheet and revision block shall indicate that such plans are revisions to a previously approved land development application and shall indicate the case number of and date of approval of the said application.
3. The revisions shall be highlighted and identified within the resubmission narrative.

8.110 SITE PLAN AMENDMENTS (SPAM)

- A. Site plan amendment applications are intended to provide a means of making minor revisions to previously approved site plan applications within an abbreviated land development application process. The site plan amendment application may be utilized for minor revisions as listed below. Revisions beyond the scope of the following shall require the submission of a new site plan application for review and approval by the Director:
 - 1. The improvements shall be minor in nature and not change the external traffic flow patterns; or
 - 2. The gross floor areas shall not be increased by more than 5,000 square feet or 75 percent of the gross building area, whichever is less; or
 - 3. The proposed additional disturbed area shall not exceed 10,000 square feet or 25 percent whichever is less; or
 - 4. The proposed revision shall only require review by the Director and will not require review and concurrence by external review agencies (i.e. Loudoun Water, VDOT, Health Department). However, associated review by the County Attorney's office may be provided within the site plan amendment process for minor easement revisions.
- B. The plan submission requirements and accompanying documents for the site plan amendment application shall be consistent with the site plan requirements as identified in this chapter.
 - 1. Zoning tabulations shall be revised, as required.
 - 2. Reference shall be provided on the plan denoting the original site plan number and approval date associated with the site plan amendment.
- C. Revisions shall be highlighted on the original site plan and explained in detail within a project narrative.

8.111 GRADING PERMIT APPLICATION

A. The following items shall be required as part of the grading permit application:

1. Completed Grading Permit Application Form and all items required by the Grading Permit Packet as made available by the Department of Building and Development. At a minimum, items required by the Grading Permit Packet shall include the following. Variations of these required items pursuant to FSM Section 1.200.A shall not be permitted.
 - a. An erosion and sediment control plan in accordance with the [Virginia Erosion and Sediment Control Handbook](#) and Chapter 7 of this manual.
 - b. A stormwater management plan in accordance with Chapter 1096 of the [Codified Ordinances](#) and Chapter 5 of this manual.
 - c. If a stormwater management plan is required pursuant to Chapter 1096 of the [Codified Ordinances](#), an unexecuted copy of the deed, and if available a plat, establishing long-term maintenance responsibility and necessary easements for storm drainage and stormwater management purposes.
2. Wetlands data as follows:
 - a. A Jurisdictional Determination approved by the Army Corps of Engineers (Corps). Any jurisdictional waters and wetlands verified by the Jurisdictional Determination shall be depicted on the Erosion and Sediment Control Plan and Grading Plan with a note referencing the Jurisdictional Determination number and date and all applicable federal and state wetland permits.
 - b. If not previously provided, the following shall be submitted with the Grading Permit Application as a digital file prepared according to the Department of Building and Development [Digital Data Submission Checklist for Wetlands](#), including:
 - i. the location of any jurisdictional waters and wetlands on the property verified by the Jurisdictional Determination approved by the Corps; and
 - ii. the location of all permitted impacts; and
 - iii. copies of all applicable Jurisdictional Determinations and federal and state wetland permits.

- c. If applicable, stream and wetland mitigation projects shall be reviewed as a Grading Permit Application.
- B. The following items shall be shown on the grading plan and erosion and sediment control plan:
 - 1. Floodplain data as follows:
 - a. Approximate watercourse locations and names, if any.
 - b. The boundaries of the FOD, or the proposed boundaries of the floodplain as shown on a floodplain study or floodplain alteration which has been submitted and accepted by the County for review in accordance with Chapter 5 of this manual.
 - c. Source of Floodplain Note. (See 8.101)
 - 2. Steep Slopes data as follows:
 - a. Very Steep Slope Areas and Moderately Steep Slope Areas, as defined and regulated in the Zoning Ordinance.

8.112 INDIVIDUAL LOT GRADING PLAN

- A. An individual lot grading plan shall be provided with each building permit application for all single-family detached and attached dwelling units on lots less than one acre in size. The plan shall address all Grading Criteria in Chapter 5; be in reasonable compliance with the overall grading shown on the approved Construction Plans and Profiles, if applicable; and shall include the following:
1. A minimum scale of 1 inch = 30 feet.
 2. Sheet size of 8.5 inches x 14 inches - the scale must be large enough to clearly depict individual lot grading features.
 3. Existing and proposed Topography (See 8.101). Topography and structures on adjacent properties within 50 feet of lot lines.
 4. Actual footprint of dwelling unit and its distance to the nearest lot lines.
 5. Structural options that extend the foundation or garage slab.
 6. Elevations for the proposed basement floor, first floor, and garage slab. In addition, elevations of the finished grade at the building and all lot corner elevations shall be shown.
 7. Driveway, including slope.
 8. Limits of clearing and grading, areas of tree canopy and vegetation preserved or conserved as part of a proffer or condition of approval or to meet BMP requirements, floodplains, wetlands, or conservation easements.
 9. Open channels and swales.
 10. Easements.
 11. Overland relief design in accordance with the approved plan including spot elevations, easements, flow path, areaway with top step spot elevation, and spot elevation at proposed walk out location. If the overland relief path is not on the lot, include the nearest overland relief elevation.
 12. Lot lines with the corners highlighted by encircling lot corners.
 13. Retaining walls shall be indicated and provided with the elevations proposed for the top and bottom of the wall.

8.113 LOCATION PLAT

- A. For any residential lot less than one acre in size, a location plat (aka as-built plan or wall-check survey) shall be submitted to the Department of Building and Development, Engineering Division. The plat is subject to the following criteria:
1. The plat must be submitted prior to requesting the framing inspection.
 2. The plat must be prepared and certified by a Licensed Professional Engineer (P.E.) or Surveyor.
 3. As-built information including house setbacks, elevations of basement floor or lowest floor, garage slab, and top step of the areaway, length and slope of driveway (percent grade from garage slab to back of driveway apron, or approximate grade if apron is not constructed), and the building permit number shall be included.
 4. The location of all recorded easements, with instrument numbers, must be shown on the plat.
 5. Sheet size of 8.5 inches x 14 inches - the scale must be large enough to clearly depict the required features and may be submitted via e-mail to asbuilts@loudoun.gov.

8.114 PLOT PLANS FOR RESIDENTIAL ZONING PERMIT APPLICATIONS

- A. Pursuant to Section 6-1000 et seq. of the Revised 1993 Zoning Ordinance, Zoning Permit applications for residential uses or structures not requiring Site Plan or Sketch Plan approval pursuant to Section 6-700 et seq. of the Revised 1993 Zoning Ordinance, shall require the approval of a Plot Plan. A Plot Plan shall contain the following minimum data, legibly drawn to scale, on sheets of 8.5 inches by 14 inches in size, unless other minimum data is approved by the Zoning Administrator or designee. The Zoning Administrator, or designee, may also require additional data to determine whether the proposed use or structure is in compliance with the provisions of the Revised 1993 Zoning Ordinance.
1. Lot lines.
 2. Area (size) of the lot.
 3. Name of Development, subdivision section, phase number, block number, and lot number, if applicable.
 4. County Parcel Identification Number (PIN).
 5. The Zoning District of the lot, including any Zoning Overlay Districts.
 6. North Arrow.
 7. Date.
 8. The location of all existing and proposed structures and driveways located on the lot, any easements located on the lot, any adjacent roadways, and adjacent access easements as shown on the record plat.
 9. The distance from the nearest portion of the proposed structure to each lot line. If the proposed structure includes a permitted structure that is allowed in a required yard or setback pursuant to Section 5-200 et seq. of the Revised 1993 Zoning Ordinance - such as, but not limited to, certain stairs, chimneys, decks, and bay windows; then the distance from such permitted structure to the lot line shall also be shown when the permitted structure is closer to the lot line than the main portion of the structure.
 10. Any buffer yards and any areas of preserved or conserved tree canopy and vegetation that are shown on the Tree Conservation and Landscape Plan that are located on the lot.
 11. Certification of the building height of the proposed dwelling by a Licensed Professional Engineer (P.E.), Surveyor, Architect, or the builder, as measured in conformance with the definition of “building height” in Article 8 of the Revised 1993 Zoning Ordinance.

12. Approximate watercourse locations and names, if any.
 13. The boundaries of the FOD, or the proposed boundaries of the floodplain as shown on a floodplain study or floodplain alteration which has been submitted and accepted by the County for review in accordance with Chapter 5 of this manual.
 14. Source of Floodplain Note. (See 8.101)
- B. Documents to accompany Plot Plans for Residential Zoning Permit Applications
1. For any parcel of land that includes within its boundaries Very Steep Slope Areas and/or Moderately Steep Slope Areas, as defined and regulated in the Zoning Ordinance, the following shall be depicted on a separate sheet for informational purposes only and not for recordation: topographic information at contour intervals of 5 feet or less and the location and extent of Very Steep Slope Areas and Moderately Steep Slope Areas; land disturbing activities including, but not limited to, any proposed building and structure sites, driveways and paved areas, drainfields and associated septic lines, wells and associated water lines, minor utilities, and public sanitary sewer and water lines; and mitigation measures. Such information shall satisfy Locational Clearance submission requirements for Steep Slope Areas.

8.200 REQUIREMENTS FOR START OF ANY CONSTRUCTION

The developer shall have accomplished or provided the following applicable items prior to the start of any construction:

A. Approved Plans

The developer shall have obtained County approval of construction plans and profiles or site plan. At least one copy of the approved plans, with revisions, must be kept on-site at all times.

B. Inspection Agreement

For public improvements to be constructed for a proposed subdivision, the developer shall provide a statement that VDOT or a third-party inspector will perform testing and inspections for the construction and must have received the Director's written approval of the proposed inspection arrangement.

C. Grading Permit

The developer shall have received a permit to conduct land-disturbing activities in accordance with the Loudoun County [Codified Ordinances](#), and shall have submitted a financial guarantee pursuant thereto and in compliance with the Bonding Policy as set forth in this chapter, except that upon the request of the developer, a conditional grading permit for erosion and sediment controls, clearing, grubbing and preliminary site preparation only may be obtained prior to construction plans and profiles or site plan approval once all technical issues associated with such plans have been resolved to the satisfaction of the Director.

1. At a minimum, such technical issues shall include the following. Variations of these technical issues pursuant to FSM Section 1.200.A shall not be permitted.
 - a. An erosion and sediment control plan approved in accordance with the [Virginia Erosion and Sediment Control Handbook](#) and Chapter 7 of this manual.
 - b. A stormwater management plan approved in accordance with Chapter 1096 of the [Codified Ordinances](#) and Chapter 5 of this manual.
 - c. If a stormwater management plan is required pursuant to Chapter 1096 of the [Codified Ordinances](#), an unexecuted copy of the deed, and if available a plat, establishing long-term maintenance responsibility and necessary easements for storm drainage and stormwater management purposes.

D. Highway Permit

The developer shall have obtained permits from VDOT for work within the right-of-way of an existing state road.

E. Sewer and Water Requirements

The developer shall have coordinated separately with the appropriate public authority for approval of plans, issuance of required permits, and inspection of installation work with respect to sewer and water installations.

F. Off-site Construction Agreements

The developer shall have obtained a recorded easement, or a letter of permission for clearing and grading, whichever is applicable, from abutting property owners for offsite construction. A letter of permission is satisfactory only for off-site clearing and grading which shall be completed and certified by the developer as completed prior to record plat or easement plat approval.

G. Health Department Certification

When applicable, the developer shall have obtained verification from the Health Department that the abandonment of wells and/or drainfields has been accomplished in accordance with Health Department requirements.

H. Demolition Permit for Existing Structures

When applicable, the developer shall have obtained from the Director the necessary permit for demolition of existing structures.

8.300 PERFORMANCE AGREEMENT AND BONDING

A. Purpose and Authorization

To provide for acceptable guarantees of performance to assure timely construction and completion of improvements in accordance with approved site plans or construction plans and profiles, as follows:

1. The County is authorized to require performance bonds, as defined in Section 8.303 herein and referred to as “bonds” or “performance bonds”, in conjunction with the approval of subdivisions, in accordance with the Land Subdivision and Development Ordinance, and to accept performance bonds in conjunction with special exceptions, site plans, and proffer conditions, in accordance with the Zoning Ordinance, all pursuant to Virginia Code Sections 10.1-565, 15.2-2241, 15.2-2286, 15.2-2299 and 15.2-2309.
2. Performance bonds shall be required for public and other physical improvements as shown upon approved construction plans and profiles for record plats and as shown upon site plans, or the approved construction plans and profiles for site plans, for condominium residential developments. Such improvements shall include, without limitation, road, curb, gutter, sidewalk, trails, storm drainage, traffic signalization and control, and any other site-related improvements required by Loudoun County Ordinances for vehicular ingress and egress, for public access roadways, for structures necessary to insure stability of critical slopes and for stormwater management facilities. Notwithstanding the foregoing, the Director may waive the requirement for a performance bond for a site plan which does not contain any improvements eligible for public maintenance if the Director determines that the satisfactory completion of construction of improvements shown upon such site plan can be enforced pursuant to ordinances regulating building permits and occupancy permits.

B. Authority for Accepting/Monitoring Performance Bonds

The Bond Committee shall review and recommend for approval or disapproval, and monitor, performance bonds for construction of improvements as identified within this Section 8.300.

1. Bond Committee Members (or their designees)
 - a. County Administrator
 - b. Director of Financial Services
 - c. Director of Building and Development

2. Authority of the Bond Committee
 - a. Review new performance bonds, bond extensions, bond substitutions, bond reductions/releases, and action resulting from defaults; and send recommendations to the Director for final action or to the Board of Supervisors for further consideration.
 - b. Establish/update standard performance bond and agreement forms.
3. Submission to the Bond Committee shall be made to the Director.

8.301 PERFORMANCE AGREEMENT SUBMISSION REQUIREMENTS

- A. A construction/performance agreement (Performance Agreement) between the Board of Supervisors and the developer/owner/sub-divider (collectively referred to as “developer”).
- B. A bond in an amount equal to the approved Bond Estimate, or in such lesser amount as is provided for herein, guaranteeing completion of the Performance Agreement.
- C. Letter from the Director approving the plans and Bond Estimate amount.
- D. Release of Lien from the contractor, if applicable.

8.302 TERM OF PERFORMANCE AGREEMENT

The maximum initial term of the Performance Agreement for a subdivision shall be three (3) years, and the minimum term shall be two (2) years. The term of the Performance Agreement for a site plan shall be two (2) years. The term of a Proffer Performance Agreement shall be as approved by the Zoning Administrator. If construction of the subject project is not completed within the initial Performance Agreement term, the performance bond amount may require adjustment and subsequent reconsideration and review by the Bond Committee.

8.303 ACCEPTABLE FORMS OF PERFORMANCE BONDS

- A. Corporate Surety Bond: A corporate surety bond in the face amount equal to one hundred percent (100%) of the approved bond estimate shall be furnished by an insurance company licensed to transact fidelity and surety insurance in Virginia and will guarantee the full amount of the bond. The ability of the insurance company to provide satisfactory performance guarantee will be assessed by the Director in accordance with criteria reported in the most recent edition of the [Best's Key Rating Guide \(Best's\)](#) and the most recent annual revision of the [U.S. Department of Treasury Fiscal Service Circular 570](#) (the Treasury Circular). Corporate Surety Bonds shall be accepted only from sureties listed in Best's:

1. with a rating of Level A or better; and,
2. in a financial size category of Class VIII, or higher, unless otherwise agreed by the Board of Supervisors or designee; and,
3. such corporate surety bonds shall be in amounts not exceeding:
 - a. those limitations identified in the Treasury Circular, nor
 - b. 1.5% of the minimum Adjusted Policyholders' Surplus for the financial size category as listed in Best's.

Developer shall not be entitled to any bond reduction until at least 30% of the bonded work is complete.

Such ratings and other qualifications must be maintained for the life of the Corporate Surety Bond or the Corporate Surety Bond shall be replaced by adequate replacement bond at the request of the Director.

- B. Cash Escrow: An amount equal to fifty percent (50%) of the approved bond estimate in the form of a cashier's check or certified check, accompanied by a W-9 or Substitute W-9 form, shall be submitted to the Director, to be deposited with the County Treasurer, in an interest bearing account with full financial accountability provided by the Director of Financial Services through a separate Performance Bond Fund. All cash escrows held shall be maintained as an individual bond from the developer as to principal and accumulated interest but may be pooled by the County for investment purposes with accrued interest allocated to each bond in accordance with County allocation policies. The Treasurer shall be entitled to retain a reasonable amount, not exceeding 5% of the interest accrued, to cover the cost of administering the account. Upon approval for release of the cash escrow as provided herein, the Director of Financial Services shall be authorized to release the cash escrow (principal plus accrued interest less allowable cost of administration) and disburse the funds.

1. An amount equal to fifty percent (50%) of the approved bond estimate is calculated by dividing the approved bond estimate in half.
2. Developer shall not be entitled to any bond reduction until at least 50% of the bonded work is complete.

- C. Letter of Credit. An amount equal to seventy five percent (75%) of the approved bond estimate in the form of a letter of credit meeting the following minimum conditions will be accepted:

1. The lending institution shall:
 - a. be insured by the Federal Deposit Insurance Corporation (FDIC);

- b. have offices and license to practice banking in Virginia, Maryland or the District of Columbia;
 - c. have a SNL Financial (f/k/a Thompson Reuters Bank Insight) national rating ("Bank Rating") of at least 35; and,
 - d. confirm that the total letter of credit exposure of the County at the lending institution limited to no more than 50 percent (50%) of the institution's equity capital, unless otherwise agreed to by the Board of Supervisors or designee.
- 2. The Board of Supervisors or designee may, upon the unanimous recommendation of all of the members of the Bond Committee, accept a letter of credit from an institution whose rating is lower than 35 provided that such rating shall be no less than 30 and shall be maintained at or above such lower level until such letter of credit has been completely released. Such ratings and other qualifications shall be maintained for the life of the letter of credit, as amended, or the letter of credit shall be replaced by adequate replacement bond at the request of the Director.
 - 3. The expiration date in the letter of credit shall be at least 6 months after the date by which the Performance Agreement must be performed. For example, a 24-month Performance Agreement requires a 30-month letter of credit. This 6-month requirement is in addition to the 6-month automatic extension that is required below.
 - 4. The letter of credit shall contain the conditions of automatic renewal providing that the letter of credit will automatically be extended for additional periods of six months unless the Director, is notified in writing, by certified mail, with return receipt requested, at least ninety (90) days in advance of the present or future expiration date, that the issuing bank does not intend to extend such letter of credit.
 - 5. All extensions of time of the Performance Agreement completion date shall be granted only upon corresponding extension of the letter of credit expiration date to comply with Subparagraph 3 above.
 - 6. Collateral Agreements. The Board of Supervisors or its designee may accept from a bank or developer a satisfactory cash collateral mechanism to serve as additional collateral (a) to permit current Bank Letters of Credit to be deemed satisfactory by the County; and (b) to be used by the County in the event of a default with respect to any current Performance Agreements or Approved Plans issued by the County and secured by a Letter of Credit issued by Bank; and (c) to secure the payment of the obligations of Bank under the Letters of Credit. Collateral Agreements shall be in a form approved by the Bond Committee.

7. Confirming Letters of Credit. Where the Bank Rating of the issuing Bank of a Letter of Credit has fallen below the minimum required rating set forth above at the time of the extension of a Performance Agreement, the Bank that issued the original letter of credit may furnish a confirming letter of credit from a Bank that meets or exceeds the said minimum required rating. Confirming letters of credit and any associated agreements shall be in a form approved by the Bond Committee.
8. Any new letter of credit or letter of credit amendment shall be subject to all the minimum requirements provided herein.
9. An amount equal to seventy-five percent (75%) of the approved bond estimate is calculated by the multiplying the approved bond estimate by 0.75.
10. Developer shall not be entitled to any bond reduction until at least 25% of the bonded work is complete.

D. Multiple Sureties

Where two or more performance bonds (including but not limited to Corporate Surety Bonds) are provided in conjunction with a single Performance Agreement, the Performance Agreement shall identify and incorporate each performance bond separately. Where two or more sureties execute a single Corporate Surety Bond, all such sureties shall execute a Co-Surety Rider in Form approved by the Bond Committee to establish and confirm the joint and several liability of the said co-sureties.

E. Additions to Previously Bonded Improvements

When a record plat is submitted for a subdivision containing public improvements that are extensions of public improvements dedicated upon a previously approved record plat for which a Performance Agreement and performance bond have already been accepted, the construction of such proposed extension improvements may be guaranteed under the previously existing bond in accordance with the following conditions:

1. The performance bond shall be capable of being modified, and any modifications shall be accepted as satisfactory by the Board of Supervisors or designee upon recommendation of the Bond Committee before they shall become effective.
2. Modifications to the performance bond shall be in writing and indicate that such performance bond covers both the improvements shown upon the proposed record plat and the improvements dedicated upon the previously approved plat.

3. A separate Performance Agreement covering such proposed extension improvements and referencing the modified performance bond shall accompany the record plat.
4. The Bond Committee may recommend an extension of the completion date under the Performance Agreement covering the previously approved plat in conjunction with the approval of the record plat, if requested by the developer, in order to establish a common date of completion under the Performance Agreements secured by the same performance bond; provided that such extension of completion date shall not be for more than one (1) year and provided that the appropriate bond extension fee shall have been paid if such extension is for more than five (5) months.
5. Such separate Performance Agreement and modified performance bond shall not be approved or accepted until the bonded and extension improvements have been inspected and found satisfactory and the Director has determined, in writing, that the amount of such performance bond, as modified, is adequate to guarantee completion of both the previously approved record plat improvements and the proposed extension improvements.

F. Performance Bond Preference.

1. Due to the varying ease or difficulty of collection and reliability of the various types of performance bonds, the County deems various types of performance bonds as being more or less preferred for the protection of the public. Cash Escrow is deemed to be the most preferred performance bond because of the ease of collection and immediate availability. Letters of Credit are less preferred than cash, and Corporate Surety Bonds are less preferred than Letters of Credit. Once a Corporate Surety Bond, Letter of Credit or Cash Escrow has been approved and accepted by the County, only a more preferred or equally preferred form of performance bond shall thereafter be substituted in place of the current form of performance bond.
2. Notwithstanding the foregoing, upon unanimous consent of the Bond Committee, and for good cause shown, the Director may accept a less preferred form of performance bond in substitution for the current form of performance bond if the substitute is found to be of equal or greater reliability than the current performance bond. "Good Cause" shall be determined to exist only in the following circumstances: (a) in cases where the Director is satisfied that there has been a complete change of ownership of the bonded project that has resulted in the need for the submission of a substitute performance bond by the new owner, or (b) in cases where the surety on a bonded project has become unacceptable, either as a result of the failure of the surety to maintain the rating required herein or as a result of any other failure of such surety to satisfy any other criteria established herein, including but not limited to debarment, and the Bond Committee

and Director are satisfied that the developer has made every reasonable good faith effort to obtain a substitute performance bond of the same form as the current form.

3. If a developer has not met all previous obligations in accordance with all Performance Agreements entered into by said developer with the Board of Supervisors for the previous five (5) years and as determined by the Director, then a Corporate Surety Bond shall be disallowed by the Director as performance bond for such projects. In these cases, the performance bonds for such projects shall be provided in the form of a certified check, cash escrow, or a letter of credit that meets the requirements specified herein.
4. Nothing herein shall prevent the County from increasing the required amount of the performance bond to the amount of a then current bond estimate based upon an inspection by the County.

8.304 BOND ESTIMATE AND BOND AMOUNT

- A. The Bond Estimate shall be based on the estimated cost of construction of all items shown upon the approved plans (labor and material), plus a 10 percent Contingency Factor to cover administrative and engineering costs in the event of default and potential damage to existing roads or utilities and the inflation factor(s). The cost estimates shall reflect the current unit costs as published and distributed by the Director and shall be increased by an inflation factor equal to the annual percentage change in the Construction Index Code, as published weekly in the Engineering News Record. This inflation factor is to be applied over the life of the bond, using the equation $C = (P)(I)(E) + E$; where P = the period of the bond (years); I = annual inflation factor; E = the estimated cost of construction (including the 10 percent Contingency Factor); and C = total Bond Estimate.
- B. The Bond Estimate shall be prepared by a Licensed Professional Engineer (P.E.) or Surveyor and submitted to the Director for approval.
- C. Where partial construction has already occurred, the amount of the bond may be less than the Bond Estimate to allow for work completed prior to establishing the original bond, subject to the Director's approval, in consultation with the Virginia Department of Transportation (VDOT) where applicable; provided, however, that after such original performance has been accepted by the Board of Supervisors or designee, any Bond Reduction requested shall be based upon the original Bond Estimate and not upon the original amount of such performance bond.
- D. For site plans only, the Director shall publish a policy permitting the original performance bond for a site plan bond to be in an amount equal to a specific percentage of the approved Bond Estimate, such percentage being set forth in the written policy, and the amount of any such bond submitted thereafter for any site plan may be equal to or greater than the amount of such percentage, rounded up to

the nearest \$1000; provided that the acceptance of such bond shall not preclude the Director from thereafter requiring an increase in the amount of the bond pursuant to the approval of an Extension of the Performance Agreement.

- E. For cash escrow only, the bond amount shall be equal to fifty percent (50%) of the approved bond estimate in the form of a cashier's check or certified check. An amount equal to 50% of the approved bond estimate is calculated by dividing the approved bond estimate in half.
- F. For letter of credits only, the bond amount shall be equal to seventy five percent (75%) of the approved bond estimate. An amount equal to 75% of the approved bond estimate is calculated by multiplying the approved bond estimate by 0.75.
- G. For corporate surety bonds, the bond amount shall be equal to one hundred percent (100%) of the approved bond estimate.

8.305 BOND PROCEDURES AND REQUIREMENTS

A. Performance Agreement

A Performance Agreement, which shall be supported by an acceptable form of performance bond, shall be required on projects which obligate the developer to construct required improvements pursuant to approved subdivisions, site plans, special exceptions or proffer conditions in a timely manner. Such Agreement shall specify the manner and date by which the required improvements shall be completed. Performance Agreements, and associated performance bonds, solely for construction of physical improvements not maintained by VDOT, shall guarantee completion of construction of such physical improvements by the developer in accordance with approved Plans, as well as a guarantee against latent defects and deficiencies in accordance with Section 8.305.F. An agreement format approved by the Bond Committee will be provided by the Director to all developers requesting same for use in preparation of the Performance Agreement. If the developer acts, or fails to act, in a manner which would constitute a breach of the Performance Agreement, or all the noted improvements are not completed within the specified time period and no extension has been obtained or replacement agreement and performance bond submitted and approved with a new expiration date, the Performance Agreement shall be in default.

B. Extensions and Rebonding of Performance Agreements

It shall be the sole responsibility of the developer to keep the Performance Agreement current.

Approximately sixty (60) days prior to the expiration of a Performance Agreement, the Director may review the project records to determine if the developer has initiated the process for final release of the Performance Agreement and associated performance bond and to determine if the Performance Agreement and associated

performance bond may reasonably be eligible for release within sixty (60) days. If it is determined that the project Performance Agreement and performance bond is not reasonably expected to be released within such sixty (60) days, the developer and entity which issued the performance bond may be notified in writing, and may be required to provide for the extension of the Performance Agreement and performance bond within such sixty (60) days. If the Performance Agreement and performance bond cannot be released or if no extension agreement and bond extension have been submitted in approved form by the agreement expiration date, the Performance Agreement shall be in default.

1. Except as provided in this paragraph, no Performance Agreement will be automatically extended beyond five (5) years from the date of the original Agreement. Thus, if the initial period of completion was 2 years, no more than three 1-year extensions or one 2-year and one 1-year extension will be granted. If the initial period was 3 years, no more than two 1-year extensions or one 2-year extension will be granted. However, upon recommendation by the Bond Committee, the Director may, at the expiration of the extension in the fifth year and at the request of the developer, grant extensions beyond the five (5) year limit, if the Bond Committee determines that such additional extensions are reasonably justified due to the magnitude of the bonded project, the reasonableness of the construction schedule and the diligence of the developer in carrying out the schedule, a reasonable estimate of the time necessary to satisfy VDOT public need requirements, and such other factors as may be deemed relevant by the Bond Committee.
2. As a part of the initial Performance Agreement extension for non-site plan Performance Agreements, the developer may be required to submit a Preliminary Street Acceptance Package (PSAP) to the County depending on the status of the project at the time of the initial extension request. The County will provide notice to the developer whether a PSAP is required and what documents are necessary at the time of the County's notice that an extension is required or after developer's first extension request. An extension request shall not be approved if a PSAP is required but has not been submitted to the County. A list of what documents generally are a part of the PSAP can be found at www.loudoun.gov (Home > Government > Departments and Offices > Building & Development > Infrastructure Compliance > Bond Release / Street Acceptance > Preliminary Street Acceptance Package (PSAP)). This list is not exhaustive and is subject to adjustment based upon the status of the project. A developer may be required to augment a PSAP at a subsequent extension or, if not previously required to submit a PSAP, submit a PSAP at a subsequent extension.
3. The developer may make a formal request to the Director for an extension of the completion date at the first request for extension for a maximum period of extension for two (2) years. The developer shall indicate the reasons and conditions which have prevented completion of the required

improvements. The developer shall furnish to the Director an Extension Agreement, a written consent to the extension by the surety and an extension of the performance bond. All signatures shall be notarized. The two year extension is only available at the first request for extension and where the extension request comes within the time period required herein such that the project was not previously deemed to be in default by the Board of Supervisors or designee. All other extension requests shall be for one (1) year only, including any and all subsequent extension requests and shall also indicate the reasons and conditions which have prevented completion of the required improvements.

4. Performance Agreement Extension Submission Requirements: The Performance Agreement Extension request shall not be processed unless the following items have been submitted as one complete package:
 - a. Fee check. The fee check entitles the developer to one submission of the extension documents and, if needed, one correction. If two or more correction reviews are needed, an additional fee equal to the original fee must be remitted.
 - b. Letter of request with justification from the developer.
 - c. Performance Agreement Extension executed by the developer, Consent to Extension executed by the developer and surety, and extension of, or confirmation of continuation of, the performance bond.
 - d. Performance Agreement Extension and Consent to Extension must be prepared on forms approved by the Bond Committee.
 - e. If such Performance Agreement Extension request seeks to extend the completion date for a fifth year, such request will not be considered nor approved unless accompanied by documentation that indicates the road acceptance Performance Agreement release process has been initiated. Such documentation shall include the punch list generated by the official inspection, submitted by the developer, and a practical work schedule reasonably designed to complete the punch list within a year. This requirement may be postponed to the next extension request if the Bond Committee has recommended and the Director has approved an extension beyond the fifth year.
5. In situations where the developer has requested an extension or a new Performance Agreement and performance bond, the Bond Committee will review the Director's report on the project and the reasons provided by the developer. Factors to be considered by the Bond Committee include, without limitation:

- a. Percentage of project already completed.
 - b. Number of homes or buildings completed, occupied, and served by public facilities.
 - c. Rate of construction activity.
 - d. Developer's history relating to completion of public improvements in the County and in neighboring jurisdictions.
 - e. Current projected completion cost: Dependent upon the amount of work yet to be completed and the currently estimated cost to complete construction of the project, the Bond Committee may require an increase in the amount of the existing bond to cover the completion of such outstanding improvements and obligations.
 - f. Current rating of the bank or corporate surety providing the performance bond for the Performance Agreement.
6. In the event the developer does not respond to the letter sent by the Director cautioning of potential default or in the event the agreement is in default, the matter will be referred to the County Attorney's Office for guidance and possible legal action.
 7. No Performance Agreement Extension request for a bonded Stormwater Management Agreement shall be accepted for processing until the Bond Committee has determined that such Agreement is qualified for an extension. If such Agreement is not determined to qualify for extension, no extension shall be granted.

C. Effects of Default on the Performance Agreement

It shall be the sole responsibility of the developer to keep the Performance Agreement current.

While the Performance Agreement is in default, the developer shall not be entitled to any bond reduction, release, permits or inspections for the project covered by that Performance Agreement. If the default can be cured by the approval of an extension of the Performance Agreement, then, upon fulfilling the Performance Agreement Extension Submission Requirements set forth above, including payment of the appropriate fees for bond extension and, if applicable, bond reduction, the inspections necessary for such bond extension and, if applicable, bond reduction, will then be performed. The denial of permits and inspections by the Director shall be in addition to any other remedy available to the Board of Supervisors under the Performance Agreement.

D. Performance Bond Reductions

1. Bond Reduction Requirements: Partial releases of bonds, referred to herein as Bond Reductions, shall be granted based upon Completion of specific, identifiable portions of the project and shall be subject to the following limitations:
 - a. No corporate surety bond shall be reduced until Completion of at least 30% of the physical improvements secured by such bond.
 - b. No cash bond shall be reduced until Completion of at least 50% of the physical improvements secured by such bond.
 - c. No letter of credit shall be reduced until Completion of at least 25% of the physical improvements secured by such bond.
 - d. The Board of Supervisors or designee shall not be required to consider more than three (3) Bond Reductions within any twelve (12) month period during the life of the bond.
 - e. No bond shall be reduced to an amount less than 10% of the original Bond Estimate.
 - f. For the purposes of this subsection D, Performance Bond Reductions, "Completion" shall mean construction of any identifiable section of a specified bonded improvement or facility in accordance with the approved site plans, construction plans and profiles, and/or specifications, and the provisions of this Facilities Standards Manual. For example, for a specific section of public roadways to be eligible to be considered for Bond Reduction, the grading, subbase, base paving, curb and gutter, including all compaction and lab tests, and all other aspects of construction, with Exceptions as defined herein, shall be completed and all work in place must be in good condition. The "good condition" requirement shall not be deemed satisfied for any such section where there exists any failing pavement.
 - g. "Exceptions" to the Completion requirement may include final surface pavement and any other ancillary, uncompleted improvements such as sidewalks, driveway aprons and lot grading which the Director or designee determines would probably suffer excessive damage during construction upon the property abutting the bonded improvement or facility.
 - h. The reduction of any performance bond shall not be considered acceptance of the bonded improvements or facility for which such reduction has been requested, and the developer shall have a

continuing responsibility for maintaining such bonded improvements or facility in good condition, including without limitation the repair of deterioration and damage, until they have been formally accepted by the County, VDOT, or other appropriate agency. Failure to perform such maintenance within thirty (30) days of being so directed by the Director or designee shall constitute default of the Performance Agreement.

- i. When any Exception to the Completion requirement is permitted, the amount of the bond as reduced shall include the cost of constructing or repairing such final surface pavement or other uncompleted bonded improvements or facility. In no event shall any bond be reduced to an amount less than the amount deemed necessary by the Board of Supervisors or designee to cover (i) the total estimated cost of achieving total completion of the project without exceptions, plus (ii) the entire ten percent (10%) Contingency Factor included in the original approved Bond Estimate, plus (iii) the inflation factor referenced above in Section 8.304.A, applied to (i) and (ii).
 - j. When a developer has achieved completion of a portion of a project subject to a Performance Agreement and performance bond, and such portion has been accepted into the state system for maintenance by VDOT, such developer may revise the approved site plans and/or construction plans and profiles to exclude such accepted portion and submit such revised site and/or construction plans and profiles to the Director along with a revision of the original Bond Estimate to cover only the portion not yet accepted. The Board of Supervisors or designee, may, upon recommendation of the Bond Committee, approve such revised Bond Estimate and any consequent Bond Reduction in accordance with the foregoing Bond Reduction requirements as applied to such revised Bond Estimate.
 - k. No bond shall be reduced for a Performance Agreement that is in default.
2. Bond Reduction Procedures: A request for a reduction of the bond amount shall be deemed to have been made when the developer has provided notice to the Director in the following manner. The Bond Reduction Request shall not be deemed to have been made until the following items have been submitted as one complete package. Such notice shall include:
- a. A written request for reduction of the bond amount, signed and acknowledged by the developer who executed the Performance Agreement. When applicable, such written request shall include a certification by the developer that the installation of all underground utilities located within the bounds of any public or private roadway

covered by such bond has been inspected and approved by the utility provider.

- b. An estimate prepared by a Licensed Professional Engineer (P.E.) or Surveyor that shows the quantities of all bonded improvements in place, complete, and in good condition.
- c. Written consent, signed and acknowledged by a duly authorized officer or agent of the corporate surety, banking institution, or other approved surety which provided the performance bond.
- d. The applicable processing fee; and
- e. Inspection reports in accordance with this Chapter.
- f. If applicable, a recorded Stormwater Maintenance Agreement as defined in Chapter 1096 of the Loudoun County Codified Ordinances and as referenced in the Performance Agreement to establish the mutual responsibilities of the County and the property owner for maintenance of such facility. Such Stormwater Maintenance Agreement shall be in a form approved by the County Attorney and executed by the Director of the Department of General Services.

- 3. After a Bond Reduction is approved, an amendment to the performance bond shall be submitted to reflect the reduced amount. A Bond Reduction shall not be deemed final and in effect until the Director has issued a letter of approval and the appropriate amendment to the performance bond is received by the County.

E. Acceptance of Public Improvements and Release of Performance Agreement and Bond

- 1. Upon meeting criteria for release of the Performance Agreement and Bond, the developer shall submit to the Director:
 - a. A set of Record Drawings certified as to construction by a Licensed Professional Engineer (P.E.) or Surveyor in accordance with this Chapter.
 - b. If requested by the County, third party inspection reports in accordance with this Chapter.
 - c. A request, in writing, that a joint inspection to be made by VDOT and the Director.

- d. If applicable, a recorded Stormwater Maintenance Agreement as defined in Chapter 1096 of the Loudoun County [Codified Ordinances](#) and as referenced in the Performance Agreement to establish the mutual responsibilities of the County and the property owner for maintenance of such facility. Such Stormwater Maintenance Agreement shall be in a form approved by the County Attorney and executed by the Director of the Department of General Services.
 - e. If applicable, a Letter of Map Revision (LOMR) from FEMA.
2. In addition to the above and as may be required:
- a. As for Roadway Improvements to be accepted by VDOT:
 - i. Upon acceptance and approval by VDOT of the complete street acceptance package, the Director shall request an inspection with VDOT. Once VDOT has scheduled the inspection, the Director shall provide notice to developer. Representatives for the developer, County and VDOT shall be present at the inspection. Subsequent to such inspection, a punch list of those items requiring correction will be prepared. The Director shall notify the developer, in writing, of the items requiring correction or revision by providing a copy of such punch list within 15 days of the inspection date.
 - ii. The developer shall complete all of the corrective work shown on the punch list within 30 days. This punch list shall not relieve the developer of any latent defects which might become apparent prior to roadway acceptance by VDOT. If punch list corrections are not completed within the allotted time, the entire project may be subject to re-inspection.
 - iii. The developer shall notify the Director, in writing, upon completion of the punch list items and shall request final inspection. The Director shall set a date for joint inspection with VDOT and the developer within 30 days of the request. Subsequent to final inspection, the Director shall await written notification from VDOT as to whether the road, as constructed, meets the applicable construction standards of VDOT as of the date of inspection. If not, the procedures herein may be repeated, as applicable.
 - iv. If all criteria for acceptance by VDOT have been met, the Board of Supervisors or designee shall cooperate with the developer to obtain acceptance into the State system, as provided in this Chapter.

- v. If final inspection indicates that the developer has fully performed as to construction, but that the road(s), due to factors other than quality of construction, are not acceptable into the state system, the developer shall enter a maintenance and indemnification agreement with maintenance and indemnification bond, in form approved by the County Attorney and executed by the Board of Supervisors or designee, guaranteeing that the developer shall maintain the roads in the same condition as existed at final inspection until such time as VDOT road acceptance occurs. Such maintenance and indemnification bond shall be in an amount as recommended by the Bond Committee and approved by the Board of Supervisors or designee. Maintenance responsibility for the road(s) shall remain with the developer until such time as the road(s) are accepted by VDOT.
 - vi. When the road(s) have been accepted by VDOT or when the maintenance and indemnification agreement required herein is approved by the Board of Supervisors or designee, the Bonding requirements, except for any ancillary improvements outside the right of way, for such road(s) shall be deemed satisfied for the purposes of record plat approval.
- b. As for public improvements to be accepted by the County, a homeowners association, a property owners association or other entity or agency:
 - i. After the developer has requested the release of a performance agreement and performance bond pursuant to the provisions of this section, the Director will schedule an inspection of such bonded improvements for which the release is requested within 30 days. (This inspection may occur at the same time as the VDOT inspection.)
 - ii. The Director shall notify the developer in writing of any items requiring correction or revision within 15 days of receipt of the request for a release.
 - iii. A request by, or the consent of, the developer to reschedule an inspection shall constitute a waiver of the 15-day period for the Director to notify the developer of the items requiring correction.
 - iv. Developer shall complete all of the corrective work shown on the punch list within 30 days. If punch list corrections are not completed within the allotted time, the entire project may be subject to re-inspection.

3. A request for final release of a performance agreement and associated performance bond, or request to reduce the amount of a performance bond associated with a Performance Agreement that includes a guarantee against latent defects and deficiencies in accordance with Section 8.305.F, to the LDIA bond amount shall be deemed to have been made when the developer has provided written notice to the Director or Director's Designee. Such notice shall include:
 - a. A written request for final release of a Performance Agreement and associated performance bond, or request to reduce the amount of a performance bond to an LDIA bond amount, signed and acknowledged by the Performance Agreement's developer or developer's representative.
 - b. If requested by County and to the extent not previously submitted pursuant to bond reduction request, copies of inspection and test reports if work was inspected and tested by a third-party inspector. If previously submitted, reference must be provided as to when submission was made.
 - c. Certification that all bonded improvements, other than improvements accepted by VDOT, have been completed in accordance with the approved plans, profiles, and specifications and the requirements of this manual. For improvements to be accepted for maintenance by VDOT, such certification shall state that the improvements have been installed and inspected in accordance with VDOT requirements.
 - d. The applicable processing fee(s).
 - e. A copy of the County approval of the record drawings as required for facilities within public rights-of-way or easements submitted pursuant to Section 8.108 of this Facilities Standards M.
 - f. For subdivisions, a letter from a Licensed Professional Engineer (P.E.) or Surveyor certifying that property corners have been set.
 - g. Documentation of acceptance by VDOT of public roadways and rights-of-way or a maintenance and indemnification agreement secured by adequate maintenance and indemnification bond in accordance with this Section 8.300.
 - h. A letter of acceptance by the entity responsible for maintaining physical improvements requiring private maintenance and a Latent Defects Indemnification Agreement secured by adequate bond (LDIA Bond) in accordance with this Section 8.300.

4. Within 30 days of receiving a release request which meets the requirements of this Subsection, unless such 30 days is waived as provided herein, the Director shall inform the developer in writing of any construction defects, deficiencies, or omissions. Failure of the Director to respond within such 30 days, unless waived, shall be governed by the provisions of Section 15.2-2245 of the Virginia Code, for which purposes the County Administrator serves as the Chief Administrative Officer of the Board of Supervisors and the Department of Building and Development as its designated administrative agency.
5. No bond shall be released for a Performance Agreement that is in default.

F. Latent Defect Indemnification Agreement and Bonds

Before a Performance Agreement and performance bond guaranteeing construction of physical improvements not maintained by VDOT is released, a Latent Defect Indemnification Agreement secured by an adequate bond (LDIA Bond) shall be provided by the developer and approved by the Board of Supervisors or designee. For purposes of this Section F. “physical improvements” shall mean roadways and associated sidewalks/trails, and stormwater drainage or stormwater management facilities.

Such guarantee shall provide that the developer will be responsible for repairs to all physical improvements not maintained by VDOT arising from construction deficiencies discovered and as determined by the Director within a period of fifteen (15) months following the date of written approval of such physical improvements, with such repairs to be made within thirty (30) days after notification by the Director, or designee, that such repairs are needed, or such longer time as the Director or designee approves. If repairs are not accomplished within that time, the developer shall be deemed to be in default of the Agreement and LDIA Bond, and the Director may take any appropriate action provided for in such Agreement, including calling upon the LDIA Bond securing such Agreement in order to perform the repairs.

The LDIA bond amount shall be established as follows:

1. If only physical improvements not maintained by Virginia Department of Transportation (VDOT) are included in the original Performance Agreement and performance bond the LDIA bond amount shall be equal to no less than five (5) percent of the approved Bond Estimate, as determined by the Director.
2. If physical improvements maintained by Virginia Department of Transportation (VDOT) are included in the original Performance Agreement and performance bond, the LDIA bond amount shall be equal to no less than ten (10) percent of the cost of all physical improvements not maintained by VDOT. The LDIA Bond amount shall be calculated by a

Licensed Professional Engineer (P.E.) or Surveyor and submitted to the Director for approval.

G. Vacation of Plat as Alternative to Subdivision Default

Failure by the developer to perform its obligations under a Performance Agreement constitutes a default. This section provides an option that may allow the parties to avoid or correct a default situation where completion of the project is inappropriate or not feasible.

1. The option of total or partial vacation is available with the consent of the Board of Supervisors if accomplished by a written instrument in accordance with the provisions of Sections 15.2-2270, 15.2-2271 or 15.2-2272 of the Code of Virginia. Such written instrument, together with any plat of vacation necessary to clarify the nature of the vacation, shall be submitted to the Director along with a written explanation of the reason for seeking such vacation or partial vacation, and the Director shall submit such vacation request to the Board of Supervisors for approval.
2. Portions or sections of the subdivision in which construction has commenced or in which lots have been occupied or house construction has begun may not be vacated and must be completed and public improvements therein accepted by the appropriate public body or association. Under appropriate circumstances, as determined by the Board of Supervisors or designee, and in accordance with the policy stated herein relating to maintenance agreements and bonds, such completed improvements may be placed under security of a maintenance bond pending acceptance.

H. Construction of Road Improvements Prior to Approval of Plat or Plan

If the developer elects to construct the public road improvements prior to obtaining approval of a record plat or site plan, the following requirements shall apply:

1. Before beginning construction, the developer shall submit construction plans and profiles to the Director, as provided in the Land Subdivision and Development Ordinance and this Facilities Standards M. The Director shall submit such plans and profiles to VDOT for review and approval. After such construction plans and profiles have been approved by the Director, the developer shall obtain the required grading permits from the Director and all other required permits before commencing construction.
2. The developer shall then construct the road according to the approved plans and profiles and all applicable VDOT regulations existing at the time of construction. During construction the developer shall be responsible for obtaining all necessary inspections by VDOT or by third party inspectors in accordance with the requirements of this manual.

3. After the construction is completed, the developer shall submit to the Director:
 - a. A set of Record Drawings certified as to construction by a Licensed Professional Engineer (P.E.) or Surveyor in accordance with this Chapter.
 - b. If requested by the County, third party inspection reports in accordance with this Chapter.
 - c. A request, in writing, that a joint inspection be made by VDOT and the Director.
4. Upon acceptance by VDOT of the complete street acceptance package, the Director shall request an inspection with VDOT. Once VDOT has scheduled the inspection, the Director shall provide notice to developer. Representatives for the developer, County and VDOT shall be present at the inspection. Subsequent to such inspection, a punch list of those items requiring correction will be prepared. The Director shall notify the developer, in writing, of the items requiring correction or revision by providing a copy of such punch list within 15 days of the inspection date.
5. The developer shall complete all of the corrective work shown on the punch list within 30 days. This punch list shall not relieve the developer of any latent defects which might become apparent prior to roadway acceptance by VDOT. If punch list corrections are not completed within the allotted time, the entire project may be subject to re-inspection.
6. The developer shall notify the Director, in writing, upon completion of the punch list items and shall request final inspection. The Director shall set a date for joint inspection with VDOT and the developer within 30 days of the request. Subsequent to final inspection, the Director shall await written notification from VDOT as to whether the road, as constructed, meets the applicable construction standards of VDOT as of the date of inspection. If not, the procedures herein may be repeated, as applicable.
7. If all criteria for acceptance by VDOT have been met, the Board of Supervisors or designee shall cooperate with the developer to obtain acceptance into the State system, as provided in this Chapter.
8. If final inspection indicates that the developer has fully performed as to construction, but that the road(s), due to factors other than quality of construction, are not acceptable into the state system, the developer shall enter a maintenance and indemnification agreement with maintenance and indemnification bond, in form approved by the County Attorney and executed by the Board of Supervisors or designee, guaranteeing that the developer shall maintain the roads in the same condition as existed at final

inspection until such time as VDOT road acceptance occurs. Such maintenance and indemnification bond shall be in an amount as recommended by the Bond Committee and approved by the Board of Supervisors or designee. Maintenance responsibility for the road(s) shall remain with the developer until such time as the road(s) are accepted by VDOT.

9. When the road(s) have been accepted by VDOT or when the maintenance and indemnification agreement required herein is approved by the Board of Supervisors or designee, the Bonding requirements, except for any ancillary improvements outside the right of way, for such road(s) shall be deemed satisfied for the purposes of record plat approval.

8.306 DEBARMENT OF SURETY

A. Purpose

Any person, company, association or other legal entity otherwise qualified to act as Surety for any performance bond may nevertheless be debarred from acting in such a capacity on any performance bond (including maintenance and indemnification and LDIA bonds) provided for the benefit of the Board of Supervisors. Such debarment shall be in accordance with the provisions of this Section.

B. Debarment Procedure

1. Bond Committee Recommendation.

In accordance with §8.300(B), the Bond Committee shall have the authority to recommend to the Director the debarment for cause of any person, company, association or other legal entity from acting as Surety on agreements where the Board of Supervisors is the obligee. The determination of the Bond Committee to recommend debarment of a Surety shall be made by majority vote of the members of the Bond Committee.

2. Notice.

Upon recommendation of debarment by the Bonding Committee and acceptance of that recommendation by the Director, any person, company, association or other legal entity debarred as a Surety in the County shall be notified in writing by the Director. The Notice of Debarment shall be sent via U.S. Mail or package delivery company and state the reasons for the actions taken and the debarment shall be final unless the Surety appeals within 30 days of issuance of the notice by giving written notice of its desire to invoke the debarment appeals procedures to the Board of Supervisors as set forth herein.

An appeal to the Board of Supervisors must be initiated by the filing of a notice of appeal with the Board of Supervisors within 30 days of issuance of Notice of Debarment. It is not sufficient that notices of appeal be postmarked within the time limits. The Notice of Appeal must actually be delivered within the time limits. The Notice of Appeal shall include a statement of appeal as well as copies of exhibits the Surety plans to present and a list of witnesses the Surety plans to call. The statement, exhibits and witnesses shall be amended no later than 30 days before any hearing.

If the Surety fails to appeal within 30 days, notice shall be provided to all developers who have provided corporate surety bonds from the debarred Surety that the Surety no longer provides a satisfactory performance guarantee and must be replaced by an adequate replacement performance bond at the request of the Director.

3. Cause for Debarment.

Cause for debarment may consist of, but is not limited to, the following:

- a. The Surety files for bankruptcy or reorganization in the bankruptcy court system or becomes insolvent or bankrupt or makes an assignment for the benefit of creditors or consents to the appointment of a trustee or receiver, or either a trustee or receiver is appointed for the Surety or for a substantial part of its property without its consent;
- b. The Surety is in default according to notice by the Director or the Director's designee on one (1) or more performance bonds to which the Board of Supervisors is the obligee, or having breached its obligations under a bond in the past fails to provide reasonable assurances that it will discharge its obligations under the future performance bonds;
- c. The Surety asserts it will not perform under a performance bond;
- d. Any managing or policy-making officer of the Surety, acting in the course of his employment or on behalf of the Surety, is convicted under State or Federal statutes of embezzlement, theft, forgery, bribery, falsification or destruction of records, fraud, or any offense indicating a lack of business integrity or business honesty which substantially affects the Surety's responsibility/reliability as surety for performance of duties owed to the County;
- e. The Surety is in default on one (1) or more identical or substantially similar performance agreements with any other political subdivision of the Commonwealth;

- f. The Board of Supervisors adopts a resolution to file suit for any reason to enforce the bond or Performance Agreement of any other agreement that the Board of Supervisors and Surety may have entered into;
- g. Any other cause exists which the Bond Committee determines to be so serious and compelling as to affect responsibility as Surety, such as debarment by another governmental entity for any cause listed herein, or because of prior suspensions or reprimands.

4. Effect of Debarment.

If cause exists, the Bond Committee may recommend that the person, company association, or legal entity be barred from acting as Surety on any and all County performance agreements for a period of up to five (5) years. The Bond Committee is not obligated to recommend nor is the Director obligated to impose the maximum period of debarment. The Director may take into consideration any mitigating circumstances and other factors which may justify the imposition of less than the maximum time of debarment. Further, the Director may establish such terms and conditions as deemed appropriate in connection with the acceptance of that Surety's future contracts. The Director's decision, if any appeal is taken, shall be in writing and include reasons substantiating the decision.

C. Procedure for Appeal of Debarment.

- 1. The appeals hearing for debarment shall be conducted by the Board of Supervisors and shall be held within 60 days of the Surety's appeal, unless the entities agree otherwise, but in no event greater than 120 day of the Surety's appeal. The Surety will be given the opportunity to be heard, submit documentary evidence, and present witnesses as stated in the Notice of Appeal.
- 2. The hearing shall be conducted as follows:
 - a. The Director may make its presentation first.
 - b. The Surety shall then be afforded the opportunity to present its response.
 - c. The Director shall then have the opportunity to rebut.
 - d. The Board of Supervisors may ask questions and request additional information from the Director, staff, or the Surety.
 - e. Based on these findings, the Board of Supervisors may sustain, dismiss or modify the debarment decision of the Director.

3. Pending any appeal of debarment, the Director shall neither accept the appealing Surety's bonds (performance or otherwise) nor approve the extension of Performance Agreements guaranteed by the appealing Surety's performance bond.
4. Board of Supervisors Decision and Notice.
 - a. Following the hearing, the Board of Supervisors may uphold, overrule, or modify in some manner as it may specify the Director's decision.
 - b. Notice of the Board of Supervisors decision of an appeal shall be by U.S. Mail or package delivery company to the Surety and the Director and Bond Committee or their designees. The Clerk to the Board of Supervisors shall be responsible for providing such notice.
 - c. If the Board of Supervisors denies the Surety's appeal of debarment, notice shall be provided to all developers who have provided corporate surety bonds from the debarred Surety that the Surety no longer provides a satisfactory performance guarantee and must be replaced by an adequate replacement bond at the request of the Director.
5. Appeal of Board of Supervisors Action

Any appeal of the decision of the Board of Supervisors shall be made to the Loudoun County Circuit Court within thirty days of issuance of notice and following the provisions and statutory requirements of the Code of Virginia.

8.400 CERTIFICATE OF OCCUPANCY OR USE

No certificate of occupancy or use shall be issued for residential, commercial, institutional, or industrial uses until required improvements as specified by the Board of Supervisors or designee, Planning Commission, or Board of Zoning Appeals are installed, inspected, and approved by the Director and the Zoning Administrator. Concurrent with the final inspection, it shall be verified that the developer has fulfilled the conditions of approval/proffers which are applicable to an occupancy within the development.

Upon a request for issuance of a certificate, a final inspection shall be made within ten (10) working days of the request. Prior to the issuance of an occupancy permit, all required improvements not installed shall be bonded in accordance with Section 8.300 of this manual.

8.500 INSPECTIONS

Inspections are required for infrastructure improvements, as shown upon approved site plans or construction plans and profiles, for bond release, acceptance of such improvements into the State system, or issuance of Certificate of Occupancy or Use. Inspections shall be sufficient to insure that the improvements have been installed in accordance with the approved site plans or construction plans and profiles and applicable VDOT standards and specifications.

A. Types of Inspections

Inspection reports shall address the following items, as applicable:

1. Compaction of embankments, compaction of trench and structure backfill, compaction of sub-grade, sub-base and base for roads and the compaction of base for walks and curbs.
2. Roller patterns and control strips and theoretical and actual densities for base and final pavement.
3. Appropriate concrete tests for concrete structures and facilities.
4. Independent structural inspections for both precast and cast-in-place concrete structures.
5. Overpasses and bridges.
6. Such additional items as the nature of the construction and the Director shall reasonably require.

B. Third Party Inspections

1. Applicability

Third party inspections are acceptable for public roadways and are required for private roadways, alleys, and all stormwater management facilities, including structures and impoundment embankments, associated with such public or private roadways or alleys.

2. Personnel Qualifications and Supervision

Tests must be performed by a certified soil, asphalt or concrete technician as appropriate. Technicians holding certifications other than those issued by the Materials Division of VDOT must provide evidence that VDOT accepts the certification as an equivalent. These technicians must be operating under the direct supervision of a professional licensed in the state to perform such work.

3. Reporting and Submission Requirements

Tests required hereunder must be available upon request to County or VDOT personnel after construction commences and must be part of the final submission to the County at project completion in conjunction with the Record Drawings, as specified in Section 8.108 of this manual. The final submission must be accompanied by a cover letter signed and sealed by the supervising professional certifying that the project has been tested in accordance to VDOT specifications and the construction of the project meets the criteria set forth by the County and VDOT.