MEMORANDUM

DEPARTMENT OF ENVIRONMENTAL QUALITY

WATER DIVISION

P. O. Box 10009 Richmond, VA 23240-0009

SUBJECT: Water Division Guidance Memo No. 95-006
Updated Technical Criteria for VPA Industrial Land Application Program

TO: Regional Directors

FROM: Larry G. Lawson, P.E.

DATE: September 28, 1995

COPIES: Regional Office Permit Managers, Martin G. Ferguson, Cal Sawyer(VDH), Russ Perkinson (DCR)

The purpose of this memo is to provide the Regional Offices guidance on the updated technical criteria used for evaluation of VPA industrial land application proposals. As indicated in the OWPS Guidance Memo No. 95-004, "Transition from VPA Permits for Sewage Sludge to VDH Biosolids Use Permits", we recommend that the regions follow the technical criteria set by the Biosolids Use Regulations for evaluation of the VPDES permit sludge management plans and any VPA permit applications regarding land application of sewage sludge. Since most of these criteria are also applicable to land application of industrial and other wastes in the VPA permit program, the need to update our current guidelines is obvious.

TECHNICAL ISSUES

Specific changes from our current guidelines provided in the VPA manual and VPA permit applications are provided below:

1) The definition of infrequent application has been changed from once every five years to once every three years. The VPA Permit Application Forms have been revised accordingly and a copy of these new forms will be distributed through a separate guidance memo.

2) The Plant Available Nitrogen (PAN) table has been revised based on recommendations made by VPI's Virginia Cooperative Extension Service recent publication entitled "The Virginia Agronomic Land Use Evaluation System" (VALUES).

   Attachment A includes three tables which replace the PAN table currently listed in the VPA Permit Manual Appendix III F. Table I provides plant uptake rates of various

non-irrigated crops for identified soil productivity groups. Table II provides the estimated yields of various non-irrigated crops for identified soil productivity groups. Table III provides the nitrogen credits from various legumes. Nitrogen credits should be made where such crops have been grown the previous year for both frequent and infrequent land application sites. This will maintain consistency on nitrogen loadings regardless of the form of nitrogen, i.e., organic or inorganic, and in accordance with recommendations from VPI.

Note that the soil productivity groups have been reclassified as a result of the VALUES research. Soil productivity groups are based upon the crop yield potential of particular soil types based on their physical and chemical properties. Soil productivity groups are NOT the same as soil capability classes listed in county soil surveys. Capability classes are related to soil limitations for development purposes and are not directly related to crop production potential or PAN rates.

Attachment B provides the updated soil productivity groupings for various cropping categories (Table I-1). Consideration should be given for yield adjustment according to various soil erosion/slope features. A general guideline for such adjustment is also provided in Attachment B (Table I-4). The regional staff should verify the soil productivity groups proposed in the VPA permit applications by using these new tables. The same tables have been published in the "Virginia Nutrient Management Standards and Criteria. 1995". This document is used by the Department of Conservation and Recreation (DCR) to develop Nutrient Management Plans for animal feeding operations. Therefore, by updating these criteria, it is anticipated that consistency will be maintained among land application of sewage sludge, industrial waste and animal waste.

Since the VALUES research was based on the non-irrigated field data and there is no up-to-date PAN/Yield tables available for most crops (except corn) with well managed irrigated system at this time, the VPI/Extension Service may be consulted to determine the appropriate rates on a case-by-case basis. In the case of those spray irrigation projects which often maintain a fixed cropping scheme within a very limited acreage, the rates may be approved through the application review and the permit may identify the crop(s) and the approved rate(s) without the inclusion of the PAN tables. An updated table for corn with managed (properly scheduled) center pivot

irrigation systems is included in **Attachment B** (Table I-3) for your reference.

3) Metal loading rates have been updated. Based on an appeal agreement (City of Danville vs. VDH), metal concentrations for selenium, cadmium, and molybdenum found in Tables 8 A&B and 9, Article 3 of the Biosolids Use Regulations have been suspended. Therefore, those levels found in the 40CFR Part 503 are recommended to be implemented for the time being.

Attachment C includes two tables which address these changes. Table 8A provides the recommended ceiling limits and replaces the previous table used for screening of good quality sludge (Table H-1, found in the draft Sewage Regulations, April 1, 1988 version). Table 9 provides the updated maximum cumulative metal loading rates and replaces Table H-6 found in the draft Sewage Regulations, April, 1988 version. Note that the pH management requirement for high cadmium sludge (>21 ppm) has been changed from pH 6.5 to pH 6.0 for the sludge/soil mixture.

As the result of the aforementioned changes on PAN rates and metal loadings, **Attachment A** also provides the revised Part I. B. Special Conditions pages in the VPA Permit Manual, which reflect the need to consider legume credits when calculating PAN loadings, the reference changes made to the PAN and the yield tables, and the minor changes made to the pH management requirement for high cadmium content sludges. Specifically, App. III C. Part I B.5 and B.8 (Page III-A28) of the industrial section have been revised and the changes are in Italics. For the convenience of the permit writers, similar special conditions in the animal and municipal sections are also revised, i.e., App. III C. Part I B.3 and B.4 (Page III-A34) for the intensified operations, and App. III C. Part B.11 (Page III-A19), B.12, B.13, and B.14 (Page III-A22) for the municipal section. No changes are made to the concentrated animal section since the nutrient management aspect of the operation should have been addressed very specifically by the approved NMP.

4) Consideration of phosphorus control measures is recommended for all frequent application sites at or below the agronomic rates. Acceptable nutrient management requirements should be part of the land application design.

In addition, when land application sites exhibit very high soil test phosphorus of 55 ppm or more (Mehlich I analytical test procedure or equivalent), regardless of

whether the site is used for frequent or infrequent applications, DCR may be consulted and a nutrient management plan and/or a soil conservation plan may be required on a case-by-case basis. Phosphorus control is especially critical in these situations since the frequency of infrequent application has been changed from once every five years to once every three years.

Note that the Mehlich I analytical test procedure is used by the VPI&SU soil testing lab and the VALUES recommendations are based on these results. If the permittee uses a commercial lab which uses the Weak Bray phosphorus procedure, adjustments may be made by utilizing the conversion table included in **Attachment B.** In all cases, the test result values give only an estimate of available phosphorus. The test extractions are proportional to the available phosphorus and the results should be considered as indicator numbers.

IMPLEMENTATION RECOMMENDATIONS

Please note that the newly adjusted PAN tables should be used along with the new soil productivity grouping system. We recommend the above updated criteria be applied immediately to any proposed projects and to existing permits at reissuance. In the case of permit modification, the regional staff should exercise their best professional judgement to determine how and when to apply these criteria. Unless the owner's agreement is received, normally only the items requested by the owner are subject to modification. Keeping the owners abreast of these changes during the initial meeting is strongly recommended.

An electronic copy of Attachment A (PAN tables and Special Conditions) is also distributed with this memo. If you have any questions regarding this guidance, please contact Lily Choi at (804)762-4054.

Attachment A

Revised VPA Permit Manual Pages

1. **PAN Tables - Pages III-A45, 46, & 46a**
2. **Special Conditions - Pages III-A19, 22, 28, & 34**

III F. Attachment B-1 Recommended PAN Rates

Attachment B-1
Table I

Recommended Plant Available Nitrogen (PAN) Application Rates in pounds of Nitrogen (N) per acre for Various Non-Irrigated Crops Used in Sludge Management Systems (1)

Crop	Soil Productivity Group								
	I		II		III		IV		V
	A	B	A	B	A	B	A	B	
	lbs N/acre								
Corn grain or silage	160 to 180	150 to 170	140 to 160	130 to 150	120 to 140	110 to 130	100 to 120	85 to 105	65 to 85
Grain sorghum	140	130	120	110	100	95	90		80
Full Season Soybeans (2)	160 to 180	150 to 170	140 to 160	130 to 150	120 to 140	110 to 130	100 to 120	85 to 105	65 to 85
Canola (3)	100		90		80		60		60
Wheat	100		90		80		60		60
Barley	90		80		80		60		60
Rye	75		75		75		75		75
Oats	80		80		80		60		60
Tallgrass hay (4)	250		250		200		160		160
Bermudagrass hay	300		300		260		210		210
Pasture Fescue/Orchardgrass(5)	120		120		100		80		80
Bermudagrass pasture	200		200		160		120		120
Alfalfa	300		300		210		150		150
Sudangrass, sudan-sorghum, millet (6)	70		70		70		70		70
Stockpiled tall fescue (summer application by August 31)	90		90		90		60		60

Notes: (1) For proposed use of crops or PAN rates (lbs/A) not included in the following tables, adequate yield and PAN Data are to be submitted for staff approval prior to land application.

(2) For double crop or late beans planted after 6/21, (of any year,) allowable PAN rates are the lowest of the listed values, as rounded to nearest factor of ten.

(3) For fall application rate, may sidedress up to 60 lbs fertilizer N/acre in late February before spring growth begins.

III F. Attachment B-2 Estimated Crop Yields

Attachment B-2
Table II

Estimated Yields in Bushels (bu) or tons (T) per acre (A) of Various Non-Irrigated Crops for identified Soil Productivity Groups

Crop	I		II		III		IV		V
	A	B	A	B	A	B	A	B	
Corn Grain(bu/A) Silage(T/A)	160 21	150 20	140 19	130 18	120 17	110 16	100 15	85 13	65 10
Grain Sorghum(bu/A)	140	130	120	110	100	90	90		80
Soybeans(bu/A) Early season Late season (7)	50 40	45 34	40 34	30	35 25		25 18		20 15
Canola (8)	**UNDETERMINED AT THIS TIME**								
Wheat(bu/A) Standard Intensive	64 80		56 70		48 60		40 50		24 30
Barley(bu/A) Standard Intensive	100 115		70 88		60 75		50 63		30 38
Oats	80		80		80		60		60
Tallgrass hay(T/A)	>4.0		3.5-4.0	3-3.5	<3.0		NA		NA
Bermudagrass hay(T/A	>6.0		4.0-6.0		<4.0		NA		NA
Alfalfa(T/A)	>6.0		4.0-6.0		<4.0		NA		NA

Notes: (4) Apply listed PAN rate when application occurs between 3/1 and 9/30 in any year and apply only one-half of listed PAN rates if application will occur between 10/1 of any year and 2/28 of the following year, with remaining PAN applied after 3/1 of that following year.

(5) For frequent applications apply 60 lbs PAN/acre per year. Following infrequent application rate, subsequent frequent applications should be adjusted on a case-by-case basis, accounting for residual from other wastes and crops.

(6) Sudangrass, sudan-sorghrum and pearl millet may receive a PAN rate of 120 lbs/A if the application occurs between 3/1 and 6/1 of any year and two cuttings are to be made, weather permitting. For Foxtail or German Millet, cut only once, application will be limited to a PAN rate of 70 LBS/A.

(7) Late season beans would be planted on or after 6/21 of that year.

(8) Sufficient Yield Data not currently available.

III F. Attachment B-3 Legume Nitrogen Credits

Attachment B-3
Table III

Residual Plant Available Nitrogen (PAN) remaining from growth of various Legumes during the previous year (9)

Crop	%Stand	Yield Description	Residual PAN (lbs/A)
Alfalfa	50-75	Good (>4T/A)	90
	25-49	Fair (3-4T/A)	70
	<25	Poor (<3T/A)	50
Red Clover	>50	Good (>3T/A)	80
	25-49	Fair (2-3T/A)	60
	<25	Poor (<2T/A)	40
Hairy Vetch	80-100	Good	100
	50-79	Fair	75
	<50	Poor	50
Peanuts			45
Soybeans			20(10)

Notes: (9) The Residual PAN values must be subtracted from the PAN values listed in Table I to determine sludge application rates following growth of Legume Crops the previous year.

(10) Where yield data is available utilize 0.5 pounds per bushel.

III C. Part I B. Special Conditions Pages (cont.)

C.2. **Municipal Sludge Land Application** (cont.)

Permit No. VPA00000
Part I
Page of

B. Other Requirements or Special Conditions (cont.)

9. All trucks that transport sludge shall be water tight and shall be totally enclosed by metal covers, and/or tarps if sludge is sufficiently dewatered to prevent spillage. The tailgates shall be properly sealed to prevent spillage.

10. Soil pH results at the time of application shall not be over 1 year old.

11. *If the sludge cadmium concentration is greater than or equal to 21 mg/kg, the soil/sludge mixture pH at each land application site shall be adjusted to a minimum pH of 6.0 at the time of application.*

* Not to be used in Silviculture operations.

III C. Part I B. Special Conditions Pages (cont.)

C.2. **Municipal Sludge Land Application** (cont.)

Permit No. VPA00000
Part I
Page of

B. Other Requirements or Special Conditions (cont.)

12. The application of sludge together with any other source of PAN shall not exceed the agronomic loading rate for the crops grown on each site. The sludge application rates shall be calculated for each field based upon the PAN and productivity *groups* provided in Attachment *B-1, Table I, and Attachment B-2, Table II. Legume nitrogen credits shall be made for sites where legumes have been grown the previous year in accordance with Attachment B-3, Table III.* PAN calculations should be made using the results from at least the last 12 month's sludge samples. The resulting application rates shall be included in the (**reporting period**) 10th-of-the-month reports sent to the Virginia Department of Health and the *Department of Environmental Quality Regional Office*.

13. (**For Infrequent Applications**)
The rate of application of sludge shall never exceed 15.0 dry tons per acre per *three* years.
(**For Frequent Applications**)
The rate of application of sludge shall never exceed 15.0 dry tons per acre per year.

14. The yield goals posted in Attachment *B-2, Table II* shall reasonably correspond to site specific yield goals. If the site specific yield goal is lower than the yield listed in Attachment *B-2, Table II*, the amount of sludge applied shall be reduced proportionately. In order to justify higher sludge application rates due to higher yield goals than those in Attachment *B-2, Table II*, the Permittee shall first obtain written verification from the county Extension Agent that the higher yield goal is reasonable.

15. If agricultural practice involves double cropping, the sludge application must be split in accordance with the nitrogen (PAN) requirements of each respective crop.

16. Milk cows shall not be allowed on sites within 60 days following sludge application and green chopped forage from the site shall not be fed to milk cows if forage is removed within 60 days following sludge application.
17. Beef cattle shall not be allowed on sites within 30 days following sludge application and green chopped forage from the site shall not be fed to beef cattle if forage is removed within 30 days following sludge application.

III C. Part I B. Special Conditions Pages (cont.)

C.4. **Industrial Sludge Land Application** (cont.)

Permit No. VPA00000
Part I
Page of

B. Other Requirements or Special Conditions (cont.)

5. If the sludge cadmium concentration is greater than or equal to *21* mg/kg, the *soil/sludge mixture* pH at each land application site shall be adjusted to a minimum pH of *6.0* at the time of application.*

6. Vegetative buffer zones (minimum 60% soil coverage) of __ feet (**minimum**) shall be maintained from all property lines and surface water courses for surface application, and __ feet (**minimum**) from all property lines and surface water courses for subsurface injection.**

7. Sludge shall not be applied within 50 feet of limestone outcrops nor be applied in such a manner that it would discharge to sinkholes that may exist in the area.

8. The application of sludge together with any other source of PAN shall not exceed the agronomic loading rate for the crops grown on each site. The sludge application rates shall be calculated for each field based upon the PAN and productivity *groups* provided in Attachment *B-1, Table I and Attachment B-2, Table II. Legume nitrogen credits shall be made for sites where legumes have been grown the previous year in accordance with Attachment B-3, Table III.* PAN calculations should be made using the results from at least the last 12 month's sludge samples. The resulting application rates shall be included in the (**reporting period**) 10th-of-the-month reports sent to the *Department of Environmental Quality Regional Office.*

9. A summary report of the previous (**reporting period**) activities shall be submitted to the *Department of Environmental Quality Regional Office* by the 10th of the following month, covering the previous (**reporting period**) activities. Reports shall include:

   a. Analyses of composite samples of industrial sludge land applied during the previous (**reporting period**) reported on the monitoring report provided in Attachment __.

* Not to be used in Silviculture operations.
** Buffer zones requirements for industrial land application should be considered on a case-by-case basis. The above special condition lists buffer zones that should be included.

III C. Part I B. Special Conditions Pages (cont.)

C.8. **Land Application of Animal Waste -- Intensified**

Permit No. VPA00000
Part I
Page of

B. Other Requirements or Special Conditions (cont.)

1. **(Use for liquid or solid spreader systems)**
Animal waste may be applied to frozen ground by liquid or solid spreader systems only under the following conditions:

   a. Slopes are not greater than 5%,
   b. A minimum of a 200 foot vegetative (or adequate crop residue) buffer is maintained from all surface water courses.
   c. Only those soils characterized by USDA as "well drained", with good infiltration, are used.
   d. Vegetation or crop residue is present and sufficient to prevent surface runoff, and
   e. No waste is surface applied to ice or snow covered ground or to soils that are saturated.

2. **(Use for Spray Irrigation systems)**
Animal Waste shall not be spray irrigated to soils which are saturated by previous precipitation events, or to ice or snow covered or frozen ground.

3. The application of animal waste together with any other source of PAN shall not exceed the agronomic loading rate for the crops grown on each site. The animal waste application rates shall be calculated for each field based upon the PAN and productivity *groups* provided in Attachment *B-1, Table I, and Attachment B-2, Table II. Legume nitrogen credits shall be made for sites where legumes have been grown the previous year in accordance with Attachment B-3, Table III.*

4. The yield goals posted in Attachment *B-2, Table II* shall reasonably correspond to site specific yield goals. If the site specific yield goal is lower than the yield listed in Attachment *B-2, Table II*, the amount of animal waste applied shall be reduced proportionately. In order to justify higher animal waste application rates due to higher yield goals than those in Attachment *B-2, Table II*, the Permittee shall first obtain written verification from the county Extension Agent that the higher yield goal is reasonable.

Attachment B

1. Updated Soil Productivity Groups for Various Cropping Categories
2. Utilizing Erosion/Slope Information
3. Planning Yields for Irrigated Corn
4. Conversion Table for Phosphorus Results

Table I-1
Soil Productivity Groupings for Various Cropping Categories

Soil Series	Soil Mngt Group	Corn	Grain Sorghum	Small Grains	Soy-beans	Canola	Alfalfa	Tall Grass Clover Hay Pasture
Abell	G	IIa	IIa	I	II	IV	II	I
Abell variant	G	IIa	IIa	I	II	IV	II	I
Ackwater	K	IIb	IIb	I	II	II	III	I
Acredale (drained)	C	Ib	Ib	II	Ib	I	NS*	I
Acredale (undrained)	OO	V	V	V	V	Vb	NS*	NS*
Aden (drained)	C	Ib	Ib	II	Ib	I	NS*	I
Aden (undrained)	OO	V	V	V	V	Vb	NS*	NS*
Airmont	BB	IVb	IVb	III	IV	IV	NS*	III
Alaga	II	V	V	III	V	IV	NS*	NS*
Alamance	FF	IVb	IVb	III	IV	IV	NS*	III
Albano	KK	V	V	V	V	Vb	NS*	IV
Albemarle	JJ	V	V	IV	V	IV	NS*	IV
Alderflats	NN	V	V	V	V	Vb	NS*	NS*
Aldino	W	IVa	IVa	IV	III	IV	NS*	IV
Aldio	Y	IVa	IVa	III	III	III	IV-V	III
Allegheny	L	IIb	IIb	I	II	II	III	II
Alonzville	L	IIb	IIb	I	II	II	III	II
Altavista	B	Ia	Ia	I	Ia	I	II	I
Alticrest	E	IIa	IIa	I	II	Va	NS*	II
Angie	AA	IVa	IVa	II	III	Va	NS*	IV
Angie variant	AA	IVa	IVa	II	III	Va	NS*	IV
Appling	V	IVa	IVa	II	III	III	III	III
Appomattox	O	IIb	IIb	I	II	II	II	II
Arapahoe	EE	IVb	IVb	III	IV	Vb	NS*	NS*
Arcola	U	IIIb	IIIb	II	II	II	III	II
Ardilla	W	IVa	IVa	IV	IIIa	IV	NS*	IV
Argent	PP	V	V	V	V	Vb	NS*	NS*
Ashburn	BB	IVb	IVb	III	IV	IV	IV-V	III
Ashe	JJ	V	V	IV	V	IV	NS*	IV
Ashlar	FF	IVb	IVb	III	IV	I	NS*	III
Assateague	QQ	V	V	V	V	Vb	NS*	NS*
Athol	M	IIb	IIb	I	II	II	I	II
Atkins	HH	IVb	IVb	III	IV	Vb	NS*	IV
Atlee	Q	IIIa	IIIa	II	II	II	NS*	III
Augusta (drained)	P	IIb	IIb	II	II	Va	NS*	III
Augusta (undrained)	Z	IVa	IVa	IV	III	IV	NS*	NS*
Augusta variant (drained)	P	IIb	IIb	II	II	Va	NS*	III

Soil Series	Soil Mngt Group	Corn	Grain Sorghum	Small Grains	Soy-beans	Canola	Alfalfa	Tall Grass Clover Hay Pasture
Augusta variant (undrained)	Z	Iva	Iva	IV	III	IV	NS*	NS*
Aura	T	IIIb	IIIb	II	II	II	NS*	III
Austinville	O	IIb	IIb	I	II	II	II	II
Axis	PP	V	V	V	V	Vb	NS*	NS*
Aycock	R	IIIa	IIIa	II	II	II	III	II
Ayersville	FF	IVb	IVb	III	IV	IV	NS*	III
Backbay	PP	V	V	V	V	Vb	NS*	NS*
Badin	X	IVa	IVa	II	III	III	III	III
Baile	HH	IVb	IVb	III	IV	Vb	NS*	IV
Bailegap	GG	IVb	IVb	IV	IV	IV	NS*	III
Balsam	GG	IVb	IVb	IV	IV	IV	IV-V	III
Bama	R	IIIa	IIIa	II	II	II	III	II
Barclay	E	IIa	IIa	I	II	Va	NS*	II
Bateau	I	IIa	IIa	I	II	Vb	IV-V	I
Bayboro (drained)	C	Ib	Ib	II	Ib	I	NS*	I
Bayboro (undrained)	OO	V	V	V	V	Vb	NS*	NS*
Beech Grove	JJ	V	V	IV	V	IV	IV-V	IV
Beckham	O	IIb	IIb	I	II	II	II	II
Belhaven	PP	V	V	V	V	Vb	NS*	NS*
Beltsville	BB	IVb	IVb	III	IV	IV	NS*	III
Belvoir	BB	IVb	IVb	III	IV	IV	NS*	III
Berks	JJ	V	V	IV	V	IV	NS*	IV
Bermudian	A	Ia	Ia	I	Ia	I	I	I
Bertie	J	IIb	IIb	II	II	II	NS*	I
Bethera (drained)	C	Ib	Ib	I	Ib	I	NS*	I
Bethera (undrained)	OO	V	V	V	V	Vb	NS*	NS*
Bethlehem	V	IVa	IVa	II	III	III	III	III
Bibb	EE	IVb	IVb	III	IV	Vb	NS*	NS*
Biltmore	II	V	V	III	V	IV	NS*	NS*
Birdsboro	L	IIb	IIb	I	II	II	III	II
Bladen (drained)	C	Ib	Ib	II	Ib	I	NS*	I
Bladen (undrained)	OO	V	V	V	V	Vb	NS*	NS
Blago	HH	IVb	IVb	III	IV	Vb	NS*	IV
Blairton	FF	IVb	IVb	III	IV	IV	NS*	III
Bland	Y	IVa	IVa	III	III	III	NS*	III
Bleakhill	J	IIb	IIb	I	II	II	NS*	I
Bohicket	PP	V	V	V	V	Vb	NS*	NS*
Bojac (ES VA Beach, Ches.)	T	IIIb	IIIb	II	II	II	NS*	III

Soil Series	Soil Mngt Group	Corn	Grain Sorghum	Small Grains	Soy-beans	Canola	Alfalfa Hay	Tall Grass Clover Pasture
Bojac (Mainland,excluding VA Beach & Ches.)	DD	IVb	IVb	II	IV	III	NS*	III
Bolling	J	IIb	IIb	I	II	II	NS*	I
Bolling variant	J	IIb	IIb	I	II	II	NS*	I
Bolton	M	IIb	IIb	I	II	II	I	II
Bonneau	DD	IVb	IVb	II	IV	III	NS*	III
Bookwood	U	IIIb	IIIb	II	II	II	III	II
Botetourt	G	IIa	IIa	I	II	IV	II	I
Bourne	BB	IVb	IVb	III	IV	IV	NS*	III
Bourne variant	BB	IVb	IVb	III	IV	IV	NS*	III
Bowmansville	I	IIa	IIa	I	II	Vb	NS*	I
Braddock	O	IIb	IIb	I	II	II	II	II
Brandywine	FF	IVb	IVb	III	IV	IV	NS*	III
Brecknock	U	IIIb	IIIb	II	II	II	III	II
Bremo	JJ	V	V	IV	V	IV	NS*	IV
Brentsville	FF	IVb	IVb	III	IV	IV	NS*	III
Broadway	A	I	Ia	I	Ia	I	I	I
Brockroad	V	IVa	IVa	II	III	III	III	III
Brushy	JJ	V	V	IV	V	IV	IV-V	III
Buchanan	BB	IVb	IVb	III	IV	IV	NS*	III
Buckhall	V	IVa	IVa	II	III	III	III	III
Buckingham	JJ	V	V	IV	V	IV	NS*	IV
Bucks	U	IIIb	IIIb	II	II	II	III	II
Buckton	A	Ia	Ia	I	Ia	I	I	I
Buffstat	V	IVa	IVa	II	III	III	III	III
Bugley	JJ	V	V	IV	V	IV	IV-V	IV
Buncombe	II	V	V	III	V	IV	NS*	NS*
Burketown	BB	IVb	IVb	III	IV	IV	NS*	III
Burrowsville	BB	IVb	IVb	III	IV	IV	NS*	III
Burton	FF	IVb	IVb	III	IV	IV	NS*	III
Cahaba	R	IIIa	IIIa	II	II	II	III	II
Calverton	BB	IVb	IVb	III	IV	IV	NS*	III
Calvin	JJ	V	V	IV	V	IV	NS*	IV
Camocca	PP	V	V	V	V	Vb	NS*	NS*
Caneyville	Y	IVa	IVa	III	III	III	NS*	III
Cape Fear (drained)	C	Ib	Ib	II	Ib	I-	NS*	I
Cape Fear (undrained)	OO	V	V	V	V	Vb	NS*	NS*
Captina	BB	IVb	IVb	III	IV	IV	NS*	III
Carbo	Y	IVa	IVa	III	III	III	NS*	III
Cardiff	FF	IVb	IVb	III	IV	IV	NS*	III

Soil Series	Soil Mngt Group	Corn	Grain Sorghum	Small Grains	Soy-beans	Canola	Alfalfa	Tall Grass Clover Hay Pasture
Caroline	AA	IVa	IVa	II	III	Va	NS*	IV
Cartecay	I	IIa	IIa	I	II	Vb	NS*	I
Carteret	PP	V	V	V	V	Vb	NS*	NS*
Cataska	JJ	V	V	IV	V	IV	NS*	IV
Catharpin	X	IVa	IVa	II	III	III	III	II
Catlett	JJ	V	V	IV	V	IV	NS*	IV
Catoctin	JJ	V	V	IV	V	IV	NS*	IV
Catpoint	II	V	V	III	V	IV	NS*	NS*
Caverns	I	IIa	IIa	I	II	Vb	IV-V	I
Cecil	X	IVa	IVa	II	III	III	III	II
Cedarcreek	GG	IVb	IVb	IV	IV	IV	IV-V	III
Chagrin	A	Ia	Ia	I	Ia	I	I	I
Chagrin variant	A	Ia	Ia	I	Ia	I	I	I
Chapanoke (drained)	C	Ib	Ib	II	Ib	I	NS*	I
Chapanoke (undrained)	OO	V	V	V	V	Vb	NS*	NS*
Charity	N	IIb	IIb	I	II	II	II	II
Chastain	LL	V	V	V	V	Vb	NS*	IV
Chatuge (drained)	C	Ib	Ib	II	Ib	I	NS*	I
Chatuge (undrained)	OO	V	V	V	V	Vb	NS*	NS*
Chavies	EE	IVb	IVb	III	IV	Vb	NS*	NS*
Chavies variant	EE	IVb	IVb	III	IV	Vb	NS*	NS*
Chenneby	I	IIa	IIa	I	II	Vb	NS*	I
Chester	D	Ib	Ib	I	Ib	I	I	I
Chesterfield	V	IVa	IVa	II	III	III	III	III
Chester Loam	D	Ia	Ia	I	Ia	I	I	I
Chewacla	I	IIa	IIa	I	II	Vb	NS*	I
Chickahominy	LL	V	V	V	V	Vb	NS*	IV
Chilhowie	JJ	V	V	IV	V	IV	NS*	IV
Chincoteague	PP	V	V	V	V	Vb	NS*	NS*
Chipley	EE	IVb	IVb	III	IV	Vb	NS*	NS*
Chiswell	JJ	V	V	IV	V	IV	IV-V	IV
Christian	AA	IVa	IVa	II	III	Va	NS*	IV
Christiana	AA	IVa	IVa	II	III	Va	NS*	IV
Cid	KK	V	V	V	V	Vb	IV-V	IV
Clapham	BB	IVb	IVb	III	IV	IV	IV-V	III
Clarksburg	W	IVa	IVa	IV	III	IV	NS*	IV
Clarksville	GG	IVb	IVb	IV	IV	IV	NS*	III
Clearbrook	JJ	V	V	IV	V	IV	NS*	IV
Clifton	L	IIb	IIb	I	II	II	III	II
Clubcaf	LL	V	V	V	V	Vb	NS*	IV

Soil Series	Soil Mngt Group	Corn	Grain Sorghum	Small Grains	Soy-beans	Canola	Alfalfa	Tall Grass Clover Hay Pasture
Clymer	U	IIIb	IIIb	II	II	II	III	II
Codorus	A	Ia	Ia	I	Ia	I	I	I
Codorus variant	A	Ia	Ia	I	Ia	I	I	I
Colfax	BB	IVb	IVb	III	IV	IV	NS*	III
Colfax variant	BB	IVb	IVb	III	IV	IV	NS*	III
Colleen	KK	V	V	V	V	Vb	IV-V	IV
Colvard	II	V	V	III	V	IV	IV-V	NS*
Combs	DD	IVb	IVb	II	IV	III	IV-V	III
Comus	A	Ia	Ia	I	Ia	I	I	I
Conetoe	DD	IVb	IVb	II	IV	III	IV-V	III
Congaree	A	Ia	Ia	I	Ia	I	I	I
Coosaw	DD	IVb	IVb	II	IV	III	IV-V	III
Corolla	EE	IVb	IVb	III	IV	Vb	NS*	NS*
Corydon	JJ	V	V	IV	V	IV	NS*	IV
Cotaco	G	IIa	IIa	I	II	IV	II	I
Cotaco variant	G	IIa	IIa	I	II	IV	II	I
Coursey	G	IIa	IIa	I	II	IV	II	I
Cowee	N	IIb	IIb	I	II	II	II	II
Coxville	LL	V	V	V	V	Vb	NS*	IV
Craigsville	CC	IVb	IVb	II	IV	IV	NS*	III
Craven	HH	IVb	IVb	III	IV	Vb	NS*	IV
Creedmoor	KK	V	V	V	V	Vb	NS*	IV
Creedmoor variant	KK	V	V	V	V	Vb	NS*	IV
Craggey	JJ	V	V	IV	V	IV	NS*	IV
Croton	LL	V	V	V	V	Vb	NS*	IV
Cullen	N	IIb	IIb	I	II	II	II	II
Culpeper	X	IVa	IVa	II	III	III	III	II
Daleville (drained)	C	Ib	Ib	II	Ib	I	NS*	I
Daleville (undrained)	OO	V	V	V	V	Vb	NS*	NS*
Dandridge	JJ	V	V	IV	V	IV	NS*	IV
Davidson	N	IIb	IIb	I	II	II	II	II
Dawhoo	PP	V	V	V	V	Vb	NS*	NS*
Dawhoo variant	PP	V	V	V	V	Vb	NS*	NS*
Decatur	M	IIb	IIb	I	II	II	I	II
Dekalb	FF	IVb	IVb	III	IV	IV	NS*	III
Delanco	B	Ia	Ia	I	Ia	I-	II	I
Deloss (drained)	C	Ib	Ib	II	Ib	I	NS*	I
Deloss (undrained)	OO	V	V	V	V	Vb	NS*	NS*
Derroc	CC	IVb	IVb	II	IV	IV	IV-V	III
Dillard	G	IIa	IIa	I	II	IV	II	I

Soil Series	Soil Mngt Group	Corn	Grain Sorghum	Small Grains	Soy-beans	Canola	Alfalfa Hay	Tall Grass Clover Pasture
Dogue	K	IIb	IIb	I	II	II	III	I
Dorovan	PP	V	V	V	V	Vb	NS*	NS*
Dothan	Q	IIb	IIb	II	II	II	NS*	III
Dragston	E	IIa	IIa	I	II	Va	NS*	II
Drall	FF	IVb	IVb	III	IV	IV	NS*	III
Drypond	JJ	V	V	IV	V	IV	IV-V	IV
Duckston	QQ	V	V	V	V	Vb	NS*	NS*
Duffield	G	IIa	IIa	I	II	IV	II	I
Dulles	Y	IVa	IVa	III	III	III	NS*	III
Dumfries	T	IVa	IVa	II	II	II	NS*	III
Dunbar (drained)	P	IIb	IIb	II	II	Va	NS*	III
Dunbar (undrained)	Z	IVa	IVa	IV	III	IV	NS*	NS*
Dunning (drained)	H	IIa	IIa	III	II	Vb	NS*	IV
Dunning (undrained)	NN	V	V	V	V	Vb	NS*	NS*
Duplin	K	IIb	IIb	I	II	II	III	I
Durham	CC	IVb	IVb	II	IV	IV	NS*	III
Dyke	O	IIIb	IIIb	I	II	II	II	II
Edgehill	CC	IVb	IVb	II	IV	IV	NS*	III
Edgehill variant	CC	IVb	IVb	II	IV	IV	NS*	III
Edgemont	U	IIIb	IIIb	II	II	II	III	II
Edneytown	L	IIb	IIb	I	II	II	III	II
Edneyville	T	IIIb	IIIb	II	II	II	NS*	III
Edom	M	IIb	IIb	I	II	II	I	II
Elbert	LL	V	V	V	V	Vb	NS*	IV
Elbert variant	LL	V	V	V	V	Vb	NS*	IV
Elioak	X	IVa	IVa	II	III	III	III	II
Elk	A	Ia	Ia	I	Ia	I	I	I
Elkton (drained)	C	Ib	Ib	II	Ib	I	NS*	I
Elkton (undrained)	OO	V	V	V	V	Vb	NS*	NS*
Elliber	M	IIb	IIb	I	II	II	I	II
Elsinboro	L	IIb	IIb	I	II	II	III	II
Emory	G	IIa	IIa	I	II	IV	II	I
Emporia	R	IIIa	IIIa	II	II	II	III	II
Endcav	Y	IVa	IVa	III	III	III	NS*	III
Enon	Y	IVa	IVa	III	III	III	NS*	III
Enott	Y	IVa	IVa	III	III	III	IV-V	III
Ernest	W	IVa	IVa	IV	III	IV	NS*	IV
Eubanks	N	IIb	IIb	I	II	II	II	II
Eulonia	K	IIb	IIb	I	II	II	III	I
Eunola	T	IIIb	IIIb	II	II	II	NS*	III

Soil Series	Soil Mngt Group	Corn	Grain Sorghum	Small Grains	Soy-beans	Canola	Alfalfa Hay	Tall Grass Clover Pasture
Evansham	LL	V	V	V	V	Vb	NS*	IV
Evard	L	IIb	IIb	I	II	II	III	II
Evesboro	II	V	V	III	V	IV	NS*	NS*
Exum	J	IIb	IIb	I	II	II	IV-V	I
Faceville	R	IIIa	IIIa	II	II	II	III	II
Fairfax	D	Ib	Ib	I	Ib	I	I	I
Fallsington	E	IIa	IIa	I	II	Va	NS*	II
Fauquier	N	IIb	IIb	I	II	II	II	II
Faywood	U	IIIb	IIIb	II	II	II	III	II
Featherstone	PP	V	V	V	V	Vb	NS*	NS*
Fisherman	QQ	V	V	V	V	Vb	NS*	NS*
Flatwoods	M	II	IIb	I	II	II	I	II
Fletcher	U	IIIb	IIIb	II	II	II	III	II
Fluvanna	Y	IVa	IVa	III	III	III	NS*	III
Forestdale	LL	V	V	V	V	Vb	NS*	IV
Fork (drained)	P	IIb	IIb	II	II	Va	NS*	III
Fork (undrained)	Z	IVa	IVa	IV	III	IV	NS*	NS*
Fork variant (drained)	P	IIb	IIb	II	II	Va	NS*	III
Fork variant (undrained)	Z	IVa	IVa	IV	III	IV	NS*	NS*
Frankstown	U	IIIb	IIIb	II	II	II	III	II
Frederick	M	IIb	IIb	I	II	II	I	II
Frederick/Lodi	M	IIb	IIb	I	II	II	I	II
Freemanville	Q	IIIa	IIIa	II	II	II	NS*	III
French	A	Ia	Ia	I	Ia	I	I	I
Fripp	QQ	V	V	V	V	Vb	NS*	NS*
Gaila	FF	IVb	IVb	III	IV	IV	NS*	III
Gainesboro	FF	IVb	IVb	III	IV	IV	NS*	III
Galestown	II	V	V	III	V	IV	NS*	NS*
Galtsmill	II	V	V	III	V	IV	NS*	NS*
Georgeville	X	IVa	IVa	II	III	III	III	II
Gilpin	U	IIIb	IIIb	II	II	II	III	II
Gilpin variant	U	IIIb	IIIb	II	II	II	III	II
Gladehill	DD	IVb	IVb	II	IV	III	IV-V	III
Glenelg(BRH)	N	IIb	IIb	I	II	II	II	II
Glenelg(NV)	U	IIb	IIb	II	II	II	III	II
Glenville	W	IVa	IVa	IV	III	IV	NS*	IV
Glenwood Variant	GG	IVb	IVb	IV	IV	IV	IV-V	III
Goldsboro	J	IIb	IIb	I	II	II	NS*	I
Goldston	JJ	V	V	IV	V	IV	NS*	IV
Goldvein	BB	IVb	IVb	III	IV	IV	NS*	III

Soil Series	Soil Mngt Group	Corn	Grain Sorghum	Small Grains	Soy-beans	Canola	Alfalfa	Tall Grass Clover Hay Pasture
Goresville	N	IIb	IIb	I	II	II	II	II
Granville	R	IIIa	IIIa	II	II	II	III	II
Greendale	A	Ia	Ia	I	Ia	I	I	I
Greenlee	GG	IVb	IVb	IV	IV	IV	IV-V	III
Grigsby	A	Ia	Ia	I	Ia	I	I	I
Grimsley	GG	IVb	IVb	IV	IV	IV	NS*	III
Gritney	T	IVa	IVa	II	II	II	NS*	III
Groseclose	M	IIb	IIb	I	II	II	I	II
Grover	X	IVa	IVa	II	III	III	III	II
Guernsey	M	IIb	IIb	I	II	II	I	II
Gullion	B	Ia	Ia	I	Ia	I	II	I
Gundy	V	IVa	IVa	II	III	III	III	III
Gunstock	V	IVa	IVa	II	III	III	III	III
Guyen	Z	IVa	IVa	IV	III	IV	NS*	NS*
Gwinnett variant	X	IVa	IVa	II	III	III	III	II
Hagerstown	M	IIb	IIb	I	II	II	I	II
Halewood	U	IIIb	IIIb	II	II	II	III	II
Hanceville	V	IVa	IVa	II	III	III	III	III
Hartleton	FF	IVb	IVb	III	IV	IV	NS*	III
Hartsells	CC	IVb	IVb	II	IV	IV	NS*	III
Hatboro	HH	IVb	IVb	III	IV	Vb	NS*	IV
Hawksbill	CC	IVb	IVb	II	IV	IV	NS*	III
Hayesville	X	IVa	IVa	II	III	III	III	II
Haymarket	KK	V	V	V	V	Vb	NS*	IV
Hayter	L	IIb	IIb	I	II	II	III	II
Haywood	JJ	V	V	IV	V	IV	NS*	IV
Hazel	JJ	V	V	IV	V	IV	NS*	IV
Hazleton	JJ	V	V	IV	V	IV	NS*	IV
Helena	KK	V	V	V	V	Vb	NS*	IV
Herndon	V	IVa	IVa	II	III	III	III	III
Hiwassee	O	IIb	IIb	I	II	II	II	II
Hiwassee variant	O	IIb	IIb	I	II	II	II	II
Hoadley	BB	IVb	IVb	III	IV	IV	NS*	III
Hobucken	PP	V	V	V	V	Vb	NS*	NS*
Hollywood	LL	V	V	V	V	Vb	NS*	IV
Hublersburg	M	IIb	IIb	I	II	II	I	II
Huntington	A	Ia	Ia	I	Ia	I	I	I
Hyde (drained)	C	Ib	Ib	II	Ib	I	NS*	I
Hyde (undrained)	OO	V	V	V	V	Vb	NS*	NS*
Ingledove	A	Ia	Ia	I	Ia	I	I	I

Soil Series	Soil Mngt Group	Corn	Grain Sorghum	Small Grains	Soy-beans	Canola	Alfalfa	Tall Grass Clover Hay Pasture
Iredell	KK	V	V	V	V	Vb	NS*	IV
Iredell variant	KK	V	V	V	V	Vb	NS*	IV
Irongate	DD	IVb	IVb	II	IV	III	NS*	III
Iuka	F	IIa	IIa	I	II	I	III	II
Izagora	J	IIb	IIb	I	II	II	NS*	I
Jackland	KK	V	V	V	V	Vb	NS*	IV
Jefferson	U	IIIb	IIIb	II	II	II	III	II
Jefferson variant	U	IIIb	IIIb	II	II	II	III	II
Jedburg	Z	IVa	IVa	IV	III	IV	NS*	NS*
Johns (drained)	C	Ib	Ib	II	Ib	I	NS*	I
Johns (undrained)	OO	V	V	V	V	Vb	NS*	NS*
Johnston	PP	V	V	V	V	Vb	NS*	NS*
Johns variant (drained)	C	Ib	Ib	II	Ib	I	NS*	I
Johns variant (undrained)	OO	V	V	V	V	Vb	NS*	NS*
Junaluska	U	IIIb	IIIb	II	II	II	III	II
Kalmia	S	IIIa	IIIa	II	II	II	NS*	III
Kelly	KK	V	V	V	V	Vb	NS*	IV
Kempsville	S	IIIa	IIIa	II	II	II	NS*	III
Kenansville	DD	IVb	IVb	II	IV	III	NS*	III
Kenansville variant	DD	IVb	IVb	II	IV	III	NS*	III
Keyport	K	IIb	IIb	I	II	II	III	I
Kinkora (drained)	C	Ib	Ib	II	Ib	I	NS*	I
Kinkora (undrained)	OO	V	V	V	V	Vb	NS*	NS*
Kinston (drained)	C	Ib	Ib	II	Ib	I	NS*	I
Kinston (undrained)	OO	V	V	V	V	Vb	NS*	NS*
Klej	EE	IVb	IVb	III	IV	Vb	NS*	NS*
Klinesville	JJ	V	V	IV	V	IV	NS*	IV
Konnarock	JJ	V	V	IV	V	IV	NS*	IV
Laidig	W	IVa	IVa	IV	III	IV	NS*	IV
Lakehurst	EE	IVb	IVb	III	IV	Vb	NS*	NS*
Lakeland	II	V	V	III	V	IV	NS*	NS
Lakin	II	V	V	III	V	IV	NS*	NS
Landisburg	W	IVa	IVa	IV	III	IV	NS*	IV
Lanexa	PP	V	V	V	V	Vb	NS*	NS*
Lansdale	FF	IVb	IVb	III	IV	IV	NS*	III
Laroque	FF	IVb	IVb	III	IV	IV-	NS*	III
Lawnes	PP	V	V	V	V	Vb	NS*	NS*
Leadvale	BB	IVb	IVb	III	IV	IV	NS*	III
Leaf (drained)	C	Ib	Ib	II	Ib	I	NS*	I
Leaf (undrained)	OO	V	V	V	V	Vb	NS*	NS*

Soil Series	Soil Mngt Group	Corn	Grain Sorghum	Small Grains	Soy-beans	Canola	Alfalfa	Tall Grass Clover Hay Pasture
Leaksville	KK	V	V	V	V	Vb	NS*	IV
Leatherwood	OO	V	V	V	V	Vb	NS*	NS*
Leck Kill	U	IIIb	IIIb	II	II	II	III	II
Leedsville	L	IIb	IIb	I	II	II	III	II
Leetonia	II	V	V	III	V	IV	NS*	NS*
Legore	V	IVa	IVa	II	III	III	III	III
Lehew	JJ	V	V	IV	V	IV	NS*	IV
Lenoir	LL	V	V	V	V	Vb	NS*	IV
Leon	II	V	V	III	V	IV	NS*	NS*
Levy	PP	V	V	V	V	Vb	NS*	NS*
Lew	FF	IVb	IVb	III	IV	IV	NS*	III
Lewisberry	II	V	V	III	V	IV	NS*	NS*
Lewisburg	CC	IVb	IVb	II	IV	IV	NS*	III
Library	KK	V	V	V	V	Vb	NS*	IV
Lickdale (drained)	H	IIa	IIa	III	II	Vb	NS*	IV
Lickdale (undrained)	NN	V	V	V	V	Vb	NS*	NS*
Lignum	LL	V	V	V	V	Vb	NS*	IV
Lily	FF	IVb	IVb	III	IV	IV	NS*	III
Linden	F	IIa	IIa	I	II	I	III	II
Lindside	A	Ia	Ia	I	Ia	I	I	I
Littlejoe	V	IVa	IVa	II	III	III	III	
Litz	JJ	V	V	IV	V	IV	NS*	IV
Lloyd	N	IIb	IIb	I	II	II	II	II
Lloyd variant	N	IIb	IIb	I	II	II	II	II
Lobdell	A	Ia	Ia	I	Ia	I	I	I
Lodi	M	IIb	IIb	I	II	II	I	II
Louisa	JJ	V	V	IV	V	IV	NS*	IV
Louisa variant	JJ	V	V	IV	V	IV	NS*	IV
Louisburg	FF	IVb	IVb	III	IV	IV	NS*	III
Lowell	M	IIb	IIb	I	II	II	I	II
Lucketts	Y	IVa	IVa	III	III	III	NS*	III
Lucy	DD	IVb	IVb	II	IV	III	NS*	III
Lumbee (drained)	C	Ib	Ib	II	Ib	I	NS*	I
Lumbee (undrained)	OO	V	V	V	V	Vb	NS*	NS*
Lumbee variant (drained)	C	Ib	Ib	II	Ib	I	NS*	I
Lumbee variant(undrained)	OO	V	V	V	V	Vb	NS*	
Lunt	AA	IVa	IVa	II	III	Va	NS*	IV
Lynchburg	E	IIa	IIa	I	II	Va	NS*	II
Macove	CC	IVb	IVb	II	IV	IV	NS*	III
Madison	X	IVa	IVa	II	III	III	III	III

Soil Series	Soil Mngt Group	Corn	Grain Sorghum	Small Grains	Soy-beans	Canola	Alfalfa Hay	Tall Grass Clover Pasture
Magotha	PP	V	V	V	V	Vb	NS*	NS*
Malbis	W	IVa	IVa	IV	III	IV	NS*	IV
Manassas	D	Ib	Ib	I	Ib	I	I	I
Manor	FF	IVb	IVb	III	IV	IV	NS*	III
Mantachie	I	IIa	IIa	I	II	Vb	NS*	I
Manteo	JJ	V	V	IV	V	IV	NS*	IV
Marbie	W	IVa	IVa	IV	III	IV	NS*	IV
Margo	A	Ia	Ia	I	Ia	I	I	I
Marlboro	R	IIIa	IIIa	II	II	II	III	II
Marr	T	IIIb	IIIb	II	II	II	NS*	III
Marumsco	K	IIb	IIb	I	II	II	III	I
Masada	L	IIb	IIb	I	II	II	III	II
Massanetta	B	Ia	Ia	I	Ia	I	II	I
Massanutten	JJ	V	V	IV	V	IV	NS*	IV
Matapeake	R	IIIa	IIIa	II	II	II	III	II
Matneflat	CC	IVb	IVb	II	IV	IV	NS*	III
Mattamuskeet	PP	V	V	V	V	Vb	NS*	NS*
Mattan	PP	V	V	V	V	Vb	NS*	NS*
Mattapex	K	IIb	IIb	I	II	II	III	I
Mattaponi	R	IIIa	IIIa	II	II	II	III	II
Maurertown	LL	V	V	V	V	Vb	NS*	IV
Maury	M	IIb	IIb	I	II	II	I	II
Mayodan	V	IVa	IVa	II	III	III	III	III
McGary (drained)	P	IIb	IIb	II	II	Va	NS*	III
McGary (undrained)	Z	IVa	IVa	IV	III	IV	NS*	NS*
McLaurin	DD	IVb	IVb	II	IV	III	NS*	III
McQueen	B	Ia	Ia	I	Ia	I	II	I
Meadows	JJ	V	V	IV	V	IV	NS*	IV
Meadowville	G	IIa	IIa	I	II	IV	II	I
Meadowville variant	G	IIa	IIa	I	II	IV	II	I
Meckesville	W	IVa	IVa	IV	III	IV	NS*	IV
Mecklenburg	V	IVa	IVa	II	III	III	III	III
Mecklenburg variant	V	IVa	IVa	II	III	III	III	III
Meggett (drained)	C	Ib	Ib	II	Ib	I	NS*	I
Meggett (undrained)	OO	V	V	V	V	Vb	NS*	NS*
Melfa	PP	V	V	V	V	Vb	NS*	NS*
Melvin (drained)	H	IIa	IIa	III	II	Vb	NS*	IV
Melvin (undrained)	NN	V	V	V	V	Vb	NS*	NS*
Millrock	II	V	V	III	V	IV	NS*	NS*
Minnieville	N	IIb	IIb	I	II	II	II	II

Soil Series	Soil Mngt Group	Corn	Grain Sorghum	Small Grains	Soy-beans	Canola	Alfalfa	Tall Grass Clover Hay Pasture
Misenheimer	JJ	V	V	IV	V	IV	NS*	IV
Molena	II	V	V	III	V	IV	NS*	NS*
Moomaw	W	IVa	IVa	IV	III	IV	NS*	IV
Monacan	I	IIa	IIa	I	II	Vb	NS*	I
Mongle	C	Ib	Ib	II	Ib	I	NS*	I
Monongahela	W	IVa	IVa	IV	III	IV	NS*	IV
Montalto	N	IIb	IIb	I	II	II	II	II
Montresso	D	Ib	Ib	I	Ib	I	I	I
Montross	Q	IIIa	IIIa	II	II	II	NS*	III
Morasonville	D	Ib	Ib	I	Ib	I	I	I
Mount Lucas	J	IIb	IIb	I	II	II	NS*	I
Morven	G	IIa	IIa	I	II	IV	II	I
Muckalee	MM	V	V	V	V	Vb	NS*	IV
Munden	F	IIa	IIa	I	IIa	I	III	II
Murrill	G	IIa	IIa	I	II	IV	II	I
Myatt (drained)	C	Ib	Ib	II	Ib	I	NS*	I
Myatt (undrained)	OO	V	V	V	V	Vb	NS*	NS*
Myatt variant (drained)	C	Ib	Ib	II	Ib	I	NS*	I
Myatt variant (undrained)	OO	V	V	V	V	Vb	NS*	NS*
Myersville	D	Ib	Ib	I	Ib	I	I	I
Nahunta	E	IIa	IIa	I	II	Va	NS*	II
Nansemond	F	IIa	IIa	I	II	I	III	II
Nason	V	IVa	IVa	II	III	III	III	III
Nawney	PP	V	V	V	V	Vb	NS*	NS*
Neabsco	BB	IVb	IVb	III	IV	IV	NS*	III
Needmore	FF	IVb	IVb	III	IV	IV	NS*	III
Nestoria	JJ	V	V	IV	V	IV	NS*	IV
Nevarc	HH	IVb	IVb	III	IV	Vb	NS*	IV
Newark (drained)	H	IIa	IIa	III	II	Vb	NS*	IV
Newark (undrained)	NN	V	V	V	V	Vb	NS*	NS*
Newark variant (drained)	H	IIa	IIa	III	II	Vb	NS*	IV
Newark variant(undrained)	NN	V	V	V	V	Vb	NS*	
Newbern	JJ	V	V	IV	V	IV	NS*	IV
Newflat	LL	V	V	V	V	Vb	NS*	IV
Newhan	QQ	V	V	V	V	Vb	NS*	NS*
Newmarc	B	Ia	Ia	I	Ia	I-	II	I
Nicholson	BB	IVb	IVb	III	IV	IV	NS*	III
Nimmo	E	IIa	IIa	I	II	Va	NS*	II
Nixa	BB	IVb	IVb	III	IV	IV	NS*	III
Nolichucky	O	IIb	IIb	I	II	II	II	II

Soil Series	Soil Mngt Group	Corn	Grain Sorghum	Small Grains	Soy-beans	Canola	Alfalfa Hay	Tall Grass Clover Pasture
Nolin	A	Ia	Ia	I	Ia	I	I	I
Nomberville	A	Ia	Ia	I	Ia	I	I	I
Norfolk	R	IIIa	IIIa	II	II	II	III	II
Oakhill	FF	IVb	IVb	III	IV	IV	NS*	III
Oaklet	Y	IVa	IVa	III	III	III	NS*	III
Oatlands	FF	IVb	IVb	III	IV	IV	NS*	III
Occoquan	DD	IVb	IVb	II	IV	III	NS*	III
Ochlockonee	II	V	V	III	V	IV	NS*	NS*
Ochlockonee variant	II	V	V	III	V	IV	NS*	NS*
Okeetee	LL	V	V	V	V	Vb	NS*	IV
Opequon	JJ	V	V	IV	V	IV	NS*	IV
Orange	KK	V	V	V	V	Vb	NS*	IV
Orangeburg	R	IIIa	IIIa	II	II	II	III	II
Orange variant	KK	V	V	V	V	Vb	NS*	IV
Orenda	KK	V	V	V	V	Vb	NS*	IV
Oriskany	GG	IVb	IVb	IV	IV	IV	NS*	III
Orrville (drained)	C	Ib	Ib	II	Ib	I	NS*	I
Orrville (undrained)	OO	V	V	V	V	Vb	NS*	NS*
Orrville variant (drained)	C	Ib	Ib	II	Ib	I	NS*	I
Orrville variant (undrained)	OO	V	V	V	V	Vb	NS*	
Osier	E	IIa	IIa	I	II	Va	NS*	II
Othello (drained)	C	Ib	Ib	II	Ib	I	NS*	I
Othello (undrained)	OO	V	V	V	V	Vb	NS*	NS*
Pacolet	X	IVa	IVa	II	III	III	III	II
Pactolus	EE	IVb	IVb	III	IV	Vb	NS*	NS*
Pagebrook	Y	IVa	IVa	III	III	III	NS*	III
Pamlico	PP	V	V	V	V	Vb	NS*	NS*
Pamunkey	B	Ia	Ia	I	Ia	I	II	I
Pamunkey variant	B	Ia	Ia	I	Ia	I	II	I
Panorama	U	IIIb	IIIb	II	II	II	III	II
Pantego (drained)	C	Ib	Ib	II	Ib	I	NS*	I
Pantego (undrained)	OO	V	V	V	V	Vb	NS*	NS*
Parker	GG	IVb	IVb	IV	IV	IV	NS*	III
Partlow	HH	IVb	IVb	III	IV	Vb	NS*	IV
Pasquotank (drained)	C	Ib	Ib	II	Ib	I	NS*	I
Pasquotank (undrained)	OO	V	V	V	V	Vb	NS*	NS*
Peaks	JJ	V	V	IV	V	IV	NS*	IV
Peawick	HH	IVb	IVb	III	IV	Vb	NS*	IV
Penn	FF	IVb	IVb	III	IV	IV	NS*	III
Philo (drained)	H	IIa	IIa	III	II	Vb	NS*	IV

Soil Series	Soil Mngt Group	Corn	Grain Sorghum	Small Grains	Soy-beans	Canola	Alfalfa	Tall Grass Clover Hay Pasture
Philo (undrained)	NN	V	V	V	V	Vb	NS*	NS*
Philoment	D	Ib	Ib	I	Ib	I	I	I
Pigeonroost	N	IIb	IIb	I	II	II	II	II
Pineywoods	NN	V	V	V	V	Vb	NS*	NS*
Pinkston	JJ	V	V	IV	V	IV	NS*	IV
Pisgah	M	IIb	IIb	I	II	II	I	II
Plummer	EE	IVb	IVb	III	IV	Vb	NS*	NS*
Pocalla	DD	IVb	IVb	II	IV	III	NS*	III
Pocaty	PP	V	V	V	V	Vb	NS*	NS*
Pocomoke	E	IIa	IIa	I	II	Va	NS*	II
Poindexter	FF	IVb	IVb	III	IV	IV	NS*	III
Poindexter variant	FF	IVb	IVb	III	IV	IV	NS*	III
Polawana	PP	V	V	V	V	Vb	NS*	NS*
Pooler variant (drained)	C	Ib	Ib	II	Ib	I	NS*	I
Pooler variant (undrained)	OO	V	V	V	V	Vb	NS*	
Pope	A	Ia	Ia	I	Ia	I	I	I
Poplimento	M	IIb	IIb	I	II	II	I	II
Porters	FF	IVb	IVb	III	IV	IV	NS*	III
Portsmouth (drained)	C	Ib	Ib	II	Ib	I	NS*	I
Portsmouth (undrained)	OO	V	V	V	V	Vb	NS*	NS*
Pouncey	LL	V	V	V	V	Vb	NS*	IV
Poynor	GG	IVb	IVb	IV	IV	IV	NS*	III
Pungo	PP	V	V	V	V	Vb	NS*	NS*
Purcellville	D	Ib	Ib	I	Ib	I	I	I
Purdy (drained)	H	IIa	IIa	III	II	Vb	NS*	IV
Purdy (undrained)	NN	V	V	V	V	Vb	NS*	NS*
Quantico	R	IIIa	IIIa	II	II	II	III	II
Rabun	N	IIb	IIb	I	II	II	II	II
Rains (drained)	C	Ib	Ib	II	Ib	I	NS*	I
Rains (undrained)	OO	V	V	V	V	Vb	NS*	NS*
Ramsey	JJ	V	V	IV	V	IV	NS*	IV
Rapidan	N	IIb	IIb	I	II	II	II	II
Rappahanock	PP	V	V	V	V	Vb	NS*	NS*
Raritan	W	IVa	IVa	IV	III	IV	NS*	IV
Rayne	U	IIIb	IIIb	II	II	II	III	II
Readington	W	IVa	IVa	IV	III	IV	NS*	IV
Reaville	JJ	V	V	IV	V	IV	NS*	IV
Remlik	DD	IVb	IVb	II	IV	III	NS*	III
Rigley	CC	IVb	IVb	II	IV	IV	NS*	III
Rion	X	IVa	IVa	II	III	III	III	II

Soil Series	Soil Mngt Group	Corn	Grain Sorghum	Small Grains	Soy-beans	Canola	Alfalfa	Tall Grass Clover Hay Pasture
Riverview	G	IIa	IIa	I	II	IV	II	I
Roanoke (drained)	H	IIa	IIa	III	II	Vb	NS*	IV
Roanoke (undrained)	NN	V	V	V	V	Vb	NS*	NS*
Robertsville	LL	V	V	V	V	Vb	NS*	IV
Rohrersville	BB	IVb	IVb	III	IV	IV	NS*	III
Ross	A	Ia	Ia	I	Ia	I	I	I
Rowland	A	Ia	Ia	I	Ia	I	I	I
Rumford	DD	IVb	IVb	II	IV	III	NS*	III
Rushtown	FF	IVb	IVb	III	IV	IV	NS*	III
Ruston	S	IIIa	IIIa	II	II	II	NS*	III
Saffell	DD	IVb	IVb	II	IV	III	NS*	III
Sassafras	T	IVa	IVa	II	III	II	NS*	III
Saunook	L	IIb	IIb	I	II	II	III	II
Savannah	W	IIIb	IIIb	IV	II	IV	NS*	IV
Schaffenaker	II	V	V	III	V	IV	NS*	NS*
Scatterville	BB	IVb	IVb	III	IV	IV	NS*	III
Seabrook	EE	IVb	IVb	III	IV	Vb	NS*	NS*
Seagate	EE	IVb	IVb	III	IV	Vb	NS*	NS*
Sedgefield	KK	V	V	V	V	Vb	NS*	IV
Sekil	FF	IVb	IVb	III	IV	IV	NS*	III
Seneca	G	IIa	IIa	I	II	IV	II	I
Sequatchie	B	Ia	Ia	I	Ia	I	II	I
Sequoia	U	IIIb	IIIb	II	II	II	III	II
Shelocta	L	IIb	IIb	I	II	II	III	II
Shelocta variant	L	IIb	IIb	I	II	II	III	II
Shenval	O	IIb	IIb	I	II	II	II	II
Sherando	CC	IVb	IVb	II	IV	IV	NS*	III
Sheva	KK	V	V	V	V	Vb	NS*	IV
Shottower	O	IIb	IIb	I	II	II	II	II
Shouns	G	IIa	IIa	I	II	IV	II	I
Sindion	B	Ia	Ia	I	Ia	I	II	I
Skeeterville	KK	V	V	V	V	Vb	NS*	IV
Slabtown	G	IIa	IIa	I	II	IV	II	I
Slagle	K	IIb	IIb	I	II	II	III	I
Snicksville	D	Ib	Ib	I	Ib	I	I	I
Speedwell	A	Ia	Ia	I	Ia	I	I	I
Spessard	CC	IVb	IVb	II	IV	IV	NS*	III
Spivey	FF	IVb	IVb	III	IV	IV	NS*	III
Spotsylvania	V	IVa	IVa	II	III	III	III	III
Spray	JJ	V	V	IV	V	IV	NS*	IV

Soil Series	Soil Mngt Group	Corn	Grain Sorghum	Small Grains	Soy-beans	Canola	Alfalfa	Tall Grass Clover Hay Pasture
Spriggs	JJ	V	V	IV	V	IV	NS*	IV
Springwood	D	Ib	Ib	I	Ib	I	I	I
Stanton	LL	V	V	V	V	Vb	NS*	IV
Starr	G	IIa	IIa	I	II	IV	II	I
Starr-Dyke	O	IIb	IIb	I	II	II	II	II
Staser	A	Ia	Ia	I	Ia	I	I	I
State (ES)	T	IIIB	IIIB	II	II	II	NS*	III
State (Mainland)	B	Ia	Ia	I	Ia	I	II	I
Steinsburg	JJ	V	V	IV	V	IV	NS*	IV
Stoneville	X	IVa	IVa	II	III	III	III	III
Stough	F	IIa	IIa	I	II	I	III	II
Stumptown	FF	IVb	IVb	III	IV	IV	NS*	III
Suches	A	Ia	Ia	I	Ia	I	I	I
Sudley	D	Ib	Ib	I	Ib	I	I	I
Suffolk	T	IIIb	IIIb	II	II	II	NS*	III
Summers	GG	IVa	IVa	IV	IV	IV	NS*	III
Susquehanna	KK	V	V	V	V	Vb	NS*	IV
Sweetapple	FF	IVb	IVb	III	IV	IV	NS*	III
Swimley	M	IIb	IIb	I	II	II	I	II
Sycoline	KK	V	V	V	V	Vb	NS*	IV
Sylco	JJ	V	V	IV	V	IV	NS*	IV
Sylvatus	JJ	V	V	IV	V	IV	NS*	IV
Talladega	JJ	V	V	IV	V	IV	NS*	IV
Tallapoosa	JJ	V	V	IV	V	IV	NS*	IV
Tallapoosa variant	JJ	V	V	IV	V	IV	NS*	IV
Tanasee	JJ	V	V	IV	V	IV	NS*	IV
Tarboro	II	V	V	III	V	IV	NS*	NS*
Tate	O	IIb	IIb	I	II	II	II	II
Tatum	X	IVa	IVa	II	III	III	III	II
Tetotum	K	IIb	IIb	I	II	II	III	I
Tetotum variant	K	IIb	IIb	I	II	II	III	I
Thunder	GG	IVa	IVa	IV	IV	IV	NS*	III
Thurmont	L	IIb	IIb	I	II	II	III	II
Tifton	Q	IIIa	IIIa	II	II	II	NS*	III
Timberville	G	IIa	IIa	I	II	IV	II	I
Timberville variant	G	IIa	IIa	II	II	IV	II	I
Tioga	A	Ia	Ia	I	Ia	I	I	I
Toccoa	II	V	V	III	V	IV	NS*	NS*
Toddstav	HH	IVb	IVb	III	IV	Vb	NS*	IV
Tomotley (drained)	C	Ib	Ib	II	Ib	I	NS*	I

Soil Series	Soil Mngt Group	Corn	Grain Sorghum	Small Grains	Soy-beans	Canola	Alfalfa	Tall Grass Clover Hay Pasture
Tomotley (undrained)	OO	V	V	V	V	Vb	NS*	NS*
Toms	C	Ib	Ib	II	Ib	I	NS*	I
Torhunta	E	IIa	IIa	I	II	Va	NS*	II
Totier	U	IIIb	IIIb	II	II	II	III	III
Toxaway (drained)	C	Ib	Ib	II	Ib	I	NS*	I
Toxaway (undrained)	OO	V	V	V	V	Vb	NS*	NS*
Trappist	U	IIIb	IIIb	II	II	II	III	II
Trego	W	IVa	IVa	IV	III	IV	NS*	IV
Trenholm	KK	V	V	V	V	Vb	NS*	IV
Tuckahoe	A	Ia	Ia	I	Ia	I	I	I
Tumbling	O	IIb	IIb	I	II	II	II	II
Turbeville	O	IIb	IIb	I	II	II	II	II
Tusquitee	G	IIa	IIa	I	II	IV	II	I
Tygart (drained)	P	IIb	IIb	II	II	Va	NS*	III
Tygart (undrained)	Z	IVa	IVa	IV	III	IV	NS*	NS*
Uchee	DD	IVb	IVb	II	IV	III	NS*	III
Unison	L	IIb	IIb	I	II	II	III	II
Unison variant	L	IIb	IIb	I	II	II	III	II
Vance	Y	IVa	IVa	III	III	III	NS*	III
Varina	Q	IIIa	IIIa	II	II	II	NS*	III
Vaucluse	Q	IIIa	IIIa	II	II	II	NS*	III
Vertrees	M	IIb	IIb	I	II	II	I	II
Wadesboro	X	IVa	IVa	II	III	III	III	III
Wagram	DD	IVb	IVb	II	IV	III	NS*	III
Wahee (drained)	C	Ib	Ib	II	Ib	I	NS*	I
Wahee (undrained)	OO	V	V	V	V	Vb	NS*	NS*
Wakulla	II	V	V	III	V	IV	NS*	NS*
Wallen	JJ	V	V	IV	V	IV	NS*	IV
Warminster	X	IVa	IVa	II	III	III	III	III
Watauga	V	IVa	IVa	II	III	III	III	III
Wateree	FF	IVb	IVb	III	IV	IV	NS*	III
Watt	JJ	V	V	IV	V	IV	NS*	IV
Watt variant	JJ	V	V	IV	V	IV	NS*	IV
Waxpool	LL	V	V	V	V	Vb	NS*	IV
Waynesboro	L	IIb	IIb	I	II	II	III	II
Weaver	A	Ia	Ia	I	Ia	I	I	I
Webbtown	U	IVb	IVb	IV	IV	II	NS*	III
Wedowee	V	IVa	IVa	II	III	III	III	III
Weeksville (drained)	C	Ib	Ib	II	Ib	I	NS*	I
Weeksville (undrained)	OO	V	V	V	V	Vb	NS*	NS*

Soil Series	Soil Mngt Group	Corn	Grain Sorghum	Small Grains	Soy-beans	Canola	Alfalfa	Tall Grass Clover Hay Pasture
Wehadkee	MM	V	V	V	V	Vb	NS*	IV
Weikert	JJ	V	V	IV	V	IV	NS*	IV
Westmoreland	U	IIIb	IIIb	II	II	II	III	II
Weston	E	IIa	IIa	I	II	Va	NS*	II
Westphalia	II	V	V	III	V	IV	NS*	NS*
Weverton	GG	IVb	IVb	IV	IV	IV	NS*	III
Wheeling	A	Ia	Ia	I	Ia	I	I	I
Whiteford	U	IIIb	IIIb	II	II	II	III	II
White Store	KK	V	V	V	V	Vb	NS*	IV
White Store variant	KK	V	V	V	V	Vb	NS*	IV
Wickham	B	Ia	Ia	I	Ia	I	II	I
Wickham variant	B	Ia	Ia	I	Ia	I	II	I
Wilkes	JJ	V	V	IV	V	IV	NS*	IV
Wingina	A	Ia	Ia	I	Ia	I	I	I
Winnsboro	KK	V	V	V	V	Vb	NS*	IV
Wintergreen	O	IIb	IIb	I	II	II	II	II
Winton	B	Ia	Ia	I	Ia	I	II	I
Wolfgap	A	Ia	Ia	I	Ia	I	I	I
Woodington	EE	IVb	IVb	III	IV	Vb	NS*	NS*
Woodstown	J	IIb	IIb	I	II	II	NS*	I
Woolvine	V	Iva	Iva	II	III	III	III	III
Worsham	HH	IVb	IVb	III	IV	Vb	NS*	IV
Worsham variant	HH	IVb	IVb	III	IV	Vb	NS*	IV
Wrightsboro	J	IIb	IIb	I	II	II	NS*	I
Wurno	JJ	V	V	IV	V	IV	NS*	IV
Wyrick	G	IIa	IIa	I	II	IV	II	I
Yadkin	X	IVa	IVa	II	III	III	III	II
Yemasse (drained)	C	Ib	Ib	II	Ib	I	NS*	I
Yemasse (undrained)	OO	V	V	V	V	Vb	NS*	NS*
Yeopim	K	IIb	IIb	I	II	II	III	I
Yogaville	MM	V	V	V	V	Vb	NS*	IV
York	BB	IVb	IVb	III	IV	IV	NS*	III
Zepp	JJ	V	V	IV	V	IV	NS*	IV
Zion	Y	IVa	IVa	III	III	III	NS*	III
Zion variant	Y	IVa	IVa	III	III	III	NS*	III
Zoar	K	IIb	IIb	I	II	II-	III	I

NS* - Not suited

Table I-4
Utilizing Erosion/Slope Information

Soil mapping units provide information on severity of erosion as well as slope yield information. If multiple yield reductions occur in a field, for example, a rocky soil (10% yield reduction) with severe erosion (30% yield reduction) on a class D slope in the ridge and valley physiographic region (25% yield reduction), the most limiting reduction would be used (30%) as opposed to an additive factor (65%).

(1)Yield Adjustment According to Erosion:

Erosion Classes	% Yield Reduction
slight and moderate (1 and 2)	0
severe (3)	25

(2)Yield Adjustment According to Slope:

Slope Classes	% Slope Coastal Plain	% Slope Piedmont, Mountain Regions	% Yield Reduction for Row Crops and Hay Conv. till*	No till*	%Increase in Acres/Animal Unit**
A	0-2	0-2	–	–	–
B	2-6	2-7	–	–	–
C	6-10	7-15	12	6	–
D	10-15	15-25	20	10	25
E	15-25	25-45	too steep for tillage		50
F	25+	45+	too steep for tillage		50

* A and B are equal and are the class standard.
** A, B and C are equal and are the class standard.

(3) Yield Adjustment According to Coarse Textures: Exclude group GG since coarse textures are part of its series criteria.

a. Fine gravelly, gravelly (gritty), cherty - 10% yield reduction
b. Cobbly, angular cobbly, channery, flaggy, slaty, shaly - 15% yield reduction
c. Very gravelly, extremely gravelly, very cherty - 20% yield reduction
d. Very cobbly, extremely cobbly, very channery, very flaggy - 25% yield reduction

(4) Yield Adjustment According to Rock Outcrop:

a. Rocky - 10% yield reduction
b. Bouldery, very bouldery, very rocky, stony, very stony - 25% yield reduction for pasture, not suited to row crops
c. Extremely bouldery, extremely rocky, extremely stony (rubbly) and all complexes with rock outcrop - 50% yield reduction for pasture, not suited to row crops
d. Karst - no row crops, extreme caution in use of fertilizers or organic nutrient sources

Table I-3
Planning Yields For Corn With Managed (Properly Scheduled)
Center Pivot Irrigation Systems

Expected Corn Yield, BU/AC	Soil Management Groups	N Recommendation
190	A,B,D	190 - 210
180	C,E,F,G,J,K,L,M,N,O,Q,R,S,T	180 - 200
170	I,DD	170 - 190
160	V,W,X	160 - 180
150	AA,BB,II	150 - 170
140	H*,Y	140 - 160
130	P*	130 - 150
120	KK	120 - 140
110	U*	110 - 130
100	Z*	100 - 120
85	CC*,EE*,FF*,GG*,HH*	85 - 105
65	LL*,MM*,NN*,OO*,PP*,QQ*	65 - 85

* = Irrigation of these soils is not recommended; factors other than water-holding capacity may be yield limiting factor. Use dryland yields in Table 1-2.

For traveling gun systems, yield response will be highly variable depending upon management of the system. A reasonable estimate of planning yield is 90% of the above estimates (excluding *) for properly scheduled irrigation.

These estimates should not be used for manure irrigation unless supplemental clean water irrigation is utilized since manure applications should usually occur prior to the times of peak moisture demand by crops to allow time for mineralization, and the quantity of water supplied would probably be insufficient.

If historical yields are available, their use is preferred. An average of the high three yields in the last five years should be used.

II.A. Correlation of A&L Labs Weak Bray Phosphorus Procedure with Virginia Tech Mehlich I Phosphorus

Converting Weak Bray Phosphorus to VPI&SU Mehlich I Phosphorus

pH < 5.6	Weak Bray P ppm X 0.6 = VPI&SU P ppm
	Weak Bray P ppm X 2.75 = VPI&SU P2O5 lbs/A
pH 5.6 - 6.2	Weak Bray P ppm X 0.7 = VPI&SU P ppm
	Weak Bray P ppm X 3.20 = VPI&SU P2O5 lbs/A
pH 6.3 - 6.9	Weak Bray P ppm X 0.8 = VPI&SU P ppm
	Weak Bray P ppm X 3.66 = VPI&SU P2O5 lbs/A
pH > 6.9	Weak Bray P ppm X 1.2 = VPI&SU P ppm
	Weak Bray P ppm X 5.50 = VPI&SU P2O5 lbs/A

Potassium

Use either A & L recommendations which are based upon cation exchange capacity for the particular soil, or convert to VPI&SU recommendations with the following equation:

K ppm X 1.33 = VPI & SU K Lb/A

or K ppm X 1.61 = VPI & SU K_2O Lb/A

II.B. Correlation of Soil Analysis Results for Phosphorus and Potassium between Brookside Laboratory and Virginia Tech

The following conversion may be used to correlate the testing methods:

Phosphorus:

Brookside **Easily Extractable** P_2O_5 lbs/A X 0.45 = VPI&SU P_2O_5 lbs/A

Potassium

Brookside K lbs/A X 0.72 = VPI&SU K_2O lbs/A

Pay particular attention to the units in these conversions.

Attachment C

Updated Metal Loading Rates

TABLE 8

A. Recommended Ceiling Pollutant Limits for the Trace Metal Content of Biosolids Acceptance for Land Application.

Pollutant	Concentration (Mg/Kg) Dry Weight
Arsenic	75
Cadmium*	(85)
Chromium	3000
Copper	4300
Lead	840
Mercury	57
Molybdenum*	(75)
Nickel	420
Selenium*	(100)
Zinc	7500
Cadmium/Zinc Ratio (if cadmium equals or exceeds 21 mg/kg)	1.5%

B. Maximum Monthly Average Pollutant Concentrations for Application of Exceptional Quality Biosolids to Lawns or Home Gardens in Residential Locations

Pollutant	Concentration (Mg/Kg) Dry Weight
Arsenic	41(1)
Cadmium*	(39)
Chromium	1200
Copper	1500
Lead	300
Mercury	17
Molybdenum*	(**)
Nickel	420
Selenium*	(36)
Zinc	2800

Note:* Metal concentrations are suspended at this time. Levels shown in parenthesis are based on 40CFR Part 503.

** Level shown in 40CFR Part 503 was recinded on 2/19/94.

(1) The monthly average concentration is currently under study by USEPA as USDA has identified that these levels were unnecessarily low due to incomplete evaluation of data. The standard may be increased up to 54 mg/kg based on the 98 percentile levels in typical biosolids as identified in NSSS.

TABLE 9

Maximum Cumulative Application of Biosolids Borne Metals That Can Be applied To Soils Used For Crop Production(1)

Metal	Kg/ha	(lbs/AC)
Arsenic(2)	41	36
Cadmium*	(39)	(35)
Chromium	3000	2680
Copper	1500	1340
Lead	300	270
Mercury	17	16
Molybdenum*	(**)	(**)
Nickel	420	375
Selenium*	(100)	(89)
Zinc	2800	2500

Note: * Metal loadings are suspended at this time. Levels shown in parenthesis are based on 40CFR Part 503.

** Level shown in 40CFR Part 503 was recinded on 2/19/94.

(1) Such total applications to be made on soils with biosolids/soil mixture pH adjusted to 6.0 or greater if the biosolids cadmium content is greater than or equal to 21 mg/kg. The maximum cumulative application rate is limited for all ranges of cation exchange capacity due to soil background pH in Virginia of less than 6.5, and lack of regulatory controls soil pH adjustment after biosolids application ceases.

(2) The maximum cumulative application may be increased in accordance with the results of USEPA recommendations at a later date.