107-11-PFM
(Also see Amendment 14-11-107,
adopted simultaneously on June 7, 2011.)

ADOPTION OF AMENDMENTS TO THE

PUBLIC FACILITIES MANUAL

OF THE COUNTY OF FAIRFAX, VIRGINIA

At a regular meeting of the Board of Supervisors of Fairfax County, Virginia, held in the Board Auditorium of the Government Center at Fairfax, Virginia, on Tuesday, June 7, 2011, the Board after having first given notice of its intention so to do, in the manner prescribed by law, adopted amendments to the Public Facilities Manual of the County of Fairfax, Virginia, said amendments so adopted being in the words and figures following, to-wit:

BE IT ORDAINED BY THE BOARD OF SUPERVISORS OF FAIRFAX COUNTY, VIRGINIA:

Amend the Public Facilities Manual, as follows:

Amendment to Chapter 4 (Geotechnical Guidelines)

Amend Chapter 4, where insertions are shown as underlines and deletions are shown as strikeouts, to read as follows:

4-0000 GEOTECHNICAL GUIDELINES – TABLE OF CONTENTS

4-0000 GEOTECHNICAL GUIDELINES

4-0100 PROCEDURES

4-0101 General Policy[1] ~~General Policy (See also § 11-0408 et seq.)~~

4-0101.1 The purpose of these guidelines for the preparation of geotechnical ~~studies~~ reports is to outline minimum recommended procedures for planning, organizing and conducting subsurface exploration, sampling, testing and engineering analysis in conjunction with ~~subsurface~~ geotechnical studies. The guidelines are not to be considered as rigid. The planning of exploration, sampling and testing programs, and close supervision of the work shall be vested in a competent geotechnical engineer who has experience in this type of work and who is licensed by the State. Geotechnical reports must be prepared by, or under the direction of, a professional authorized by the State to perform such work.

4-0101.2 ~~For problem soils, a GRB~~ The Geotechnical Review Board (GRB) has been established to review ~~soils~~geotechnical reports and associated plans referred to it by the Director and~~. The GRB is required~~ to provide recommendations to the Director on the sufficiency of the investigations, analyses, and proposed designs and construction techniques. The GRB will review all geotechnical reports and associated plans for projects located in areas of problem soils that the Director determines pose a serious threat of soil-related problems.

4-0102 Scope

4-0102.1 Experience has shown that ~~in certain areas of the County~~ there are potential problems associated with certain types of soils including ground slippage and instability of Cretaceous Age deltaic clays, ~~often called~~ identified as Marumsco soils and/or "marine clays," shrinking and swelling of certain clays, ~~and high water table conditions.~~ soils with shallow water tables, soils containing hazardous material, buried waste sites, uncompacted and/or undocumented fills, and/or earthen structures that would require special precautions for safety during and after construction activity. The extent of such soils has been approximately delineated on the County soils maps which have been adopted by the Board. Problem Soils are defined in Chapter 107 (Problem Soils) of the County Code. Any grading and/or construction of any building or structure, modification to add to the exterior dimensions of any existing building or structure, or any foundation related work on land containing problem soils must comply with the applicable provisions of Chapters 107 (Problem Soils), 112 (Zoning Ordinance), and 101 (Subdivision Ordinance) of the County Code and any applicable Federal or State Regulations.

4-0102.2 There are implied warranties for the foundation of new dwellings in accordance with Virginia Code § 55-70.1.

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[1] See also §§ 6-1605, 6-1606, 6-1607, and 11-0408 et seq.

~~4-0102.2 The guidelines are not to be considered as rigid. The planning of exploration, sampling and testing programs and close supervision of the work shall be vested in a competent geotechnical engineer and/or engineering geologist who has experience in this type of work and who is licensed to practice engineering in Virginia.~~

4-102.3 The geotechnical report is generally prepared in support of an associated site or grading plan. The submission requirements for geotechnical report outlined in this section is in relation to the associated site or grading plan for the proposed project, as required per Chapter 107 (Problem Soils) of the Code. Other agencies may have geotechnical report requirements based on the Virginia Uniform Statewide Building Code (USBC).

4-0200 SOILS

4-0201 County Soil Units, Map and Classes

4-0201.1 The comprehensive source of information about soils in the County is the Soil Survey of Fairfax County, prepared by the United States Department of Agriculture Natural Resources Conservation Service (NRCS), publicly released in January 2008. This survey describes one hundred-eight (108) soil units, numbered one (1) through fifty-seven (57), and fifty-nine (59) through one hundred-nine (109). Names for the soil units were formulated using the NRCS's Soil Taxonomy, 2nd Ed. The soil survey was used to create the County soils map which depicts the soil unit boundaries and includes overlays of Marumsco soils, "marine clays," non-marine clay high shrink-swell soils, and asbestos containing soils.

4-0201.2 Based on the severity of problems associated with these soils and the potential difficulty of analyzing and correcting those problems, the one hundred-eight (108) units of soils are grouped into four (4) classes (I, II, III, and IV). The designations serve as a guide to determine if and what type of geotechnical engineering study is required for proposed construction.

4-0201.3 As defined in Chapter 107 of the Code, Problem Soils include landslide susceptible soils, shrinking and swelling soils, soils with shallow water tables, soils containing hazardous material, buried waste sites, uncompacted and undocumented man-placed fills, and earthen structures that would require special precautions for safety during and after construction activity. Problem soils include areas of Marumsco soils, "marine clays", Class III, and Class IV soils, as shown and/or identified on the official map adopted by the Board of Supervisors or any other soil as determined by the Director of the Department of Public Works and Environmental Services.

4-0201.4 "Marine clay" is a term used locally for clay-rich sediments of the Cretaceous-Age Potomac Formation of the Atlantic Coastal Plain. The Potomac Formation, identified as unit Kp on USGS geologic maps, thickens from a few feet along the boundary with the Piedmont Province in the west to over one hundred feet along the eastern boundary of Fairfax County. As a result of removal of younger deposits that have since eroded away, the sediments are commonly over-consolidated. The "marine clay" sediments consist mostly of montmorillonite minerals (which results in a high potential for shrink and swell with variations in moisture) that are commonly classified as elastic SILT (MH) and fat CLAY (CH) by the Unified Soil

Classification System. Due to physical and chemical weathering, "marine clay" in the uppermost 20 ft of the Potomac Formation are preferentially weakened along fractures, joints and parting planes, and can cause landslides many years after the slopes are created. Sand layers, often water-bearing, are frequently mixed with the "marine clay" layers. The clays and silt are subject to large changes in volume with soil moisture changes.

4-0201.5 Areas containing "marine clay" soils were mapped by the County Soil Science Office[2] and designated as such on prior County soil maps. The more recent soil mapping by NRCS, which utilizes national standards for soil unit names and descriptions, does not include a specific soil unit for "marine clay". Areas mapped as containing "marine clay" soils in earlier survey work are identified as "Previously Mapped Marine Clay" and are overlaid on the NRCS mapping. Undisturbed soils within the "Previously Mapped Marine Clay" overlay are mostly Marumsco soils, but in some locations other soil units occur. In those locations within the "Previously Mapped Marine Clay" overlay where the soils are mapped as something other than Class III soils, the requirements outlined in Section 4-0205.2.2 for Class IVA soil shall be met, regardless of the classification based on the recent NRCS soil map. Regulations in the Fairfax County Zoning Ordinance, regarding "Marine Clay" are only applicable to the areas mapped as "Previously Mapped Marine Clay."

4-0202 Class I Soils

4-0202.1 Class I soils are undisturbed natural soils that typically have few characteristics that would adversely affect building foundations or surrounding land. Class I soils consist of Soil Nos. 11, 28, 33, 38, 39, 76, 79, 80, 81, 84, 85, 87, 88, and 90. A geotechnical investigation is advised but not required as a condition of site or grading plan approval.

4-0202.2 The submission of a geotechnical report is typically not required under the following circumstances:

a) The building footprint is more than 25 feet from any Class III or IV problem soil. The 25-foot margin allows for errors in soil mapping. If the building footprint is within 25 feet, a report is required unless waived by the Director.
b) All proposed construction is in Class I and Class II soils and there is no grading activity in problem soils. If the proposed construction is partially located in a problem soil, especially Class III or IV soils, submission of a geotechnical report is required unless waived by the Director.
c) There are no buildings with more than three stories, mat foundations, deep foundations, deep excavations, sheeting and shoring, or retaining walls over 6 feet high. On a case by case basis, any report that is prepared may be submitted with the building plans after site or grading plan approval.

4-0202.3 For site, grading, subdivision or construction plans, the following items must be addressed in the plan:

[2] The County Soil Science Office closed in 1996.

a) Foundation drain details for proposed walls below-grade
b)Yard or overlot drainage
c) Construction notes for fill placement (acceptable material, lift thickness, density testing, frequency of testing, construction inspection notes as shown in §§ 4-0502.1 and 4-0502.2)
d) Excavation Safety
e) Impact on adjoining property

4-0203 Class II Soils

4-0203.1 Class II soils are undisturbed natural soils that typically have shallow water tables or restrictive soil layers. Class II soils consist of Soil Nos. 2, 7, 9, 31, 75, 77, 78, 92, and 93. A geotechnical investigation is strongly advised but not required as a condition of site or grading plan approval.

4-0203.2 The submission of a geotechnical report is typically not required under the following circumstances:

a) The building footprint is more than 25 feet from any Class III or IV problem soil. The 25-foot margin allows for errors in soil mapping. If the building footprint is within 25 feet, a report is required unless waived by the Director.
b) All proposed construction is within Class I and Class II soils and there is no grading activity in any problem soils. If the proposed construction is partially located in a problem soil, especially Class III or IV soils, submission of a geotechnical report is required unless waived by the Director.
c) There are no buildings with more than three stories, mat foundations, deep foundations, deep excavations, sheeting and shoring, or retaining walls over 6 feet high. On a case by case basis, any report that is prepared may be submitted with the building plans after site or grading plan approval.

4-0203.3 For site, grading, subdivision or construction plans, the following items must be addressed in the plan:

a) Groundwater problems are addressed with appropriate foundation drains and backfill on proposed walls below-grade
b) Yard or overlot drainage
c) Construction notes for fill placement (acceptable material, lift thickness, density testing, frequency of testing, construction inspection notes as shown in §§ 4-0502.1 and 4-0502.2)
d) Excavation Safety
e) Impact on adjoining property

4-0204 Class III Soils

4-0204.1 Class III soils are undisturbed natural soils that have characteristics such as high shrink/swell potential, high compressibility, low bearing strength, and shallow water tables, which may result in poor drainage, building settlement, and unstable slopes, etc. Class III soils

consist of Soil Nos. 1, 8, 10, 29, 30, 32, 34, 35, 36, 37, 48, 49, 59, 60, 61, 62, 63, 64, 65, 74, 82, 83, 89, 91, 94, and 109. The soil types or conditions included in this group are: 1) Cretaceous-age Potomac Group Clays (mapped as Marumsco soils and/or "marine clay"); 2) Other soils containing high shrink-swell clays; 3) Soils with a seasonal high water table at or near the surface for prolonged periods and low bearing strength (poor foundation support); and 4) Alluvial or floodplain soils. A detailed geotechnical investigation and report are required.

4-0204.2 Geotechnical problems must be addressed with adequate engineering evaluations and designs prior to development. A geotechnical report, prepared according to the geotechnical guidelines in this chapter and the Virginia Uniform Statewide Building Code (USBC) is mandatory for all construction and grading within these problem soil areas. The engineering evaluation and report shall be submitted for approval, and the recommendations incorporated into the grading plans as requirements prior to plan approval. Construction inspections and certifications are required from the Engineer-of-Record.

4-0205 Class IV Soils

4-0205.1 Class IV soils are soils that have been disturbed or altered as a result of grading or construction resulting in soils with variable characteristics. Class IV soils are divided into two groups, IVA and IVB.

4-0205.2 Class IVA Soils

4-0205.2.1 Class IVA soils are disturbed soils that were originally Class III soils, and consist of Soil Nos. 13, 15, 17, 20, 21, 26, 27, 42, 43, 44, 47, 51, 52, 53, 54, 55, 56, 57, 69, 71, 73, 86, 103, and 106. Landfill and quarry areas are also grouped here. A detailed geotechnical investigation and report are required.

4-0205.2.2 Geotechnical problems must be addressed with adequate engineering evaluations and designs prior to development. A geotechnical report, prepared according to the geotechnical guidelines in this chapter and the Virginia Uniform Statewide Building Code (USBC) is mandatory for all construction and grading within these problem soil areas. The engineering evaluation and report shall be submitted for approval, and the recommendations incorporated into the grading plans as requirements prior to plan approval. Construction inspections and certifications are required from the Engineer-of-Record.

4-0205.3 Class IVB Soils

4-0205.3.1 Class IVB soils are disturbed soils that were originally Class I or II soils, and consist of Soil Nos. 3, 4, 5, 6, 12, 14, 16, 18, 19, 22, 23, 24, 25, 40, 41, 45, 46, 50, 66, 67, 68, 70, 72, 95, 96, 97, 98, 99, 100, 101, 102, 104, 105, 107, and 108.

4-0205.3.2 A limited geotechnical investigation is required in the form of a letter report to be incorporated into the first submission of the site, subdivision, grading or construction plans. The information placed on the plans will consist of soil strength tests e.g. SPT boring logs and construction notes addressing identified problems and other requirements for construction such

as those identified under CLASS II soils (§ 4-0203.3). For example, the letter report should be based on knowledge of the previous site disturbance, proposed construction, site grades, floor elevations, etc. Borings shall extend through any fill to depths below the proposed footing elevation. Standard engineering practice is a depth that is two to three times the width of the proposed footing. Depending on the issues identified during the review of the plan, (i.e. depth of existing fill, proposed construction, recommended foundation and slab support, stability of slopes, the need for referral to the Geotechnical Review Board), a detailed geotechnical report submitted separately may be required prior to the second submission of the site or grading plans. It is therefore advised that a comprehensive geotechnical report be obtained for these soils earlier in the process.

4-0205.3.3 For non-bonded lot grading plans, where proposed residential dwellings are to be located on properties containing Class IVB soils, a geotechnical investigation and report will not be required if a certification is provided stating that all eight of the items below are met. The certification must be signed and sealed by a professional authorized by the State to provide such information and incorporated into the plans. The eight items are listed below:

1. Class III or Class IVA soils are not mapped by NRCS on the property.
2. Project does not require sheeting and shoring, retaining walls over 6 feet high, pile foundations, geopiers, mat foundation, or ground modification; such as dynamic compaction, stone columns, vibra compaction, chemical stabilization, etc.
3. Geotechnical reports are not required under any other county regulation or building codes.
4. Maximum depth of existing disturbed land on the property is less than 5 feet.
5. Footings and floor slabs will be supported on competent natural soils.
6. Existing slopes on the property are not steeper than 3:1(horizontal:vertical). If existing slopes are steeper than 3:1(horizontal:vertical), the County's geotechnical review engineer shall be contacted. Evaluation of the slopes may be required, depending on the proposed house location.
7. Structure is located at least 15 feet from the top of any 3:1(horizontal:vertical) or steeper slope and the influence zone of house footings does not intercept with any slope. The influence zone of a footing is defined as the area beneath a 45-degree line extending outward and downward from footing exterior edge.
8. Foundation drain details are included on the plans.

4-0206 Geotechnical Report Requirements Summary

4-0206.1 The geotechnical report requirements are summarized in Table 4.1 below:

Table 4.1 Geotechnical Report Requirements Summary

ITEM	SOIL CLASS				
	I	II	III	IV	
				A	B
Geotechnical Investigation	1	2	REQ	REQ	REQ

	Geotechnical Report	NRQ	NRQ	REQ	REQ	3
	Geotechnical Specification on Plans[4]	REQ	REQ	REQ	REQ	REQ

Footnotes:

1. Advised but not required.
2. Strongly advised, but not required.
3. Results of geotechnical investigation are required on the first submission of plans. For non-bonded lot grading plans, where the proposed residential dwellings are to be located on properties containing Class IVB soils, the certification referenced in § 4-0205.2.3 shall be incorporated into plans.
4. For Class I soils see § 4-0202.3, and for Class II soils see § 4-0203.3. For Class III, and Class IV soils, report recommendations must be stated as requirements in specifications.

NRQ=Not Required REQ=Required

4-0206.2 The installation of linear structures such as storm sewer or sanitary sewer lines, usually do not require submission of a geotechnical report. Notes addressing placement of backfill and OSHA excavation requirements are sufficient in most cases. The only exception would be in cases where such construction activity might trigger movement in adjoining slopes. Cutting of existing steep slopes in slide prone areas (Marumsco or "Marine Clay" areas) requires slope stability analysis and submission of geotechnical report prior to plan approval or permit issuance. Additions to residential structures and minor commercial buildings exempt from site or grading plan submission requirements, only require an engineered foundation design submitted with building permit application.

4-0200 0300 SOILS GEOTECHNICAL REPORT

4-0201 0301 General Requirements and Procedures

4-0201.1 0301.1 At the preliminary and pre-site plan stages, notations may be made during review that compliance with the Subdivision Ordinance, Zoning Ordinance, and Chapter 107 (Problem Soils) of the Code will be required for proposed plans. in problem soils areas.

4-0201.2 0301.2 For subdivisions and site plans in these difficult areas, a soilsgeotechnical report conforming to these guidelines must be submitted with the construction plans, and the construction plans must incorporate the recommendations of the soils reportgeotechnical report as requirements. A soilsgeotechnical report submission fee must be paid upon initial submission of the soilsgeotechnical report.

4-0201.2A 0301.2.A It shall be determined during staff review whether or not the project must be referred to the GRB.

4-0201.2B 0301.2.B If a determination is made for referral, then 3 additional copies of the soilsgeotechnical report and the construction plans shall be required.

4-0201.2C 0301.2.C When these additional copies are received, the soilsgeotechnical report and the construction plans shall be forwarded to the members of the GRB for their recommendations.

~~4-0201.2D~~ 0301.2.D The GRB shall review construction plans only in conjunction with the ~~soils~~geotechnical report.

4-0301.3 If the Director determines that proposed construction on a site with problem soils will not adversely impact either the subject property or adjoining properties, the Director may waive the project from the requirement of a geotechnical report in accordance with Chapter 107 of the Code.

~~4-0202~~ 0302 Purpose of Geotechnical Investigation

~~4-0201.1~~ 0302.1 The purpose of any geotechnical investigation is to determine the character and physical properties of soil deposits for use as structure foundation or material for earthwork construction purposes. The type of structure to be built and anticipated geologic and field conditions have a major bearing on the type of investigation to be conducted.

~~4-0202.2~~ 0302.2 The investigation must, therefore, be planned with a knowledge of intended project size, land utilization and a broad knowledge of the geologic history of the area. Advice on geological features should be obtained from an experienced engineering geologist as required.

~~4-0203~~ 0303 General Guidelines. The site and soil exploration should include, but not be limited to, the following detailed factual information, analysis and recommendations:
~~4-0203.1~~ 0303.1 Surface Features. Surface contours include, but are not limited to, old construction, rock outcrops, water courses, ditches, ponds, wooded areas, and filled-in areas. Particular emphasis must be given to identification of possible old slide areas. This should include a thorough surface reconnaissance of both the site being developed and surrounding area. Consideration should also be given to re-viewing aerial photographs of the area.

~~4-0203.2~~ 0303.2 Hydrologic Features. The presence of seepage zones, depth to groundwater and the possible fluctuations with the seasons should be investigated.

~~4-0203.3~~ 0303.3 Subsurface Features

~~4-0203.3A~~ 0303.3.A A plotted record of the stratification of the soil deposits, both horizontal and vertical, shall be included in the ~~soils~~geotechnical report. This record should indicate, in the soil profile, the surface elevation of all borings and test pits, and should also indicate the thickness and character of the soils encountered. The profiles should reach to such a depth as may be required, and are to include 24 hr water level readings.

~~4-0203.3B~~ 0303.3.B Information on the degree of compactness of granular soils and on the consistency of cohesive soils should be provided.

~~4-0203.4~~ 0303.4 Exploration Methods. Field explorations should follow the applicable standards and recognized procedures of geotechnical engineering as set forth by ASTM, ASCE, AASHTO, ~~AEC,~~ etc.

~~4-0203.4A~~ 0303.4.A The interval of soil sampling shall be determined on the basis of soils encountered, the type of structure and other conditions. Continuous sampling may be required. Test procedures utilized shall be identified.

~~4-0203.4B~~ 0303.4.B The spacing and depth of borings must be based on the site conditions and the proposed construction.

~~4-0203.4C~~ 0303.4.C Borings shall extend sufficiently into an underlying material of adequate bearing capacity and below the depth of a possible slope failure. The bore holes must be plugged after completion of the borings and obtaining 24 hr water level readings.

~~4-0203.4D~~ 0303.4.D All the information and data obtained from the explorations must be recorded properly in the ~~soils~~geotechnical report.

~~4-0203.5~~ 0303.5 Groundwater Measurements. Information on groundwater elevations must be provided, including depth of permanent and perched water tables.

~~4-0203.5A~~ 0303.5.A Water tables should be determined after completing the boring and a minimum of 24 hrs later.

~~4-0203.5B~~ 0303.5.B Perforated casings or piezometers may be required in selected bore holes satisfactory to the Director to obtain long-term water level readings.

~~4-0203.6~~ 0303.6 Classification and Description. Direct observation of soil samples from various depths and locations shall be required for correlation with the known geology of the area. Classification and description of soils shall be done by the USCS (ASTM Specification D2487), and by the Visual Manual Identification Procedure (ASTM D2488). All terms and nomenclatures used for textural description of the soils must be clearly defined. Complete soil descriptions must also include in-place conditions, geologic names, local names and any other information that is pertinent to the interpretation of the subsoil characteristics.

~~4-0203.7~~ 0303.7 Laboratory Testing. The nature and ex-tent of laboratory testing deemed necessary is dependent upon the characteristics of the soil and the anticipated geotechnical problems requiring analysis.

~~4-0203.7A~~ 0303.7.A On granular soils, gradation tests on representative samples and water content determinations often are adequate.

~~4-0203.7B~~ 0303.7.B Testing of cohesive soils samples may include, but are not limited to, determination of water content, dry density and unconfined compressive strength.

~~4-0203.7C~~ 0303.7.C In stiff, fissured clays such as the Cretaceous Marumsco and/or "marine clays", the results of unconfined compression tests alone cannot be used to assess the structural property of the soil in-situ. Atterberg limit and hydrometer analysis tests aid in classification and also in predicting certain properties.

4-~~0203.7D~~ 0303.7.D Consolidation tests should be performed on samples from relatively soft soils which may underlie the foundations. Expansive pressure of the clays should also be determined for foundation design.

4-~~0203.7E~~ 0303.7.E For the deltaic clays which have undergone relatively large strains in the past, the important properties for predicting long-term behavior are the residual effective friction angle and the residual cohesion intercept (the absolute minimum strength of clay material). These parameters should be determined by appropriate laboratory tests (drained direct shear tests using sufficient stress reversals to obtain large strains as discussed in the COE laboratory testing procedure EM 1110-2-1906). Many reversals are required to reach residual strengths. Some references suggest using a pre-split sample (Ref. Engineering Properties of Clay Shales Report No. 1, by W. Haley and B. N. MacIver). For less complex situations subject to approval of the Director, the required parameters may be estimated by comparison of other index properties (particularly the Atterberg limits) with those of similar soils for which test results are reported in the published literature and on the basis of past experience. Documentation shall be furnished when shear strength parameters are based on results other than laboratory tests. Such documentation must set forth the reasoning by which parameters were determined.

4-~~0203.8~~ 0303.8 Engineering Analysis and Recommendations

4-~~0203.8A~~ 0303.8.A The report of the soil studies shall include sufficient analytical foundation and slope stability studies to allow a reviewer to follow the logic and assumptions on which the analysis was based and conclusions reached. Recommendations and advice concerning pavement design, foundation design, earthwork, site grading, drainage, slope stabilization and construction procedures must be included in the report. The report shall include a complete record of the field and laboratory findings, information concerning structures to be built (types and elevations of basements), the conclusions reached from the study and the recommendations for use by the designer and the owner. Probable total and differential settlement of foundations, special basement problems and retaining wall design must be discussed and recommendations set forth.

4-~~0203.8B~~ 0303.8.B Where Marumsco soils and/or “marine clays" are found, an engineering analysis of the short and long-term stability of existing and planned slopes must be made including a careful evaluation of potential adverse effects on nearby properties. The stability analysis shall be made by acceptable methods of analysis. The long-term stability of Marumsco soils and/or “marine clays" ~~stability~~ shall be based on the "residual" shear strength parameters for the Marumsco soils and/or “marine clays".

4-~~0203.8C~~ 0303.8.C In areas that are susceptible to high water table (permanent, perched and/or seasonal) the engineer shall provide pavement design, and measures to assure dry basements and to preclude wet yards, etc.

4-~~0203.8D~~ 0303.8.D Design criteria for retaining walls or structures shall be given.

4-~~0203.8E~~ 0303.8.E The report shall include a discussion on the problems of expansive soils. Clay soils containing montmorillonite have been found in a wide variety of locations in southern Fairfax County and could exist in the areas of problem soils. It is suggested that the design

recommendations be based on expansive properties of the clay unless it is shown other-wise by X-ray defraction studies or other appropriate laboratory tests.

4-0300 0400 CONSTRUCTION PLANS

4-0301 0401 General Information

4-0301.1 0401.1 The recommendations in the soilsgeotechnical report shall be incorporated into the plans as requirements to be performed during construction.

4-0301.2 0401.2 The soils engineer must review the final construction plans and state his opinion as to whether or not the plans have been prepared in accordance with his recommendations, and note deviations from his recommendations.

4-0302 0402 Footing and Drainage Design
4-0302.1 0402.1 Where Cretaceous Age deltaic clays occur, roof drains shall be required and the downspouts from these drains shall be piped to a storm drainage system. However, the requirement may be waived or modified by the Director where soil conditions warrant.

4-0302.2 0402.2 Foundation footings of structures must be placed at depths that will minimize differential settlement due to desiccation of underlying clays. The emplacement depth shall be based on the soil characteristics of the site. Consideration must be given to stratification of underlying materials, natural moisture content, gradation of backfill soils, site grading and adjacent vegetation. Consideration should also be given to special cases of potential volume change of clays underlying footings embedded in thin layers of natural or artificially compacted granular soils. Foundations in Marumsco and/or "marine clays" should be at least 4' (1.2m) deep. Where the geotechnical study has proven the 4' (1.2m) to be insufficient, the proper depth must be recommended. Foundations in areas of expansive clays developed in residual soils can usually be emplaced on firm underlying weathered rock materials.

4-0302.3 0402.3 Surface and subsurface drainage shall be planned to minimize the amount of water entering the Marumsco soils and/or "marine clays"-soils.

4-0302.4 0402.4 Perimeter drains shall be provided around all basement areas.

4-0400 0500 CONSTRUCTION TECHNIQUES

4-0400 0501 Sheeting, Shoring and Filling

4-0401.1 0501.1 Sheeting and shoring or other approved methods for trench bracing may be required with the construction of underdrain or utility trenches and foundations.

4-0401.2 0501.2 Engineered fill and backfill around structures shall be placed with approved select materials and uniform compaction throughout must be provided in 6" to 8" (150mm to 200mm) layers. Each layer of engineered fill shall be compacted at optimum moisture, plus or

minus 2%, to a density of not less than 95% in accordance with AASHTO T-99 or ASTM D-698. ~~"Marine clays" shall not be permitted as backfill around structures or behind retaining walls.~~

4-0501.3 Expansive Soils, such as Marumsco and/or "marine clays" are not permitted as structural fill for building pads, foundation backfill, backfill around structures, or behind retaining walls. Expansive Soil is defined by the International Building Code and International Residential Code as:

> "Soils meeting all four of the following provisions shall be considered expansive, except that tests to show compliance with Items 1, 2 and 3 shall not be required if the test prescribed in Item 4 is conducted:
> 1. Plasticity Index (PI) of 15 or greater, determined in accordance with ASTM D 4318.
> 2. More than 10 percent of the soil particles pass a No. 200 sieve (75 μm), determined in accordance with ASTM D 422.
> 3. More than 10 percent of the soil particles are less than 5 micrometers in size, determined in accordance with ASTM D 422.
> 4. Expansion Index greater than 20, determined in accordance with ASTM D 4829."

If the PI of the soil is 20 or less (e.g. PI $\leq$ 20) and the LL 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 above definition of expansive soils. PI_{cor} and EI_{cor} are defined as:

$$PI_{cor} = PI \times \frac{(\%\ \text{Passing No. 40 Sieve})}{100} \quad \text{and} \quad EI_{cor} = EI \times \frac{(\%\ \text{Passing No. 4 Sieve})}{100}$$

4-~~0402~~ 0502 Inspection

4-~~0402.1~~ 0502.1 All construction involving problem soils must be performed under the full-time inspection of the geotechnical engineer.

4-~~0402.2~~ 0502.2 The geotechnical engineer shall furnish a written opinion to the County as to whether or not work has been performed in accordance with the approved plans, and his recommendations for work in the vicinity of the units to be occupied prior to the issuance of residential or non-residential use permits.

4-~~0403~~ 0503 Minimum Standards Required for ~~Site~~ Density Testing of Compacted Fill Soil (68-00-PFM)

4-~~0503.1~~ 0503.1 (68-00-PFM) The minimum frequency of field density testing shall be as listed in Table 4.~~1~~2, unless otherwise approved by the Director. The testing frequencies are the minimums considered necessary to provide effective quality control of soil and aggregate material compactive effort under normal conditions. Additional testing other than that specified should be performed if deemed necessary by the Inspection and Testing Agency, the Geotechnical Engineer of Record, or the Fairfax County Site Inspector. All testing shall be in conformance with approved VDOT test methods. In the event that the testing frequencies are

specified to be greater in other applicable standards or specifications, those frequencies shall supersede the frequencies listed in Table 4.~~1~~2.

~~4-0500~~ 0600 ~~GRB~~GEOTECHNICAL REVIEW BOARD (GRB)

~~4-0501~~ 0601 Membership. The GRB, as established by the Board, shall consist of 3 members and 3 respective alternates appointed by the Board.

~~4-0501.1~~ 0601.1 Members and alternates shall be either Professional Engineers registered in Virginia, specializing in soil and foundation engineering, or Engineering Geologists, licensed to practice engineering in Virginia.

~~4-0501.2~~ 0601.2 Appointments shall be made for 3 years, with staggered terms, from a list of eligible nominees recommended by the County Executive.

~~4-0502~~ 0602 Nominations

~~4-0502.1~~ 0602.1 The list of eligible nominees shall be furnished to the County Executive by the Director.

~~4-0502.2~~ 0602.2 The Director shall solicit candidates or nominees from the following professional organizations of soil engineers and engineering geologists and from other sources: ASCE, American Council of Engineering Companies of Metropolitan Washington (ACEC/MW)~~Consulting Engineers Council of Metropolitan Washington,~~ ASFE~~Association of Soil and Foundation Engineers~~, Virginia Society of Professional Engineers, ~~VPI~~Virginia Tech, ~~American Institute of Professional Geologists, and AEG,~~ and WACEL. Names of candidates shall be submitted along with supporting data to substantiate the qualifications of the candidate(s).

~~4-0502.3~~ 0602.3 The Director of ~~the Office of Site~~ Land Development Services, DPWES, shall serve as secretary to the GRB, and shall be a non-voting member.

~~4-0502.4~~ 0602.4 The respective alternate to a member of the GRB shall serve whenever that member cannot serve due to illness, conflict of interest or other reasons.

~~4-0503~~ 0603 Review and Processing of Reports, Plans and Specifications

~~4-0503.1~~ 0603.1 The GRB shall review reports, plans, and specifications submitted to the Director and make recommendations to the Director. The recommendations may be for approval, denial, additional information or revisions of plans and specifications as appropriate. This review is intended to be limited to geotechnical aspects and foundation design only.

4-0503.2 0603.2 Decisions for approval of plans are to be made by the Director taking into consideration recommendations received from the GRB. The recommendations of the GRB shall not be binding on the Director.

4-0504 0604 Compensation. GRB members shall be compensated at the rate determined by the Board for work performed in connection with the review of projects assigned by the Director.

TABLE 4.12 Minimum Standards Required for Site Density Testing of Compacted Fill Soil (92-06-PFM, 68-00-PFM)

TEST LOCATIONS	TESTING FREQUENCY
Embankments Fill sections for streets, travelways, and pipestem driveways	One density test shall be performed per 5000 ft² (500 m²) per 6" (150mm) compacted lift. The embankment test shall not be performed at the same spot where the utility trench backfill test was performed. Trench testing shall be performed in addition to the embankment test. Under curb and gutter, one density test shall be per-formed per 300 ft. (90m) on alternating sides.
Subgrade Cut in existing fill for streets, travelways, and pipestem driveways	Proofrolling, evaluation and approval by the geotechnical-cal engineer of record (undercut and stabilization may be necessary as determined by the geotechnical engineer of record). The exception to this is in the pro-posed underground utilities, where the existing fill shall be completely removed and replaced with new engineered fill placed and compacted as per 4-0401.2, for utility support.
Subgrade Cut in natural soils	Proofrolling, evaluation and approval by the geotechnical-cal engineer of record.
Subbase Material For streets, travelways, and pipestem driveways	One density test shall be performed per 5000 ft² (500 m²) per 6" (150mm) compacted lift. When the subbase aggregate is placed in layers or lifts, each lift shall be tested. Under curb and gutter when placed before the subbase material in the street, perform one density test per 300 ft (90m) on alternating sides.
Base Material	One density test shall be performed per 5000 ft² (500 m²) at the finished base grade. When the base aggregate is placed in layers or lifts, each 6" (150mm) compacted lift shall be tested at the required frequency.
Storm Drainage System - Backfill *	One density test shall be performed per 300' (90m) and at vertical intervals not to exceed 12" (300mm).
Sanitary Sewer, Water and Gas Mains - Backfill * (Note: Field density test reports must be provided to the Fairfax County Site Inspector before field approval is given for issuance of tap permits.)	One density test shall be performed per 300' ft (90m) or between manholes if less than 300' (90m) apart and at vertical intervals not to exceed 12" (300mm). Refer to § 10-0104.2L(13) and Plate Nos. 18-10 (18M-10) or 19-10 (19M-10).
Sanitary Sewer, Water and Gas Laterals - Backfill for Stub	One density test shall be performed per 5

Constructed in Conjunction with Utility Main *	laterals and at vertical intervals not to exceed 12" (300mm).
Sidewalks and Driveway Aprons	Sidewalk subgrade: One density test shall be performed per 500' (150m) on alternating sides at the subgrade elevation. A minimum of two density tests per street is required. Driveway apron: One density test per apron shall be performed.
Asphalt Concrete Pavement (Note: The thin lift nuclear density test can be used for any surface course placed directly over an aggregate pavement or on a lift of 135 lbs/yd² (73.24 Kg/m²) (or greater) that is placed on an asphalt pavement course).	*Saw Cuts or Cores* • Two cuts or cores represent one test. A minimum of two tests per street are required regardless of the street length. • One test shall be performed per 500' (150m) of roadway or 1000' (300m) of any pass made by a paving train. *OR Conventional Nuclear Density Gauge* • One test shall be performed per 500' (150m) of roadway. • Five tests shall be performed in each test section. A minimum of two test sections per street is required regardless of the length of the street. *Thin Lift Nuclear Density Gauge* Test areas are defined as lots and sublots. A lot consists of 5000' (1500m) of a pass made by a paving train. Each lot is divided into five sublots of equal size. Two tests will be performed on each sublot. Each separate street shall consist of at least one lot. Streets less than 500' (150m) in length shall be tested a minimum of twice.

* Testing required beneath structures only, including but not limited to sidewalks, driveways, streets and stoops.

Amendment to Chapter 6 (Storm Drain)

Deletions are shown as strikeouts and insertions are underlined.

Amend §6-0101 (Drainage Systems) of the Public Facilities Manual, by revising paragraph 6-0101.3C to read as follows:

6-0101.3C (91-06-PFM) Engineering Properties of Fairfax County Soils are available from the USDA-NRCS website. ~~published by Fairfax County Department of Public Works and Environmental Services.~~

Amend §6-0203 (Analysis of Downstream Drainage System) of the Public Facilities Manual by revising paragraph 6-0203.4A(2) to read as follows:

6-0203.4A(2) The shear stress for both the predevelopment condition and the post-development condition for the 2-year storm shall be plotted in relation to time at each cross-section. On each graph, the permissible shear stress also shall be plotted. The permissible shear stress is based on the soil type, and may be determined for cohesive soils from Plate 76-6 (Plate 76M-6) and for non-cohesive soils from Plate 77-6 (Plate 77-M-6). The soil type may be determined by field test or the soil type designated on the County soils maps may be used. If the soil type is designated using the County soils maps, the most conservative permissible shear stress for the soil type shall be used. The plans shall indicate how the soil type was determined. The County soils maps are available on the county website, and the soil properties are available from the USDA-NRCS website. The area between the permissible shear stress and the actual shear stress on the graph is erosive work on the channel. The erosive work for the post-development condition shall be less than the erosive work for predevelopment condition by a percentage equal to the required proportional improvement.

Amend §6-1002 (Side Ditches and Median Ditches) of the Public Facilities Manual by revising paragraph 6-1002.2G to read as follows:

6-1002.2G Where the velocity, as determined above, exceeds the allowable velocity, as determined from the soil classification in the geotechnical report ~~soils report~~, the ditch shall be lined.

Amend §6-1304 (Pervious Pavement) of the Public Facilities Manual by revising paragraph 6-1304.4K to read as follows:

6-1304.4K Side slopes of the facility excavated below ground may be as steep as the *in situ* soils will permit. The bottom of the excavated bed shall be level or nearly level. All excavation must

be performed in accordance with Virginia Occupational Safety and Health (VOSH) requirements. If the facility is located on problem soils, as defined in Section 107-2-1 (j) of the County Code ~~(such as marine clays)~~, a professional authorized by the State ~~geotechnical engineer~~ shall specify the maximum acceptable slope for the excavation.

Amend §6-1307 (Bioretention Filters and Basins) of the Public Facilities Manual by revising paragraph 6-1307.4G to read as follows:

6-1307.4G The side slopes of the facility above ground shall be a maximum of 3:1. Where space permits, gentle side slopes (e.g. 5:1) are encouraged to blend the facility into the surrounding landscape. Side slopes of the facility excavated below ground may be as steep as the in situ soils will permit. All excavation must be performed in accordance with Virginia Occupational Safety and Health (VOSH) requirements. If the facility is located on problem soils, as defined in Section 107-2-1 (j) of the County Code ~~(such as marine clays)~~, a professional authorized by the State ~~engineer with experience in geotechnical engineering~~ shall specify the maximum acceptable slope.

Amend §6-1605 (Geotechnical Design Guidelines for Stormwater Management Reservoirs with Earthdams) of the Public Facilities Manual by revising paragraph 6-1605.2C(1)to read as follows:

6-1605.2C(1) Field Investigation. The field investigation program shall be performed to explore the subsurface conditions for the proposed embankment dam, reservoir and borrow area. The field investigation program must include: (1) review of available data; (2) field reconnaissance; and (3) subsurface exploration. Existing information such as topographic and geologic data should be reviewed. References such as soil maps, the soil properties available from the USDA-NRCS website ~~General Ratings for Dams, Embankments and Reservoirs (Table 6.27 following § 6-1605.6F(2))~~, and any other sources of information should be reviewed. This review of available data should be followed by a field reconnaissance of the site of the dam and reservoir. The subsurface exploration program, consisting of test borings, test pits, or both, should be developed based on the complexity of the geologic and topographic features disclosed by the previous phases. Except when adequate measures are taken to restore the natural condition of excavations, test pits shall be in areas outside the alignment of the dam. At a minimum, 3 test borings shall be located along the dam alignment (centerline) and along the principal spillway profile at intervals not to exceed 100' (30m). Additional borings shall be required at each major structure. Borings also shall be required throughout the ponding area at a density of at least 1 per acre (0.4 ha) (evenly distributed) with a minimum of 2 borings for ponding areas less than 2 acres (0.8 ha). The ponding area shall be defined as that area inundated by the 2-yr water surface elevation. The depth of borings shall extend to competent material or to a depth equal to the lesser of either the embankment height or the foundation width. The use of geophysical techniques where applicable is encouraged. The subsurface exploration program shall be designed and implemented to evaluate the foundations, abutments, reservoir area and embankment design and any other pertinent geological considerations. Insitu testing, such as

permeability tests, undisturbed sampling and installation of piezometers may be required depending upon the site conditions and anticipated designs.

Amend §6-1900 (Tables) of the Public Facilities Manual by deleting the referenced to Table 6.27.

STANDARD DESIGNATION	TABLE NO.	DESCRIPTION	SECTION
N/A	6.26	10-Year Storm Routing	6-1305
~~N/A~~	~~6.27~~	~~General Ratings for Dams, Embankments and Reservoirs~~	~~6-1605~~
N/A	6.28	Aggregate Gradation	6-1304.8B

Amend §6-1605 (Geotechnical Design Guidelines for Stormwater Management Reservoir with Earthdams) by deleting Table 6.27 General Ratings for Dams, Embankments and Reservoirs.

~~Table 6.27 General Ratings for Dams, Embankments and Reservoirs~~ ~~(56-96-PFM)~~

~~No.~~	~~Soil Name[1]~~	~~Physiographic Province/ Parent Material/ Landscape Position[2]~~	~~Typical USCS Classification[3]~~	~~Embankment Materials[4]~~	~~Embankment Foundation[4]~~	~~Core/Liner Materials[4]~~	~~Seepage Potential[5]~~	~~Erosion Potential[6]~~
~~1~~	~~Mixed Alluvial~~	~~(Tr, Pd, Cp) Silty, sandy, and clayey recent alluvium in floodplains~~	~~Variable—CH to GM~~	~~Marginal—W, P, O~~	~~Poor—B, W, O~~	~~Marginal—W, P, O~~	~~Moderate~~	~~Low~~
~~2~~	~~Chewacla~~	~~(Pd) Silty alluvium on low terraces in floodplains~~	~~ML~~	~~Marginal—W, P~~	~~Poor—B, W~~	~~Marginal—W, P~~	~~Moderate~~	~~Low~~
~~3~~	~~Congaree~~	~~(Pd) Silty alluvium on low terraces in floodplains~~	~~ML~~	~~Fair—P, W~~	~~Marginal—B, W~~	~~Fair—P, W~~	~~Moderate~~	~~Low~~
~~5~~	~~Wehadkee~~	~~(Pd) Silty and clayey alluvium on low terraces in floodplains~~	~~CL, MH, ML, CH~~	~~Marginal—W, P~~	~~Poor—B, W~~	~~Marginal—W, P~~	~~Low~~	~~Low~~
~~6~~	~~Hyattsville~~	~~(Cp) Silty to sandy local alluvium overlying Coastal Plain sediments~~	~~CL, SM, SC~~	~~Fair—P, W~~	~~Fair—B, W~~	~~Marginal—T, P, W~~	~~Moderate~~	~~Low~~
~~8~~	~~Worsham~~	~~(Pd) Local alluvium overlying schist and granite~~	~~ML-CL, ML, CH, CL~~	~~Marginal—W, M, P~~	~~Poor—B, W~~	~~Marginal—M, P, W~~	~~Moderate~~	~~Low~~
~~10~~	~~Glenville~~	~~(Pd) Local alluvium overlying schist and granite~~	~~ML, ML-CL, SM~~	~~Fair—M, P, W~~	~~Fair—B, W~~	~~Marginal—M, P, W~~	~~Moderate~~	~~Moderate~~
~~11~~	~~Bermudian~~	~~(Tr) Alluvium on low terraces in floodplains~~	~~ML-CL, CL~~	~~Fair—P, K~~	~~Marginal—B, W~~	~~Fair—P, T, K~~	~~Moderate~~	~~Low~~
~~12~~	~~Rowland~~	~~(Tr) Alluvium on low terraces in floodplains~~	~~ML-CL, ML~~	~~Fair—P, W, K~~	~~Poor—B, W~~	~~Fair—P, T. W, K~~	~~Low~~	~~Low~~

Table 6.27 General Ratings for Dams, Embankments and Reservoirs (56-96-PFM)

No.	Soil Name[1]	Physiographic Province/ Parent Material/ Landscape Position[2]	Typical USCS Classification[3]	Embankment Materials[4]	Embankment Foundation[4]	Core/Liner Materials[4]	Seepage Potential[5]	Erosion Potential[6]
13	Bowmansville	(Tr) Alluvium on low terraces in floodplains	ML-CL, CL, CH	Marginal – W, P, K	Poor – B, W	Marginal – W, P, K	Low	Low
14	Manassas	(Tr) Local alluvium overlying siltstone and sandstone	ML-CL, CL, ML, GC	Fair – P, W, K	Fair – B, W	Fair – P, T, W, K	Moderate	Moderate
15	Muck	(Cp) Organic sediments	OL, OH	Poor – W, O	Poor – B, W, O	Poor – W, O	Moderate	Low
18 19	Rocky Land and Very Rocky Land (Acid)	(Pd) Schist and granite	ML, SM	Marginal – D, R, M, P	Good	Poor – D, R, M, P	High	High
20	Meadowville	(Pd) Local alluvium overlying schist and granite	ML-CL, CL, ML, SM	Fair – M, P, W	Fair – B, W	Marginal – M, P, W	Moderate	Moderate
21	Manor	(Pd) Schist	ML, SM	Fair – M, P	Good	Poor – M, P	High	High
23	Captina	(Pd) High terraces near streams	CL-ML, SM, SM-SC	Fair – P, W	Fair, B, W	Fair – P, T, W	Moderate	Moderate
24	Elioak	(Pd) Schist	ML-CL, MH, SM	Fair – M, P	Good	Fair – M, P	High	High
26	Bertie	(Cp) Silty Coastal Plain sediments	ML, CL	Fair – P, W	Fair – B, W	Marginal – P, W	Moderate	Moderate
27	Legore sil	(Tr) Diabase/diorite	ML, CL, MH-CH	Marginal – D	Good	Marginal – T, D	Low	Moderate
28	Montalto sil	(Tr) Diabase/diorite	ML, CL, MH-CH	Good	Good	Good	Low	Moderate
29	Legore st sil	(Tr) Diabase/diorite	ML, CL, MH-CH	Marginal – D	Good	Marginal – T, D	Low	Moderate
30	Huntington	(Pd, Cp) Aluvium on low terraces in Potomac River floodplain	ML-CL, CL, ML	Fair – P	Fair – B, W	Fair – P	Moderate	Low
31	Lindside	(Pd, Cp) Aluvium on low terraces in Potomac River floodplain	ML-CL, CL, ML	Fair – W, P	Marginal – B, W	Fair – W, P	Moderate	Low
32	Fairfax sil	(Pd) Silty upland terraces overlying schist and granite	ML, ML-CL, SM	Fair – P	Good	Marginal – P, M	Moderate	High
33	Melvin	(Pd, Cp) Alluvium on low terraces in Potomac River floodplain	ML-CL, CL, ML	Marginal – W, P	Poor – B, W	Marginal – W, P	Moderate	Low
34	Woodstown	(Cp) Sandy Coastal Plain sediments	SM-SC, SM, SC	Fair – P, W	Fair – W	Marginal – T, P, W	High	Low
35	Manteo	(Pd) Schist	CL, ML, SM	Marginal – D, M, P	Good	Poor – D, M, P	High	High

Table 6.27 General Ratings for Dams, Embankments and Reservoirs (56-96-PFM)

No.	Soil Name[1]	Physiographic Province/ Parent Material/ Landscape Position[2]	Typical USCS Classification[3]	Embankment Materials[4]	Embankment Foundation[4]	Core/Liner Materials[4]	Seepage Potential[5]	Erosion Potential[6]
37 38	Beltsville sil Beltsville 1	(Cp) Silty uplands overlying dense gravelly Coastal Plain sediments or weathered schist and granite	ML, CL, ML-CL, SC	Fair P, W	Good	Marginal T, P, W	Moderate	Moderate
39	Othello	(Cp) Silty and clayey Coastal Plain sediments	ML-CL, ML, MH, CH, SM	Marginal W, P	Poor B, W	Marginal W, P	Moderate	Low
40	Mecklenburg	(Tr) Diabase	ML-CL, MH, SM-SC	Fair C	Marginal Z	Fair C	Low	Moderate
41 42	Rocky Land and Very Rocky Land (Iredell Group)	(Tr) Diabase	ML-CL, CH, SC, SM	Marginal R, D, C	Marginal Z	Marginal R, D, C	Low	Moderate
43	Masada gravelly loam	(Pd) Gravelly high terraces near streams	GM, ML, GC, CL	Good	Good	Fair T	Moderate	Moderate
44	Caroline	(Cp) Silty and Clayey Coastal Plain sediments	ML, MH, CH	Fair C	Marginal B, C	Fair C	Moderate	Moderate
45	Matapeake	(Cp) Silty Coastal Plain sediments	ML-CL, CL, ML, SM	Fair P	Good	Fair P	Low	Moderate
46	Mattapex	(Cp) Silty Coastal Plain sediments	ML-CL, ML, CL, SM	Fair P, W	Good	Fair P, W	Low	Moderate
47	Dragston	(Cp) Sandy Coastal Plain sediments	SC, SM	Fair W, P	Fair B, W	Marginal T, W, P	High	Low
48	Iredell	(Tr) Diabase	ML-CL, CH, SC	Fair C, W	Marginal Z	Fair C, W	Low	Moderate
49	Lunt fine sandy loam	(Cp) Sandy to clayey Coastal Plain sediments	SM-SC, CH, SC	Fair C, U	Marginal B, C, U	Fair T	High	Moderate
50	Iredell Mecklenburg st sil	(Tr) Diabase	ML-CL, MH, CH, SC	Fair C, W, R	Marginal Z	Fair C, W, R	Moderate	Moderate
51	Keyport	(Cp) Silty and clayey Coastal Plain sediments	ML, CL, MH, CH	Fair W	Fair B, W	Fair W	Low	Moderate
52	Elbert (Iredell Group)	(Tr) Local alluvium overlying diabase bedrock	CL, CH, MH-CH, SM-SC	Marginal W, C	Poor B, W, C	Marginal W, C	Low	Low
53	Lenoir	(Cp) Silty and clayey Coastal Plain sediments	ML, ML-CL, MH-CH, CL	Fair W	Marginal B, W	Fair W	Low	Moderate
54	Sassafras	(Cp) Sandy Coastal Plain sediments	SM, SC	Fair P	Good	Marginal T, P	High	Moderate
55	Glenelg	(Pd) Schist	ML, SM	Fair M, P	Good	Poor M, P	High	High
56	Kempsville	(Cp) Silty and sandy Coastal Plain sediments	ML, SM, SM-SC, CL-ML, SC	Fair P	Good	Marginal T, P	Moderate	Moderate

Table 6.27 General Ratings for Dams, Embankments and Reservoirs (56-96-PFM)

No.	Soil Name[1]	Physiographic Province/ Parent Material/ Landscape Position[2]	Typical USCS Classification[3]	Embankment Materials[4]	Embankment Foundation[4]	Core/Liner Materials[4]	Seepage Potential[5]	Erosion Potential[6]
57	Brecknock 1	(Tr) Baked sandstone (hornfels)	ML-CL, CL	Fair - K	Good	Fair - K	Moderate	Moderate
59	Orange	(Pd) Greenstone (metabasalt)	ML, CL, CH	Fair - C, W	Marginal - Z	Fair - C, W	Low	Moderate
60	Appling	(Pd) Granite and gneiss	ML, MH-CH, MH, SC	Good	Good	Fair - T	Moderate	High
61	Loamy/Gravelly Sediments	(Cp) Sandy and gravelly Coastal Plain sediments	CL, ML, MH, SM, GM, GC	Marginal - T, C, U	Marginal - B, C, U	Marginal - T, C	High	High
62	Brecknock gravelly silt loam	(Tr) Baked siltsone (hornfels)	ML-CL, ML	Fair - K	Good	Fair - K	Moderate	Moderate
63	Louisburg	(Pd) Granite and gneiss	SM	Good	Good	Marginal - T	Moderate	High
64	Silty/Clayey Sediments	(Cp) Silty and clayey Cretaceous-age Coastal Plain sediments	CH, MH, SC, CL, ML	Marginal - C, U	Poor - B, C, U	Marginal - C, T	High	High
65	Colfax	(Pd) Granite and gneiss	ML, CL, SC	Fair - W	Marginal - B,W	Fair - W, T	Low	Moderate
66	Lloyd	(Pd) Greenstone and schist	ML, MH	Good	Good	Good	Low	Moderate
67	Penn fsl	(Tr) Sandstone	SM, ML-CL, CL, ML	Fair - P, K, D	Good	Fair - P, K, D	High	High
68	Roanoke	(Pd) Clayey alluvium on low terraces in floodplains	CH, MH, CL, CL-ML, GM-GC	Marginal - W	Poor - B, W	Marginal - W	Low	Low
69	Enon	(Pd) Greenstone and schist	ML, MH-CH, ML-CL	Good	Fair - B	Good	Low	Severe
70	State	(Cp) Sandy alluvium on low terraces in floodplains	SM, SC, CL	Fair - P	Good	Marginal - T, P	High	Low
71	Bucks sil	(Tr) Siltstone	ML-CL, MH-CH, ML	Fair - P, K	Good	Fair - P, K	Moderate	Moderate
72	Bucks 1	(Tr) Sandstone	ML, CL, ML-CL	Fair - P, K	Good	Fair - P, K	Moderate	Moderate
73	Penn sil	(Tr) Siltstone and sandstone	ML-CL, ML, GC	Fair - P, K, D	Good	Fair - T, P, K, D	Moderate	High
75	Penn 1	(Tr) Sandstone and siltstone	ML-CL, ML, CL	Fair - D, P, K	Good	Fair - D, P, K	Moderate	High
76	Calverton 1	(Tr) Siltstone and sandstone	ML-CL, CL, MH-CH, SM-SC	Fair - W, K	Marginal - B, W	Fair - W, K	Low	Moderate
77	Penn sh sil	(Tr) Siltstone and sandstone	ML-CL, ML, GM-GC	Marginal - P, K, D	Good	Marginal - D, T, P, K	Moderate	High
78	Calverton sil	(Tr) Siltstone and sandstone	ML-CL, ML, MH-CH, SM-SC	Fair - W, K	Marginal - B, W	Fair - W, K	Low	Moderate
79	Kelly	(Tr) Diabase and siltstone (hornfels)	ML-CL, CH, MH	Fair - K, C	Marginal - Z	Fair - K, C	Moderate	Moderate

Table 6.27 General Ratings for Dams, Embankments and Reservoirs (56-96-PFM)

No.	Soil Name[1]	Physiographic Province/ Parent Material/ Landscape Position[2]	Typical USCS Classification[3]	Embankment Materials[4]	Embankment Foundation[4]	Core/Liner Materials[4]	Seepage Potential[5]	Erosion Potential[6]
80	Croton	(Tr) Siltstone and sandstone	ML-CL, ML, CH, MH, GM-GC	Marginal W, K	Marginal B, W	Marginal W, K	Low	Low
83	Galestown	(Cp) Sandy Coastal Plain sediments	SM, SC	Fair P	Good	Poor T	High	Low
84	Fallsington	(Cp) Sandy Coastal Plain sediments	SM-SC, SM, SC	Marginal W, P	Poor B, W	Marginal W, T	High	Low
85	Elkton	(Cp) Clayey Coastal Plain sediments	ML-CL, ML, CL, CH, MH	Marginal W, C	Poor B, W, C	Marginal W, C	Low	Low
86	Klej	(Cp) Sandy Coastal Plain sediments	SM, SC	Fair W	Fair B, W	Poor T	High	Low
87	Wickham	(Pd) Silty high terraces along streams	ML, SC, CL	Good	Good	Good	Low	Moderate
88	Hiwassee sil	(Cp) Silty high terraces along streams	ML, CL, MH	Good	Good	Good	Low	Moderate
89	Tidal Marsh	(Cp) Organic soils in recent alluvium along the tidal Potomac River	OL, OH	Poor W, O	Poor B, W, O	Poor W, O	Moderate	Low
90	Augusta vfsl	(Pd, Cp) Silty and clayey alluvium on low terraces in floodplains	ML, CL, MH-CH, GC	Fair W	Fair B, W	Marginal T, W	Low	Moderate
91	Birdsboro	(Tr) Silty and clayey alluvium on low to high terraces near streams	ML-CL, CL	Fair P, W	Marginal B, W	Fair P, W	Low	Moderate
92	Raritan	(Tr) Silty and clayey alluvium on low to high terraces near streams	ML-CL, CH-MH, GM-GC	Fair W, P	Marginal B, W	Fair W, P	Low	Moderate
104	Catlett	(Tr) Baked siltstone and sandstone (hornfels)	ML-CL, ML	Marginal D, P, K	Good	Marginal D, P, K	Moderate	Moderate
110	Augusta 1	(Pd, Cp) Silty and clayey alluvium on low terraces in floodplains	ML, CL, MH-CH, GC	Fair W	Fair B, W	Marginal T, W	Low	Moderate
112	Augusta sl	(Pd, Cp) Silty and calyey alluvium on low terraces in floodplains	ML, CL, MH-CH, GC	Fair W	Fair B, W	Marginal T, W	Low	Moderate
113	Fairfax gr sil	(Pd) Silty and gravelly upland terraces overlying schist and granite	ML, ML-CL, SM, GM	Fair P	Good	Marginal P, T, M	High	High
114	Masada fsl	(Pd) Gravelly high terraces along streams	GM, ML, GC, CL	Good	Good	Fair T	Moderate	Moderate
115	Hiwassee fsl	(Pd) Silty high terraces along streams	ML, CL, MH	Good	Good	Good	Low	Moderate
116	Christiana	(Cp) Silty and clayey Cretaceous-age Coastal Plain sediments	MH, CH	Poor C, U	Poor U, C, B	Marginal C	Moderate	Moderate

Table 6.27 General Ratings for Dams, Embankments and Reservoirs (56-96-PFM)

No.	Soil Name[1]	Physiographic Province/ Parent Material/ Landscape Position[2]	Typical USCS Classification[3]	Embankment Materials[4]	Embankment Foundation[4]	Core/Liner Materials[4]	Seepage Potential[5]	Erosion Potential[6]
117	Marsh (Fresh)	(Cp) Organic soils and alluvium along streams	OL, OH	Poor – W, O	Poor – B, W, O	Poor – W, O	Moderate	Low
118	Marine Clay	(Cp) Clayey and silty Cretaceous-age Coastal Plain sediments	CH, MH	Poor – C, U	Poor, U, C, B	Marginal – C	Moderate	High
120	Altavista	(Cp) Sandy and clayey alluvium on low terraces in floodplains	CL, CL-ML, SC, SM-SC	Fair – P, W	Fair – W	Fair – P, W	Moderate	Moderate
128	Montalto stsil	(Tr) Diabase/diorite	ML, CL, MH-CH	Fair – R	Good	Fair – T, R	Low	Moderate
129	Montalto rsil	(Tr) Diabase/diorite	ML, CL, MH-CH	Fair – R	Good	Fair – T, R	Low	Moderate
132	Mayodan	(Tr) Sandstone conglomerate	SM, ML, SM-SC, MH	Good	Good	Good	Low	Moderate
141 142	Rocky Land and Very Rocky Land (Orange Group)	(Pd) Greenstone (metabasalt)	ML, ML-CL, CH	Marginal – R, D, C	Marginal – Z	Marginal – R, D, C	Low	Moderate
148	Iredell – Mecklenburg sil	(Tr) Diabase	ML-CL, MH, CH, SC	Fair – C, W	Marginal – Z	Fair – C, W	Low	Moderate
149	Lunt sil	(Cp) Clayey and sandy Coastal Plain sediments (includes Cretaceous-age sediments)	SM-SC, CH, MH	Marginal – C, U	Marginal – U, B, C	Marginal – C	Moderate	Moderate
152	Elbert (Orange Group)	(Pd) Local alluvium overlying Greenstone (metabasalt)	CL, CH, MH-CH	Marginal – W, C	Poor – B, W, C	Marginal – W, C	Low	Low
232	Fairfax 1	(Pd) Clayey and silty upland terraces overlying weathered schist and granite	ML, MH-CH, MH, ML-CL	Fair – P	Good	Fair – P	Moderate	High
273	Readington	(Tr) Siltsone and sandstone	ML-CL, CL, ML	Fair – P, K, D, W	Good	Fair – P, K, D, W	Moderate	Moderate

NOTES:

Soil Name[1] (56-96-PFM)

Soil names are taken from the **Soil Survey of Fairfax County, Virginia, Series 1955, No. 11, Issued May 1963**. Additional soil series, not included in the original survey, occur in revised soil maps of Fairfax County. Since the original soil survey in 1955, the USDA Soil Conservation Service has continued to revise and update its list of soils found state-wide in Virginia. Property descriptions and interpretations for some soils were modified as more information was gathered, and some soil names were changed. As a result, some soil series used in Fairfax County may not coincide in properties and interpretations with the same soil names used elsewhere in Virginia. Properties and engineering interpretations in this table are specific to Fairfax County, and are based on surveys and data gathered by the County since the original survey.

Soil names include modifiers that indicate surface texture (proportion of sand, silt, clay, gravel, stones, etc.). Differences in surface texture often indicate parent material differences and reflect other differences in the soil which may affect engineering properties. The following abbreviations (USDA texture name) are used in this table: fsl (fine sandy loam), gr (gravelly), l (loam), r (rocky), sh (shaly), sil (silt loam), sl (sandy loam), st (stony), vfsl (very fine sandy loam).

Physiographic Province/ Parent Material/ Landscape Position[2] (56-96-PFM)
Physiographic Province, Parent Material, and Landscape Position defines general geologic area, source of soil constituent, and/or landscape setting. Physiographic Province is defined as: Tr = Triassic, Pd = Piedmont, and Cp = Coastal Plain. Detailed geologic maps are available from the U.S. Geological Survey.

Typical USCS Classification[3] (56-96-PFM)
Typical Unified Soil Classification System (USCS) Classifications listed here are estimates based on limited laboratory analyses (published data include the Soil Survey of Fairfax County, Virginia and F.H.A. Report No. 373 "Engineering Soil Classification For Residential Development") and on observations and test data assembled by the County. Classes typically found in each soil type are listed. Site-specific variations occur within soil types. These soil classifications should be used for planning purposes only and should not replace on-site investigations for significant dam structures.

Key to General Ratings For Embankment Materials, Embankment Foundation, and Core/Liner Materials[4]
The design of an earthen structure should be preceded by careful investigation of both the cut and fill areas. Soils typically occur as horizons or layers that change significantly in gradation and other physical properties with depth and horizontal distance. For example, the Iredell (48) series consists of less than 1 foot (0.3 meters) of silts overlying 1 to 3 feet (0.3 to 1 meters) of highly plastic clay, which in turn overlies sandy to clayey decomposed bedrock of variable depth. The depth to bedrock or large boulders in the Iredell soils may vary from 3 to 15 feet (1 to 4.6 meters). For these and other soils, care should be taken in engineering investigations to identify significant soil strata changes that occur over short distances. Previous excavation or filling activities may significantly alter site conditions.

As a general rule in embankment construction, all visible organic debris such as roots and limbs should be removed from the fill material prior to compaction to a specified density. Soils with organic matter content exceeding five percent by weight should not be used as structural fill. Stones greater than 4 inches to 6 inches (100 millimeters to 150 millimeters) in diameter should be removed from the fill material. It is essential that a good bond be established between the soils in the dam and in the foundation by removing loose organic debris, organic-rich soils, and soft soils prior to compacting and scarifying the subgrade.

For reestablishment of vegetation after construction, a minimum of 6 inches (150 millimeters) of topsoil, limed and fertilized, should be placed on the embankment surface.

Ratings for **Embankment Materials** evaluate the soil as a source of fill for embankment construction. Ratings apply to the upper 5 feet (1.5 meters) of in-situ soil material and consider that mixing of the soil materials will occur during construction operations.

Ratings for **Core/Liner Materials** evaluate the soil as a source of low-permeability materials to be used as an impervious soil core within the dam or as an upstream liner above highly permeable substrata to minimize seepage loss. Segregation of acceptable soil strata from surrounding soils is usually necessary to minimize contamination.

Ratings for **Embankment Foundations** are based on the ability of the natural (undisturbed) soil to support an embankment without excessive settlement occurring.

Ratings:

Good = No significant problems in natural undisturbed soils.
Fair = Minor potential problems affecting design or construction.
Marginal = Significant problems that must be considered in design and construction.
Poor = Major problems that must be addressed during the design and construction to ensure satisfactory performance of structures.

Key to Problems and Characteristics For Embankment Materials, Embankment Foundation, and Core/Liner Materials

B = Low bearing values due to soft or saturated soil strata may provide marginal to poor support for the dam and result in significant total or differential settlement.
C = High shrink-swell clays are difficult to work or compact under certain moisture contents (too wet or too dry). These clays are typically suitable for liner materials, but may be difficult to compact properly.
D = Shallow depth to bedrock results in a thin soil layer and lack of sufficient materials for the embankment or core. Suitable soil material may need to be imported from off-site.
K = The bedrock disintegrates (slakes) rapidly when exposed to surface or subsurface weathering, which may lead to embankment instability unless proper gradation is attained during compaction.

M = High mica content makes the soil difficult to compact and increases the susceptibility to piping and embankment slope failure.

O = High organic matter content (organic strata, loose debris, or organic enrichment in mineral horizons) results in compression and differential settlement under the embankment foundation. The organic materials and organic-enriched soils (greater than 5 percent organic matter) are difficult to compact properly and will decay over time, reducing the embankment and core stability.

P = Piping hazard (internal erosion and channeling) may occur in the dam foundation as a result of no or inadequate core construction, and within embankments because of poor compaction.

R = High content of rocks or stones in the soil interferes with compaction, grading, workability.

T = Medium to coarse textures (SM or coarser) are suitable for the shell but not the core of the dam.

U = Potentially unstable slopes resulting in slope failure or slope creep may destabilize the dam. Slope failures may occur unless the embankments are constructed at slopes of 4H:1V or flatter.

W = High seasonal water tables result in wet conditions during certain periods of the year, adversely affecting workability and compaction. Wetness problems are minimized during dry periods of the year.

Z = Embankment foundation support is poor in the plastic clay layer, good in underlying saprolite or bedrock.

Seepage Potential[5]

Seepage potential is based on permeability of the near-surface soils and depth to permeable saprolite, fractures bedrock, or other permeable strata. These properties are evaluated based on the potential for seepage loss from the excavated areas within the reservoir, emergency spillway and under the embankment.

Soils with a **high seepage potential** have moderately rapid or rapid permeability in the near-surface soils or have highly permeable saprolite, fractured bedrock, or other permeable strata. Soils with a **moderate seepage potential** have a moderate permeability or have permeable saprolite, bedrock, or other strata, often deeper than 4 feet (1.2 meters). In some predominantly silty or clayey Coastal Plain soils, lateral seepage may occur within permeable strata. Moderately slow to slowly permeable soils which are not likely to be underlain by permeable saprolite, bedrock, or other strata have a **low seepage potential**.

Erosion Potential[6]

Erosion potential is based on the Universal Soil Loss Equation adapted for soils under construction site conditions. Soil erodibility is affected by texture (relative proportion of sand, silt, and clay), rock content, permeability, structure, and slope (natural or man-made).

Soils with a **low erosion potential** are not highly erodible, rarely exceeding soil loss tolerances except on steep unprotected cuts.

Soils with a **moderate erosion potential** are moderately erodible on B (2-7 percent) slopes and highly erodible on C (7-14 percent) slopes or greater (exceeding the soil loss tolerance). Sheet, rill and shallow gully erosion can be expected on unprotected soils during a severe storm.

Soils with a **high erosion potential** are highly erodible, exceeding soil loss tolerances even on B (2-7 percent) slopes. Sheet and rill erosion, with the formation of numerous gullies can be expected on unprotected soils in a severe storm.

Amendment to Chapter 11 (Erosion and Sediment Control)

Deletions are shown as strikeouts and insertions are underlined.

Amend Table of Contents for Chapter 11 of the Public Facilities Manual by deleting references to 11-0409 (Soil Profile and Test Data), and 11-0410 (Reserved), and by renumbering 11-0411 (Biotechnical Slope and Bank Protection) to read as follows:

~~11-0409 Soil Profile and Test Data~~
~~11-0410 (Reserved)~~
11-~~0411~~ 0409 Biotechnical Slope and Bank Protection

Amend Table of Contents for Chapter 11 of the Public Facilities Manual by revising references to Plate Nos. 3-11 (General Soil Map-Fairfax County), 4-11 (Symbols Shown on Soil Maps of the County), and 5-11 (Generalized Stratigraphic Profile of County Soils), 10-11 (Biotechnical Slope Protection), and 11-11 (Super Silt Fence), and by deleting references to Plate Nos. 6-11, 7-11, 8-11, and 9-11 (Engineering Test Data) to read as follows:

11-0500 PLATES

STANDARD DESIGNATION	PLATE NO.	DESCRIPTION	SECTION
N/A	3-11 (3M-11)	Soil Physiographic Provinces ~~General Soil Map~~ Fairfax County	11-0408.2
N/A	4-11 (4M-11)	Symbols Shown on Soil Maps of the County	11-0408.~~14~~11
N/A	5-11 (5M-11)	Generalized Stratigraphic Profile of County Soils	11-~~0409~~ 0408.10
~~N/A~~	~~6-11 (6M-11)~~	~~Engineering Test Data~~	~~11-0409~~
~~N/A~~	~~7-11 (7M-11)~~	~~Engineering Test Data~~	~~11-0409~~
~~N/A~~	~~8-11 (8M-11)~~	~~Engineering Test Data~~	~~11-0409~~
~~N/A~~	~~9-11 (9M-11)~~	~~Engineering Test Data~~	~~11-0409~~
N/A	6-11(6M-11)~~10-11 (10M-11)~~	Biotechnical Slope Protection	11-~~0411.6~~ 0409.6
N/A	7-11(7M-11)~~11-11 (11M-11)~~	Super Silt Fence	11-0110.3J

Amend Table of Contents for Chapter 11 of the Public Facilities Manual by revising the references to Table Nos. 11.1 (Grade Class) and 11.3 (Numerical Index-County Soils), and by deleting the reference to Table No. 11.2 (Erosion (Long Term) Symbols to read as follows:

TABLE NO.	DESCRIPTION	SECTION

11.1	Grade Class	11-0408.~~12~~ 10
~~11.2~~	~~Erosion (Long Term) Symbols~~	~~11-0408.12~~
~~11.3~~ 11.2	Numerical Index-County Soils	11-0408.~~12~~ 10

Amend §11-0102 (General Plan Preparation) of the Public Facilities Manual by revising paragraph 11-0102.2 to read as follows:

11-0102.2 (56-96-PFM) For all land proposed for development, a soil map showing soil type boundaries and highlighting areas posing problems for urban development shall be required. Such soil map shall be at a scale of not less than 1" = 500' (1:6000), and shall also identify classification of soil types, based upon the official County soils ~~identification~~ maps ~~or, if not mapped, based upon soils identified by a professional authorized by the State to provide such information~~. This analysis and a resultant E&S control plan shall provide guidance to the developer as to those areas where topography, drainage and soils are most favorable for intended development and the most favorable routing of roads and sewers so as to create the least erosion potential.

Amend §11-0103 (Stage 1) of the Public Facilities Manual by revising paragraphs 11-0103.2A, and 11-0103.2B to read as follows:

11-0103.2A (56-96-PFM) Such areas shall be identified by use of the official soils map ~~current published soil survey maps of the County~~ or by use of supplemental ~~soil surveys~~ geotechnical report prepared by a professional authorized by the State to provide such information.

11-0103.2B (56-96-PFM) ~~Copies of the~~ The official soils map adopted by the Board of Supervisors is available on the county website and published soil survey maps and text are available ~~at~~ on the NRCS website. ~~Department of Public Works and Environmental Services and on the County web site. Publications Counter, the Office of the NVSWCD and the SCS.~~

Amend §11-0103 (Stage 1) of the Public Facilities Manual by deleting paragraph 11-0103.2C.

~~11-0103.2C (56-96-PFM) The latest criteria, including but not limited to those available from the Director, the SCS and the NVSWCD, shall be used as a guide for interpreting the soil survey maps.~~

Amend §11-0110 (Data Availability) of the Public Facilities Manual by revising paragraph 11-0110.3 to read as follows:

11-0110.3 (24-88-PFM) Standards and specifications are provided in the current Virginia E&S Control Handbook. Some supplemental County standards are included in Plates 1-11 (1M-11)

thru ~~10-11~~ 7-11 (~~10M-11~~ 7M-11) and Chapter 104 (Erosion and Sedimentation Control) of the Code. § 104-1-8(a) of the Code contains modifications to State standards which are mandatory in the County.

Amend §11-0408 (Soils of the County) of the Public Facilities Manual by revising paragraphs 11-0408.1, 11-0408.2, 11-0408.9, 11-0408.11, 11-0408.12, and 11-0408.13 to read as follows:

11-0408.1 (56-96-PFM) The comprehensive source of information about soils in the County is the Soil Survey of Fairfax County, prepared by NRCS and publicly released in January 2008. This survey describes one hundred-eight (108) units of soils, numbered one (1) through fifty-seven (57), and fifty-nine (59) through one hundred-nine (109). Names for the units of soils were formulated using the NRCS's Soil Taxonomy: 2nd Ed. (see 11-103.2B)
~~The soils in the County are classified into approximately 100 major soil series~~. The differences in soil characteristics (i.e., soil color, texture, depth, drainage, chemistry, permeability, erodibility, etc.) are due to the diversity of parent materials and topography in the County. ~~Soils information available from the County has been carefully and scientifically gathered for many years. A continuing process of evaluation and updating of soils information has been used to provide current information relative to the needs of a growing urban area. A detailed soil survey was prepared by soil scientists who systematically traversed approximately 2/3 of the County, examining many hand auger borings, road-cuts, embankments, and soil test pits to group the similar soils into Series. A soils map was prepared by identifying these areas of similar soils on aerial photographs. Samples of the various soil horizons, or layers from representative soils of each series were analyzed in the laboratory to evaluate physical and chemical properties which affect both agronomic and engineering uses of the soils. For many years the County has pioneered in and benefitted from the practical application of soil survey in-formation for engineering and urban uses (see Plate 3-11 (3M-11)).~~

11-0408.2 ~~3~~ Three major separations, or physiographic provinces, have been identified in the County (see Plate 3-11 (3M-11)):

11-0408.~~9~~ 8 (56-96-PFM) The Erosion Factor and selected engineering data for the County Soils are available on the NRCS website. ~~The estimated erodibility and selected engineering data on the following pages was prepared by the County with supplemental information furnished by the SCS, the NVSWCD and VPI.~~ Additional information and advice concerning the County soils is available from ~~the SCS,~~ the NVSWCD and the NRCS~~VPI~~.

11-0408.~~11~~ 9 Soil survey maps and data should be regarded as excellent guides for conducting preliminary detailed engineering investigations, and in making land-use decisions. They should not be used alone for design or construction purposes.
11-0408.~~12~~ 10 (56-96-PFM) In the following tables, soils are listed by Soil Series name. Soil maps available from the County utilize a numeric system of soil identification, for example, 39B ~~55B2~~:

39 ~~55~~ - Soil Number – Glenelg silt loam (Soil Series name and type) (see Table 11.2 ~~11.3~~)

B - Grade Class - 2% to 7% grades
~~2 - Erosion Class - Moderate erosion existed at time of soil mapping~~
The first number(s) in the legend indicates the Soil Series name and Soil Type (which is the texture of the surface, or A horizon, of the representative soil of the Series). The letter in the legend indicates the grade class. (See Table 11.1.) ~~The second number in the legend indicates the estimated degree of erosion at time of survey. (see Table 11.2).~~

11-0408.~~13~~ 11 (56-96-PFM) The legend used on the County soil maps ~~obtained from the County~~ is located in Plate 4-11 (4M-11).

Amend §11-0408 (Soils of the County) of the Public Facilities Manual by deleting paragraphs 11-0408.8, and 11-0408.10.

~~11-0408.8 (56-96-PFM) The Engineering Test Data, contained in Plates 6-11 (6M-11) thru 9-11 (9M-11) has been prepared by VPI, FHA, State Highway Departments, and universities and colleges. Much of this data is available in the booklet "Soil Survey, Fairfax County, Virginia," a cooperative publication of the SCS, the Virginia Agricultural Experiment Station, VPI and the County, available from the SCS District Office and the NVSWCD. The data may also be found in the FHA publication Engineering Soil Classi-fication for Residential Development. The engineering characteristics are presented with the agricultural descriptions in both publications.~~

~~11-0408.10 (56-96-PFM) Soil Identification Maps for the County may be purchased from the Publica-tions Counter in Suite 156, 12000 Government Cen-ter Parkway, Fairfax, Virginia 22035.~~

Amend §11-0408 (Soils of the County) of the Public Facilities Manual by revising Table 11.1 to read as follows:

TABLE 11.1
GRADE CLASS

A =0 - 2%
B =2 - 7%
C =7 - ~~14%~~ 15%
D =15~~14~~ - 25%
E =25~~+%~~ - 45%

Amend §11-0408 (Soils of the County) of the Public Facilities Manual by deleting Table 11.2.

~~**TABLE 11.2**~~
~~**EROSION (LONG TERM) SYMBOLS**~~
~~+ = Soil accumulation~~

~~0 = No erosion~~
~~1 = Slight erosion~~
~~2 = Moderate erosion~~
~~3 = Severe erosion~~

Amend §11-0408 (Soils of the County) of the Public Facilities Manual by renumbering and revising Table 11.3 to read as follows:

TABLE 11.2 ~~11.3~~
NUMERICAL INDEX COUNTY SOILS

~~1 Mixed alluvial land~~
~~2 Chewacla silt loam~~
~~3 Congaree silt loam~~
~~5 Wedhadkee silt loam~~
~~6+ Hyattsville fine sandy loam~~
~~6B+ Hyattsville fine sandy loam~~
~~8+ Worsham silt loam~~
~~8B+ Worsham silt loam~~
~~8A1 Worsham silt loam~~
~~8B1 Worsham silt loam~~
~~8A+ Worsham silt loam~~
~~10B Glenville silt loam~~
~~11 Bermudian silt loam~~
~~12 Rowland silt loam~~
~~13 Bowmansville silt loam~~
~~14B Manassas silt loam~~
~~15 Muck~~
~~18B Rocky land (acidic rock) undulating~~
~~18C Rocky land (acidic rock) rolling phase~~
~~18D Rocky land (acidic rock) hilly phase~~
~~18E Rocky land (acidic rock) steep phase~~
~~19C Very rocky land (acidic rock) rolling phase~~
~~19D Very rocky land (acidic rock) hilly phase~~
~~19E Very rocky land (acidic rock) steep phase~~
~~20B Meadowville silt loam~~
~~21C1 Manor silt loam, rolling phase~~
~~21C2 Manor silt loam, rolling phase~~
~~21C3 Manor silt loam, eroded rolling phase~~
~~21D1 Manor silt loam, hilly phase~~
~~21D2 Manor silt loam, hilly phase~~
~~21D3 Manor silt loam, eroded hilly phase~~
~~21E2 Manor silt loam, steep phase~~
~~21E3 Manor silt loam, eroded steep phase~~
~~22B2 Chillum gravelly silt loam~~
~~23B1 Captina silt loam, undulating phase~~

~~23B2 Captina silt loam, undulating phase~~
~~23C1 Captina silt loam, rolling phase~~
~~24B1 Elioak silt loam, undulating phase~~
~~24B2 Elioak silt loam, undulating phase~~
~~24B3 Elioak silt loam, eroded undulating phase~~
~~24C1 Elioak silt loam, rolling phase~~
~~24C2 Elioak silt loam, rolling phase~~
~~24C3 Elioak silt loam, eroded rolling phase~~
~~24D1 Elioak silt loam, hilly phase~~
~~24D2 Elioak silt loam, hilly phase~~
~~24D3 Elioak silt loam, eroded hilly phase~~
~~25 Sequatchie silt loam~~
~~26 Bertie silt loam~~
~~27B2 Ruxton silt loam, undulating phase~~
~~27C2 Ruxton silt loam, rolling phase~~
~~27D2 Ruxton silt loam, hilly phase~~
~~28B1 Montalto silt loam, undulating phase~~
~~28B2 Montalto silt loam, undulating phase~~
~~28C1 Montalto silt loam, rolling phase~~
~~28C2 Montalto silt loam, rolling phase~~
~~28C3 Montalto silt loam, eroded rolling phase~~
~~29B2 Ruxton stony silt loam, undulating phase~~
~~29C2 Ruxton stony silt loam, rolling phase~~
~~29D2 Ruxton stony silt loam, hilly phase~~
~~30 Huntington silt loam~~
~~31 Lindside silt loam~~
~~32B1 Fairfax silt loam, undulating phase~~
~~32B2 Fairfax silt loam, undulating phase~~
~~32B3 Fairfax silt loam, eroded undulating phase~~
~~32C1 Fairfax silt loam, rolling phase~~
~~32C2 Fairfax silt loam, rolling phase~~
~~32C3 Fairfax silt loam, eroded rolling phase~~
~~33 Melvin silt loam~~
~~34 Woodstown fine sandy loam, nearly level phase~~
~~34B1 Woodstown fine sandy loam, undulating phase~~
~~34B2 Woodstown fine sandy loam, undulating phase~~
~~34C1 Woodstown fine sandy loam, rolling phase~~
~~34C2 Woodstown fine sandy loam, rolling phase~~
~~35C1 Manteo shaly silt loam, rolling phase~~
~~35C2 Manteo shaly silt loam, rolling phase~~
~~35C3 Manteo shaly silt loam, eroded rolling phase~~
~~35D2 Manteo shaly silt loam, hilly phase~~
~~35D3 Manteo shaly silt loam, eroded hilly phase~~
~~36B1 Brays silt loam, undulating phase~~
~~36B2 Brays silt loam, undulating phase~~
~~36C2 Brays silt loam, rolling phase~~

~~36C3 Brays silt loam, eroded rolling phase~~
~~36D3 Brays silt loam, eroded hilly phase~~
~~37B1 Beltsville silt loam, undulating phase~~
~~37B2 Beltsville silt loam, undulating phase~~
~~37C2 Beltsville silt loam, rolling phase~~
~~38B1 Beltsville loam, undulating phase~~
~~38B2 Beltsville loam, undulating phase~~
~~39 Othello silt loam~~
~~40B1 Mecklenburg silt loam, undulating phase~~
~~40B2 Mecklenburg silt loam, undulating phase~~
~~40C1 Mecklenburg silt loam, rolling phase~~
~~40C2 Mecklenburg silt loam, rolling phase~~
~~41B Rocky land (basic rock) undulating phase~~
~~41C Rocky land (basic rock) rolling phase~~
~~41D Rocky land (basic rock) hilly phase~~
~~42B Very rocky land (basic rock) undulating phase~~
~~42C Very rocky land (basic rock) rolling phase~~
~~42D Very rocky land (basic rock) hilly phase~~
~~43B1 Masada gravelly loam, undulating phase~~
~~43B2 Masada gravelly loam, undulating phase~~
~~43C1 Masada gravelly loam, rolling phase~~
~~43C2 Masada gravelly loam, rolling phase~~
~~43D2 Masada gravelly loam, hilly phase~~
~~44B3 Caroline silt loam, eroded undulating phase~~
~~44C3 Caroline silt loam, eroded rolling phase~~
~~45 Matapeake silt loam, nearly level phase~~
~~45B1 Matapeake silt loam, undulating phase~~
~~45B2 Matapeake silt loam, undulating phase~~
~~45C2 Matapeake silt loam, rolling phase~~
~~46 Mattapex silt loam, nearly level phase~~
~~46B1 Mattapex silt loam, undulating phase~~
~~46B2 Mattapex silt loam, undulating phase~~
~~46C1 Mattapex silt loam, rolling phase~~
~~46C2 Mattapex silt loam, rolling phase~~
~~47 Dragston fine sandy loam~~
~~48A1 Iredell silt loam, nearly level phase~~
~~48B1 Iredell silt loam, undulating phase~~
~~48B2 Iredell silt loam, undulating phase~~
~~49B1 Lunt fine sandy loam, undulating phase~~
~~49B2 Lunt fine sandy loam, undulating phase~~
~~49C1 Lunt fine sandy loam, rolling phase~~
~~49C2 Lunt fine sandy loam, rolling phase~~
~~49C3 Lunt fine sandy loam, eroded rolling phase~~
~~49D2 Lunt fine sandy loam, hilly phase~~
~~50B1 Iredell-Mecklenburg stony silt loams, undulating phase~~
~~50B2 Iredell-Mecklenburg stony silt loams, undulating phase~~

~~50C1 Iredell-Mecklenburg stony silt loams, rolling phase~~
~~50C2 Iredell-Mecklenburg stony silt loams, rolling phase~~
~~51 Keyport silt loams~~
~~52A+ Elbert silt loam, nearly level phase~~
~~52A1 Elbert silt loam, nearly level phase~~
~~52B+ Elbert silt loam, undulating phase~~
~~52B1 Elbert silt loam, undulating phase~~
~~53 Lenoir silt loam~~
~~54 Sassafras fine sandy loam, nearly level phase~~
~~54B1 Sassafras fine sandy loam, undulating phase~~
~~54B2 Sassafras fine sandy loam, undulating phase~~
~~54C1 Sassafras fine sandy loam, rolling phase~~
~~54C2 Sassafras fine sandy loam, rolling phase~~
~~55B1 Glenelg silt loam, undulating phase~~
~~55B2 Glenelg silt loam, undulating phase~~
~~55C1 Glenelg silt loam, rolling phase~~
~~55C2 Glenelg silt loam, rolling phase~~
~~55C3 Glenelg silt loam, eroded rolling phase~~
~~55D1 Glenelg silt loam, hilly phase~~
~~55D2 Glenelg silt loam, hilly phase~~
~~55D3 Glenelg silt loam, eroded hilly phase~~
~~56 Kempsville loam~~
~~57B1 Brecknock loam, undulating phase~~
~~57B2 Brecknock loam, undulating phase~~
~~57C1 Brecknock loam, rolling phase~~
~~57C2 Brecknock loam, rolling phase~~
~~57C3 Brecknock loam, eroded rolling phase~~
~~58A Susquehanna silt loam~~
~~58B2 Susquehanna silt loam~~
~~59B1 Orange silt loam, undulating phase~~
~~59B2 Orange silt loam, undulating phase~~
~~59B3 Orange silt loam, undulating phase~~
~~59A1 Orange silt loam, nearly level phase~~
~~59C1 Bremo orange silt loam, rolling phase~~
~~59C2 Bremo orange silt loam, rolling phase~~
~~60B1 Appling gritty loam, undulating phase~~
~~60B2 Appling gritty loam, undulating phase~~
~~60C1 Appling gritty loam, rolling phase~~
~~60C2 Appling gritty loam, rolling phase~~
~~60C3 Appling gritty loam, eroded rolling phase~~
~~60D1 Appling gritty loam, hilly phase~~
~~60D2 Appling gritty loam, hilly phase~~
~~60D3 Appling gritty loam, eroded hilly phase~~
~~61C2 Rolling land, loamy and gravelly sediments~~
~~61C3 Rolling land, loamy and gravelly sediments, eroded phase~~
~~61D2 Hilly land, loamy and gravelly sediments~~

~~61D3 - Hilly land, loamy and gravelly sediments, eroded phase~~
~~61E2 - Steep land, loamy and gravelly sediments~~
~~62B1 - Brecknock silt loam, undulating phase~~
~~62B2 - Brecknock silt loam, undulating phase~~
~~62C1 - Brecknock silt loam, rolling phase~~
~~62C2 - Brecknock silt loam, rolling phase~~
~~62C3 - Brecknock silt loam, eroded rolling phase~~
~~63C2 - Louisburg coarse sandy loam, rolling phase~~
~~63C3 - Louisburg coarse sandy loam, eroded rolling phase~~
~~63D2 - Louisburg coarse sandy loam, hilly phase~~
~~63E2 - Louisburg coarse sandy loam, steep phase~~
~~64B1 - Undulating land, loamy sediments~~
~~64B2 - Undulating land, loamy sediments, eroded phase~~
~~64C1 - Rolling land, loamy sediments~~
~~64C2 - Rolling land, loamy sediments, eroded phase~~
~~64D1 - Hilly land, loamy sediments~~
~~64D2 - Hilly land, loamy sediments, eroded phase~~
~~64E1 - Steep land, loamy sediments~~
~~64E2 - Steep land, loamy sediments, eroded phase~~
~~65B1 - Colfax loam, undulating phase~~
~~65B2 - Colfax loam, undulating phase~~
~~65C1 - Colfax loam, rolling phase~~
~~65C2 - Colfax loam, rolling phase~~
~~66B1 - Lloyd loam, undulating phase~~
~~66B2 - Lloyd loam, undulating phase~~
~~66C2 - Lloyd loam, rolling phase~~
~~66C3 - Lloyd loam, eroded rolling phase~~
~~66D2 - Lloyd loam, hilly loam~~
~~67B1 - Penn fine sandy loam, undulating phase~~
~~67B2 - Penn fine sandy loam, undulating phase~~
~~67C1 - Penn fine sandy loam, rolling phase~~
~~67C2 - Penn fine sandy loam, rolling phase~~
~~67D1 - Penn fine sandy loam, hilly phase~~
~~67D2 - Penn fine sandy loam, hilly phase~~
~~68A - Roanoke silt loam~~
~~69B2 - Enon silt loam, undulating phase~~
~~69C1 - Enon silt loam, rolling phase~~
~~69C2 - Enon silt loam, rolling phase~~
~~69C3 - Enon silt loam, eroded rolling phase~~
~~69D2 - Enon silt loam, hilly phase~~
~~70A - State fine sandy loam~~
~~71B1 - Bucks silt loam, undulating phase~~
~~71B2 - Bucks silt loam, undulating phase~~
~~72B1 - Bucks loam, undulating phase~~
~~72B2 - Bucks loam, undulating phase~~
~~73B1 - Penn silt loam, undulating phase~~

~~73B2 Penn silt loam, undulating phase~~
~~73B3 Penn silt loam, eroded undulating phase~~
~~73C1 Penn silt loam, rolling phase~~
~~73C2 Penn silt loam, rolling phase~~
~~73C3 Penn silt loam, eroded rolling phase~~
~~73D2 Penn silt loam, hilly phase~~
~~75B1 Penn loam, undulating phase~~
~~75B2 Penn loam, undulating phase~~
~~75C1 Penn loam, rolling phase~~
~~75C2 Penn loam, rolling phase~~
~~75C3 Penn loam, eroded rolling phase~~
~~75D2 Penn loam, hilly phase~~
~~75D3 Penn loam, eroded hilly phase~~
~~76A+ Calverton loam, nearly level phase~~
~~76A1 Calverton loam, nearly level phase~~
~~76B+ Calverton loam, undulating phase~~
~~76B1 Calverton loam, undulating phase~~
~~76B2 Calverton loam, undulating phase~~
~~76C1 Calverton loam, rolling phase~~
~~77B1 Penn shaly silt loam, undulating phase~~
~~77B2 Penn shaly silt loam, undulating phase~~
~~77B3 Penn shaly silt loam, undulating phase~~
~~77C2 Penn shaly silt loam, rolling phase~~
~~77C3 Penn shaly silt loam, rolling phase~~
~~77D2 Penn shaly silt loam, hilly phase~~
~~77D3 Penn shaly silt loam, hilly phase~~
~~77E2 Penn shaly silt loam, steep phase~~
~~77E3 Penn shaly silt loam, steep phase~~
~~78A+ Calverton silt loam, nearly level phase~~
~~78A1 Calverton silt loam, nearly level phase~~
~~78B+ Calverton silt loam, undulating phase~~
~~78B1 Calverton silt loam, undulating phase~~
~~79B1 Kelly silt loam, undulating phase~~
~~79B2 Kelly silt loam, undulating phase~~
~~80A+ Croton silt loam, nearly level phase~~
~~80A1 Croton silt loam, nearly level phase~~
~~80B+ Croton silt loam, undulating phase~~
~~80B1 Croton silt loam, undulating phase~~
~~83 Galestown loamy fine sand, nearly level phase~~
~~83B1 Galestown loamy fine sand, undulating phase~~
~~84 Fallington fine sandy loam~~
~~85 Elkton silt loam~~
~~86 Klej loamy fine sand~~
~~87B1 Wickham loam~~
~~88B1 Hiwassee silt loam~~
~~88B2 Hiwassee silt loam~~

~~88C1 Hiwassee silt loam~~
~~88C2 Hiwassee silt loam~~
~~89 Tidal Marsh~~
~~90B1 Augusta very fine sandy loam, undulating phase~~
~~90B2 Augusta very fine sandy loam, undulating phase~~
~~90C1 Augusta very fine sandy loam, rolling phase~~
~~90C2 Augusta very fine sandy loam, rolling phase~~
~~90C3 Augusta very fine sandy loam, eroded rolling phase~~
~~91B1 Birdsboro silt loam, undulating phase~~
~~91B2 Birdsboro silt loam, undulating phase~~
~~92B1 Raritan silt loam~~
~~92B2 Raritan silt loam~~
~~104B1 Catlett gravelly silt loam, undulating phase~~
~~104B2 Catlett gravelly silt loam, undulating phase~~
~~104C1 Catlett gravelly silt loam, rolling phase~~
~~104C2 Catlett gravelly silt loam, rolling phase~~
~~104C3 Catlett gravelly silt loam, eroded rolling phase~~
~~104D2 Catlett gravelly silt loam, hilly phase~~
~~104D3 Catlett gravelly silt loam, eroded hilly phase~~
~~110B1 Augusta loam~~
~~112B1 Augusta silt loam~~
~~113B1 Fairfax gravelly silt loam C2,D2~~
~~114 Masada fine sandy loam~~
~~115 Hiwassee fine sandy loam, light surface phase~~
~~116 Chistiana gravelly loam~~
~~118 Marine clay deposits (subject to land slippage)~~
~~120 Altavista fine sandy loam (from coastal plain soils)~~
~~128B1 Montalto stony silt loam, undulating phase~~
~~128B2 Montalto stony silt loam, undulating phase~~
~~128C1 Montalto stony silt loam, rolling phase~~
~~128C2 Montalto stony silt loam, rolling phase~~
~~128C3 Montalto stony silt loam, eroded rolling phase~~
~~129 Montalto rocky silt loam~~
~~132B1 Mayodan silt loam, undulating phase~~
~~132B2 Mayodan silt loam, undulating phase~~
~~132C1 Mayodan silt loam, rolling phase~~
~~132C2 Mayodan silt loam, rolling phase~~
~~141B Rocky land greenstone~~
~~141C Rocky land greenstone~~
~~141D Rocky land greenstone~~
~~142B Rocky land greenstone~~
~~142C Rocky land greenstone~~
~~142D Rocky land greenstone~~
~~146 Caroline fine sandy loam~~
~~148B1 Iredell-Mecklenburg silt loams, undulating phase~~
~~148B2 Iredell-Mecklenburg silt loams, undulating phase~~

~~148C2 Iredell-Mecklenburg silt loams, rolling phase~~
~~148C3 Iredell-Mecklenburg silt loams, eroded rolling phase~~
~~149B1 Lunt silt loam, undulating phase~~
~~149B2 Lunt silt loam, undulating phase~~
~~149C2 Lunt silt loam, rolling phase~~
~~149C3 Lunt silt loam, eroded rolling phase~~
~~152A+ Elbert orange group~~
~~152A1 Elbert orange group~~
~~152B+ Elbert orange group~~
~~152B1 Elbert orange group~~
~~216 Hyattsville loam, clayey subsoil varient~~
~~232B1 Fairfax loam, undulating phase~~
~~232B2 Fairfax loam, undulating phase~~
~~273A1 Readington silt loam, nearly level phase~~
~~273B1 Readington silt loam, undulating phase~~
~~273B2 Readington silt loam, undulating phase~~
~~274 Readington fine sand loam~~
1A, Albano silt loam, 0 to 2 percent slopes
2B, Ashburn silt loam, 2 to 7 percent slopes
3, Barkers Crossroads loam, 0 to 45 percent slopes
4B, Barkers Crossroads-Nathalie complex, 2 to 7 percent slopes
4C, Barkers Crossroads-Nathalie complex, 7 to 15 percent slopes
4D, Barkers Crossroads-Nathalie complex, 15 to 25 percent slopes
5B, Barkers Crossroads-Rhodhiss complex, 2 to 7 percent slopes
5C, Barkers Crossroads-Rhodhiss complex, 7 to 15 percent slopes
5D, Barkers Crossroads-Rhodhiss complex, 15 to 25 percent slopes
5E, Barkers Crossroads-Rhodhiss complex, 25-45 percent slopes
6B, Barkers Crossroads-Rhodhiss-Rock outcrop complex, 2 to 7 percent slopes
6C, Barkers Crossroads-Rhodhiss-Rock outcrop complex, 7 to 15 percent slopes
6D, Barkers Crossroads-Rhodhiss-Rock outcrop complex, 15 to 25 percent slopes
6E, Barkers Crossroads-Rhodhiss-Rock outcrop complex, 25 to 45 percent slopes
7B, Beltsville silt loam, 2 to 7 percent slopes
8A, Bermudian silt loam, 0 to 2 percent slopes occasionally flooded
9B, Birdsboro loam, 2 to 7 percent slopes
10A, Bowmansville silt loam, 0 to 2 percent slopes, occasionally flooded
11B, Catlett gravelly silt loam, 2 to 7 percent slopes
11C, Catlett gravelly silt loam, 7 to 15 percent slopes
11D, Catlett gravelly silt loam, 15 to 25 percent slopes
12, Chantilly loam, 0 to 45 percent slopes
13A, Chantilly-Albano complex, 0 to 2 percent slopes
14B, Chantilly-Ashburn complex, 2 to 7 percent slopes
15A |Chantilly-Bermudian complex, 0 to 2 percent slopes
16B, Chantilly-Birdsboro complex, 2 to 7 percent slopes
17A, Chantilly-Bowmansville complex, 0 to 2 percent slopes
18B, Chantilly-Catlett complex, 2 to 7 percent slopes
18C, Chantilly-Catlett complex, 7 to 15 percent slopes

18D, Chantilly-Catlett complex, 15 to 25 percent slopes
19B, Chantilly-Clover complex, 2 to 7 percent slopes
20B, Chantilly-Delanco complex, 2 to 7 percent slopes
21A, Chantilly-Dulles complex, 0 to 2 percent slopes
21B, Chantilly-Dulles complex, 2 to 7 percent slopes
22B, Chantilly-Manassas complex, 2 to 7 percent slopes
23B, Chantilly-Montalto complex, 2 to 7 percent slopes
23C, Chantilly-Montalto complex, 7 to 15 percent slopes
24D, Chantilly-Nestoria complex, 15 to 25 percent slopes
24E, Chantilly-Nestoria complex, 25 to 45 percent slopes
25B, Chantilly-Penn complex, 2 to 7 percent slopes
25C, Chantilly-Penn complex, 7 to 15 percent slopes
26A, Chantilly-Rowland complex, 0 to 2 percent slopes, frequently flooded
27B, Chantilly-Sycoline-Kelly complex, 2 to 7 percent slopes
27C, Chantilly-Sycoline-Kelly complex, 7 to 15 percent slopes
28B, Clover silt loam, 2 to 7 percent slopes
29A, Codorus silt loam, 0 to 2 percent slopes, occasionally flooded
30A, Codorus and Hatboro soils, 0 to 2 percent slopes, occasionally flooded
31B, Danripple gravelly loam, 2 to 7 percent slopes
31C, Danripple gravelly loam, 7 to 15 percent slopes
32B, Delanco loam, 2 to 7 percent slopes
33A, Downer loamy sand, 0 to 2 percent slopes
34A, Dulles silt loam, 0 to 2 percent slopes
34B, Dulles silt loam, 2 to 7 percent slopes
35A, Elbert silt loam, 0 to 2 percent slopes, frequently flooded
36A, Elkton silt loam, 0 to 2 percent slopes, occasionally ponded
37B, Elsinboro loam, 2 to 7 percent slopes, rarely flooded
38B, Fairfax loam, 2 to 7 percent slopes
38C, Fairfax loam, 7 to 15 percent slopes
38D, Fairfax loam, 15 to 25 percent slopes
39B, Glenelg silt loam, 2 to 7 percent slopes
39C, Glenelg silt loam, 7 to 15 percent slopes
39D, Glenelg silt loam, 15 to 25 percent slopes
39E, Glenelg silt loam, 25 to 45 percent slopes
40, Grist Mill sandy loam, 0 to 25 percent slopes
41A, Grist Mill-Downer complex, 0 to 2 percent slopes
42A, Grist Mill-Elkton complex, 0 to 2 percent slopes
43A, Grist Mill-Gunston complex, 0 to 2 percent slopes
44A, Grist Mill-Honga complex, 0 to 2 percent slopes
45A, Grist Mill-Matapeake complex, 0 to 2 percent slopes
45B, Grist Mill-Matapeake complex, 2 to 7 percent slopes
46A, Grist Mill-Mattapex complex, 0 to 2 percent slopes
46B, Grist Mill-Mattapex complex, 2 to 7 percent slopes
47B, Grist Mill-Woodstown complex, 2 to 7 percent slopes
48A, Gunston silt loam, 0 to 2 percent slopes
49A, Hatboro silt loam, 0 to 2 percent slopes, frequently flooded

50, Hattontown silt loam, 0 to 25 percent slopes
51A, Hattontown-Elbert complex, 0 to 2 percent slopes
52B, Hattontown-Haymarket complex, 2 to 7 percent slopes
52C, Hattontown-Haymarket complex, 7 to 15 percent slopes
53A, Hattontown-Jackland complex, 0 to 2 percent slopes
54B, Hattontown-Jackland-Haymarket complex, 2 to 7 percent slopes
54C |Hattontown-Jackland-Haymarket complex, 7 to 15 percent slopes
55B, Hattontown-Kelly complex, 2 to 7 percent slopes
56B, Hattontown-Orange complex, 2 to 7 percent slopes
57C, Hattontown-Orange complex, 7 to 15 percent slopes, very stony
59B, Haymarket silt loam, 2 to 7 percent slopes
59C, Haymarket silt loam, 7 to 15 percent slopes
60A, Honga peat, 0 to 1 percent slopes, very frequently flooded, tidal
61A, Huntington silt loam, 0 to 2 percent slopes, occasionally flooded
62A, Jackland silt loam, 0 to 2 percent slopes
63B, Jackland and Haymarket soils, 2 to 7 percent slopes
63C, Jackland and Haymarket soils, 7 to 15 percent slopes
64B, Jackland and Haymarket soils, 2 to 7 percent slopes, very stony
64C, Jackland and Haymarket soils, 7 to 15 percent slopes, very stony
64D, Jackland and Haymarket soils, 15 to 25 percent slopes, very stony
65B, Kelly silt loam, 2 to 7 percent slopes
66, Kingstowne sandy clay loam, 0 to 45 percent slopes
67B, Kingstowne-Beltsville complex, 2 to 7 percent slopes
68B, Kingstowne-Danripple complex, 2 to 7 percent slopes
68C, Kingstowne-Danripple complex, 7 to 15 percent slopes
69B, Kingstowne-Elsinboro complex 2 to 7 percent slopes
70A, Kingstowne-Sassafras complex, 0 to 2 percent slopes
70B, Kingstowne-Sassafras complex, 2 to 7 percent slopes
70C, Kingstowne-Sassfrass complex, 7 to 15 percent slopes
71C, Kingstowne-Sassafras-Marumsco complex, 7 to 15 percent slopes
71D, Kingstowne-Sassafras-Marumsco complex, 15 to 25 percent slopes
71E, Kingstowne-Sassafras-Marumsco complex, 25 to 45 percent slopes
72B, Kingstowne-Sassafras-Neabsco complex, 2 to 7 percent slopes
73A, Lindside silt loam, 0 to 2 percent slopes, occasionally flooded
74B, Lunt-Marumsco complex, 2 to 7 percent slopes
75B, Manassas silt loam, 2 to 7 percent slopes
76A, Matapeake silt loam, 0 to 2 percent slopes
76B, Matapeake silt loam, 2 to 7 percent slopes
77A, Mattapex loam, 0 to 2 percent slopes
77B, Mattapex loam, 2 to 7 percent slopes
78B, Meadowville loam, 2 to 7 percent slopes
79B, Nathalie gravelly loam, 2 to 7 percent slopes
79C, Nathalie gravelly loam, 7 to 15 percent slopes
79D, Nathalie gravelly loam, 15 to 25 percent slopes
80D, Nestoria channery silt loam, 15 to 25 percent slopes
80E, Nestoria channery silt loam, 25 to 45 percent slopes

81B, Oatlands loam, 2 to 7 percent slopes
81C, Oatlands loam, 7 to 15 percent slopes
82B, Orange silt loam, 2 to 7 percent slopes
83C, Orange silt loam, 7 to 15 percent slopes, very stony
84B, Panorama loam, 2 to 7 percent slopes
85B, Penn silt loam, 2 to 7 percent slopes
85C, Penn silt loam, 7 to 15 percent slopes
86, Pits, gravel
87C, Rhodhiss sandy loam, 7 to 15 percent slopes
87D, Rhodhiss sandy loam, 15 to 25 percent slopes
87E, Rhodhiss sandy loam, 25 to 45 percent slopes
88C, Rhodhiss-Rock outcrop complex, 2 to 15 percent slopes
88D, Rhodhiss-Rock outcrop complex, 15 to 25 percent slopes
88E, Rhodhiss-Rock outcrop complex, 25 to 45 percent slopes
89A, Rowland silt loam, 0 to 2 percent slopes, frequently flooded
90A, Sassafras sandy loam, 0 to 2 percent slopes
90B, Sassafras sandy loam, 2 to 7 percent slopes
90C, Sassafras sandy loam, 7 to 15 percent slopes
91C, Sassafras-Marumsco complex, 7 to 15 percent slopes
91D, Sassafras-Marumsco complex, 15 to 25 percent slopes
91E, Sassafras-Marumsco complex, 25 to 45 percent slopes
92B, Sassafras-Neabsco complex, 2 to 7 percent slopes
93B, Sumerduck loam, 2 to 7 percent slopes
94B, Sycoline-Kelly complex, 2 to 7 percent slopes
94C, Sycoline-Kelly complex, 7 to 15 percent slopes
95, Urban land
96, Urban land-Barker Crossroads complex
97, Urban land-Chantilly complex
98, Urban land-Grist Mill
99, Urban land-Hattontown complex
100, Urban land-Kingstowne complex
101, Urban land-Wheaton complex
102, Wheaton loam, 2 to 25 percent slopes
103A, Wheaton-Codorus complex, 0 to 2 percent slopes
104B, Wheaton-Fairfax complex, 2 to 7 percent slopes
104C, Wheaton-Fairfax complex, 7 to 15 percent slopes
104D, Wheaton-Fairfax complex, 15 to 25 percent slopes
104E, Wheaton-Fairfax complex, 25 to 45 percent slopes
105B, Wheaton-Glenelg complex, 2 to 7 percent slopes
105C, Wheaton-Glenelg complex, 7 to 15 percent slopes
105D, Wheaton-Glenelg complex, 15 to 25 percent slopes
106A, Wheaton-Hatboro complex, 0 to 2 percent slopes, frequently flooded
107B, Wheaton-Meadowville complex, 2 to 7 percent slopes
108B, Wheaton-Sumerduck complex, 2 to 7 percent slopes
109B, Woodstown sandy loam, 2 to 7 percent slopes W, Water

Amend §11-0409 (Soil Profile and Test Data) of the Public Facilities Manual by deleting it in its entirety.

~~11-0409 Soil Profile and Test Data - See Plates 5-11 (5M-11) thru 9-11 (9M-11).~~

Amend §11-0410 (Reserved) of the Public Facilities Manual by deleting it in its entirety.

~~11-0410(RESERVED)~~

Amend §11-0411 (Biotechnical Slope and Bank Protection) of the Public Facilities Manual by renumbering paragraphs 11-0411.1, 11-0411.2, 11-0411.3, 11-0411.4, 11-0411.5, and 11-0411.6, and 11-0411.7 to read as follows:

11-~~0411~~ 0409 Biotechnical Slope and Bank Protection

11-~~0411.1~~ 0409.1 Conditions in the County have resulted in numerous eroded or unstable banks. Some soils are difficult to stabilize on steep slopes after they are disturbed by construction activities. Also conversion of watersheds to urban uses has increased storm run-off and enlarged, deepened and eroded many stream channels.

11-~~0411.2~~ 0409.2 Cost and aesthetic concerns make it desirable to consider vegetative measures as an alternative to conventional structural solutions to these problems. Biotechnical slope and bank protection is one alternative which warrants consideration on an experimental basis, case by case, with the advance approval of DPWES.

11-~~0411.3~~ 0409.3 Biotechnical slope and bank protection consists of the use of natural materials to stabilize stream banks and other unstable or eroding slopes. Dormant wood vegetative materials which grow from cuttings are combined with natural materials such as stone and wood in an integrated, complementary manner.

11-~~0411.4~~ 0409.4 When the cuttings root and grow, they produce a mass of leafy vegetation protecting the soil surface and a dense mat of roots which bind the sub-soil to prevent caving, sloughing, and erosion.

11-~~0411.5~~ 0409.5 The plant materials may be combined with riprap, crib walls and other combinations to meet the needs of each site. Such structures are flexible, tend to move with the dynamics of the site, and are self-repairing.

11-~~0411.6~~ 0409.6 Descriptions of biotechnical treatment may be found in the Virginia E&S Control Hand-book. Diagrams showing some forms of biotechnical slope and bank protection are shown in Plate 10-11 (10M-11).

11-~~0411.7~~ 0409.7 As bioengineering stabilization techniques call for coordination of plant science, soils science and engineering principles, they should be employed only with the guidance of experts familiar with bioengineering work. Approval of the Director is required.

These amendments shall become effective at 12:01 a.m. June 8, 2011.

GIVEN under my hand this 7th day of June, 2011.

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NANCY VEHRS
Clerk to the Board of Supervisors