Article 14, Appendix A:

DEFINITIONS, CRITERIA AND DESIGN GUIDELINES FOR CALCULATION OF LAND HOLDING CAPACITY AND NET DEVELOPABLE AREAS

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1. Introduction to Environmental Performance Standards

The Town's revised zoning ordinances incorporates contemporary land evaluation and environmental analysis techniques into the determination of appropriate land holding capacities and land use densities for new development and redevelopment in Smithfield. This techniques have been used throughout Virginia and allow for both property owners and public officials to better evaluate the development potential of urban real estate.

This Appendix provides the rationale and recommended methodology to used in calculating the *"net developable area"* and *"land holding capacities"* for the Town's zoning districts. The use of this environmental planning process will promote sound land use planning principles and facilitate compliance with the environmental and natural resource goals and objectives which are fundamental to Smithfield's Comprehensive Plan and growth management program.

2. Land Holding Capacities: Zoning Ordinance Concepts for New Development

A Comprehensive Plan, by definition, is a locality's effort to do what is right, or most suitable, for the land. In turn, the Plan is translated into reality via the zoning and subdivision ordinances. In contemporary ordinances, environmental performance standards are employed as a quantitative criteria to establish the suitability of land for new development. The recommended process to be incorporated into the Town's zoning ordinance allows for the actual physical characteristics of the land to determine its inherent *"holding capacities."* Virginia's enabling statutes for planning and zoning support an environmental performance standards as a basis for undergirding the development suitability process. This process presents a more logical approach to define and allocate land holding capacities and development densities to individual properties.

"Land holding capacities" are normally viewed in terms of land use density and intensity. While most traditional zoning and comprehensive planning practices in Virginia allocate land use densities to the land with little regard for the slope, soil type, vegetation, floodplains, wetlands, geology and existing development, the recommended development suitability process allows land use decisions related to density and specific use to be determined by the character of the land and its underlying physical, environmental, and geological influences.

From a general land planning perspective, more intelligent future land use decisions can be made from this form of analysis. However, land use decisions also must be tempered by Smithfield's open space, public recreation, and environmental conservation objectives. For instance, gently sloping or perfectly flat land is normally judged as being more "suitable" than steeply sloped land for commercial development via the application of typical environmental performance standards. However, the Comprehensive Plan may view the same flat land as being more appropriately allocated to long-term public park or recreational use because of the environmental attractiveness of the particular property.

Thus, a property's environmental-based *"holding capacities,"* in and of itself, does not specifically point to the optimal land use for a given property, but, rather, it prescribes the land use density (or intensity) which is considered most appropriate by the provisions of the particular zoning district for which the property is mapped.

3. General Criteria for Environmental Performance Standards

The criteria for environmental performance standards serve to identify the most relevant and significant land units to be included in the calculation of land holding capacities. This process would be initiated in the early stages of the land development process by the developer or subdivider during the preparation of plats and plans for cluster residential developments as well as attached and multi-family projects.

Because land units containing critical environmental areas oftentimes pose significant site development constraints, the zoning ordinance should require that the following critical environmental characteristics be identified, mapped and fully considered in any subdivision proposal:

1. *Slopes less than 10% are generally suitable for most land development, including agricultural and forestry. In this slope range, a physical rational cannot be used to justify one use over another.*

2. *Slopes in the 10%-20% range begin to restrict more intensive development, certain land uses and the overall physical capacities of a project.*

3. *Slopes in the 20%-30% percent range significantly constrain most types of development and should be restricted.*

4. *Slopes greater than 30% severely limit most development on the Town's critical hillsides and should be greatly restricted and avoided to the extent possible.*

5. *Floodplains, wetlands, tributary streams, lakes, and major drainage channels are physical systems necessary to maintain hydrologic balance in a watershed and development in those areas should be avoided.*

6. *Soils with low bearing capacities and high permeability have restricted suitability for non-agricultural development, and the total permissible density should be reduced.*

7. *Soils with shrink/swell soil characteristics pose severe hazards for land development, including increasing the potential for foundation settlement. Residential development on lands identifying as having shrink/swell soil characteristics should only be permitted after a geotechnical and foundation design report has been prepared for each proposed lot. Such report shall be prepared by a professional engineer and shall address soils preparation and foundation design recommendations for the intended structure(s). No plat or site plan shall be approved for recordation until a foundation engineering report has been reviewed and approved by the Town .*

8. *Highly erodable soils pose limitations for urban uses, and the scale, density and character of development should limit adverse environmental impacts.*

9. *Significant vegetative cover is a valued element of the Town's natural system because of its ability to protect state water quality by natural means. The development of non-agricultural uses must respect its maintenance and conservation.*

10. *Land areas for major public rights-of-way and easements to accommodate public infrastructure should be reserved as a part of private development proposals.*

The Planning Commission and Town Planners will carefully consider these land characteristics and apply them in evaluating all land development proposals, not just residential projects. However, for the purposes of providing for an example of the calculation of net developable areas, a project to be developed under the Town's A-R, Attached Residential (Townhouse) District is employed. From the above information conclusions should be drawn by the applicant and the Town with respect to the following key aspects of a property's development potential:

(1) the overall suitability of an site for development;

(2) the prime areas for the siting of appropriate (zoned) uses for an area;

(3) the land use carrying capacities;

(4) environmentally sensitive land units where urban uses should be restricted; and

(5) specific areas of a property that should be reserved for facilities and infrastructure.

4. Environmental Performance Standards for New Residential Development: Criteria for "Net Developable Areas"

Simply stated, the ability of land to "hold" or "absorb" development is directly correlated to its capacity to be put to good use, i.e. *good land "holds more" than bad land*. In other words, Mother Nature has given each tract of land certain physical and environmental attributes which are unique to any other piece of property. Zoning law enables a locale to assess these distinguishing attributes in assessing the physical development potentials of a given property. Environmental performance standards are a means by which the Town's zoning ordinance designates the process by which "holding capacity" is determined. These standards recognize that the maximum density or yield of proposed developments and subdivisions should be assessed by calculating the "net developable area" of the land on which a project is proposed.

In order to establish a realistic measure of land holding capacity for an area or parcel in the Town, "effective capacity ratings" are to be assigned to the critical physical and environmental land units contained within a given property proposed for development. Critical physical and environmental land units include *shrink/swell soils, floodplains, wetlands, steep slopes, rights-of-way and other sensitive ecological characteristics* of a property. This concept enables the Town and the developer's site planner or engineer to critically assess the site's land carrying capacity based on the environmental limitations of the particular property.

The product of the "effective capacity rating" multiplied by the area of the land unit yields the available net acreage which qualifies for development density. In other words, the "effective capacity rating" is a ratio that establishes the percentage of the land qualifying for an allocable density credit. After determining the permitted land use (as provided for by zoning), the total development yield is based on the available net acreage multiplied by the density credit for that use as cited in the zoning ordinance.

Consider the following example: 10 acres of a parcel is floodplain, and, based on the prevailing trends in urban land use, active development within a floodplain should be prohibited. On this basis, the "effective capacity rating" of the site's floodplain area as zero (0.0), and the product of

floodplain acreage multiplied by the "effective capacity rating" is zero (10 acres x 0.0 effective capacity rating = 0 acres). As a result, floodplains do not contribute to or qualify for inclusion in the calculation of the "net developable area."

In addition, the same tract may have 5 acres of land with slopes ranging from 10%-20%. The zoning ordinance establishes an "effective capacity rating" equal to 0.7 for 10%-20% slopes. The product of the "effective capacity rating" (0.7) multiplied by the land area of this environmental land unit (5 acres) is 3.5. Therefore, 3.5 acres of the total 5.0 acres serves as the qualifying environmental land unit in computing the development capacity of the property. It follows that only after a cumulative analysis of each environmental land unit and its related "effective capacity rating" can the total carrying capacity for a property be determined.

Listed below are the environmental land units and capacity ratings to be used in determining the "net developable area" and "land holding capacities" for subdivisions and site development proposals. The computation of "net developable areas" will be subject to detailed site engineering and environmental studies that must accompany the preparation of a private development application. All "environmental land units" should be mapped, categorized, and their acreages determined by the applicant's engineer.

Physical/Environmental Land Units		***Effective capacity Rating***
1.	*Slopes (0%-10%)*	*1.0*
2.	*Slopes (10%-20%)*	*0.75*
3.	*Slopes (21%-30%)*	*0.5*
4.	*Slopes (greater than 30%)*	*0.1*
5.	*Soils with high shrink/swell characteristics*	*0.75*
6.	*Public Rights-of-Way and Major Easements (Existing or Proposed)*	*0.0*
7.	*Designated Wetlands*	*0.0*
8.	*Floodplains, Streams, Rivers, and Drainage Channels*	*0.0*
9.	*Permanent Erosion and Sediment Control Facilities*	*0.0*
10.	*Ponds, Water Features, and Stormwater Retention Areas*	*0.0*

5. A-R, Attached Residential District Subdivision Case Study

To further illustrate this methodology for determining "net developable area" and "development capacity," the following illustration applies the residential townhouse density of eight dwelling units per acre in the Town's A-R, Attached Residential District.

A. Illustration Assumptions: A-R Residential District (Townhouses @ 8 DU/AC)

Zoned Land Use:	A-R Residential
Zoning District Maximum Density:	8 units net acre
Planned Land Use:	Townhouses
Gross Acreage:	100 acres
Existing and Planned Rights-of-Way:	10 acres
Floodplains:	5 acres
Slopes (10%-20%):	5 acres
Slopes (21%-30%):	10 acres
Slopes (31%+):	2 acres
Ponds:	1 acre

B. Compute "Net Developable Area" of the Property's Environmental Land Units

	Acres x Capacity Rating	Net Developable Area of Unit
Planned Rights-of-Way:	10 acres x 0.0	0.0 acres
Floodplains	5 acres x 0.0	0.0 acres
Slopes (10%-20%):	5 acres x 0.75	3.8 acres
Slopes (21%-30%):	10 acres x 0.5	5.0 acres
Slopes (31%+):	2 acres x 0.1	0.2 acres
Ponds:	1 acre x 0.0	0.0 acres
Site Area Impacted by Environmental Land Units:	33.0 acres	
Qualifying Acreage of Environmental Land Units for "Net Developable Area" Calculation:		9.0 acres

C. Compute "Net Developable Area" of the A-R Zoned Property

Gross Acreage of A-R Property:	100.0
Less: Area of Environmental Land Units:	-33.0
Available Acreage (less Environmental Land Unit Area):	67.0
Add: Qualifying Area of Environmental Land Units:	+ 9.0
Total "Net Developable Area"	76.0 acres

D. Compute "Development Capacity" for A-R District, Townhouse Residential Use

8.0 dwellings unit per acre x 76.0 net developable acres: 608 units

E. Allowable “Net Density” of A-R District Residential Development

608 Dwelling Units / 100 Acres: 6.1 DU/AC

6. Summary

The application of this "performance-oriented" methodology offers Smithfield a legally supportable and environmentally sound process through which the land use carrying capacity of any land development proposal can be measured. It is intended to be applied to both the subdivision and the site plan process and is particularly applicable to cluster development.

When the "net developable area" concept is used in conjunction with good site planning and subdivision standards for individual development projects, the Town is able to more effectively merge conventional zoning techniques with well balanced, environmental performance standards. The end result will be a more realistic implementation process that is more responsive to the physical attributes and ecological qualities of the land. In this fashion, the land is truly allowed to "speak for itself," and, in so doing, the link between comprehensive planning goals and zoning regulations is more integrally established.

One essential test of Virginia zoning law is "uniformity". The "performance-oriented", net-developable area approach to growth management ensures a uniform application of regulatory criteria and land holding capacities to land with differing sizes, physical and geological characteristics, and other environmental characteristics.