ROUTE 29

CORRIDOR STUDY

CITY OF CHARLOTTESVILLE AND ALBEMARLE COUNTY

TECHNICAL MEMORANDUM
FOR ENVIRONMENTAL IMPACT STATEMENT

TERRESTRIAL ECOLOGY

6029-002-122, PE 100

U.S. Department of Transportation
Federal Highway Administration
and
Virginia Department of Transportation

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Route 29 Corridor Study
Terrestrial Ecology - Technical Memorandum dated April, 1990

All references to alignment 8 or Alternative 8 on tables and figures and in the text should be deleted. Alternative 8 was an earlier expressway alternative that was discarded.

Similarly, references to alignments 11N-12S and 12N-11S should also be deleted as these alternatives were also discarded.

NATURAL ENVIRONMENTAL ANALYSIS TECHNICAL REPORT

Part 2 of 3

Terrestrial Ecology

U. S. Route 29 Corridor Study -
City of Charlottesville and
Albemarle County, Virginia

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PREFACE

This report has been prepared for the Virginia Department of Transportation as supporting information for the Draft and Final Environmental Impact Statements (D.E.I.S. and F.E.I.S.) for the U.S. Route 29 Corridor Study project in the City of Charlottesville and Albemarle County, Virginia.

The study consists of an examination of nine (9) alternatives for a corridor selection within which to construct a limited access highway facility to provide sufficient traffic capacity to address problems now existing in the area and traffic volumes anticipated to the year 2010. The study area encompasses approximately 63 square miles of Albemarle County, and extends from a point 0.25 miles south of the junction of U.S. Route 29 and the South Fork of the Rivanna River in the north, to U.S. Interstate Route 64 in the south.

This report is one of a series of technical reports which provides detailed supporting documentation for the summary discussions presented in the Draft and Final Environmental Impact Statements. Technical report sections for the project's Natural Environmental Analysis have been prepared for each of the following areas:

- Aquatic Resources and Water Quality
- Aquatic Ecology
- Wetlands
- Groundwater and Surface Hydrology
- Floodplains
- Terrestrial Ecology
- Geology and Soils
- Agricultural Resources
- Forest Resources

Copies of this report and associated project plans and information are available for the public's review during office hours at the Virginia Department of Transportation Offices at 1401 East Broad Street, Richmond, Virginia.

SUMMARY

TERRESTRIAL RESOURCES

1.0 INTRODUCTION

The U.S. Route 29 Corridor Study was designed to identify and evaluate transportation alternatives for the improvement of traffic conditions within the existing Route 29 transportation corridor. This aspect of the study was undertaken to define environmental consequences of road construction along selected alternates as this construction would impact on the terrestrial ecology. Terrestrial ecology included: land cover, topography and soils, geologic formations, wildlife resources, endangered species of plants and animals, Wild and Scenic River and natural areas.

This analysis meets the information and analysis requirements of the National Environmental Policy Act, Endangered Species Act, Fish and Wildlife Coordination Act, and the Wild and Scenic Rivers Act.

2.0 STUDY AREAS AND METHODS

To assess impacts on existing conditions in the study area, an extensive survey was carried out along each study alternate. This survey lasted over 1.5 years and included an evaluation of all the acreages of the seven (7) alignments. Acreages of wildlife habitat and wildlife related resources were compared by alignments. Resources were assessed according to the availability of alternate resources, the uniqueness of any resource, and the relative degree of alteration or degradation.

The impact on any Wild and Scenic rivers in the area was established by the presence or absence of such a stream, the length of stream in the alternative corridor, and the length of stream segment remaining, as those less than four miles long may be excluded from Wild and Scenic status.

A variety of federal, state, and private agencies, organizations, and individuals were contacted. Information was gathered on: 1. Federal and state lands important to wildlife, 2. other wildlife lands, 3. game species, 4. Endangered, Threatened or Special concern (ETS) species, 5. soils, 6. geologic formations, 7. minerals, 8. natural areas, 9. potential wild and scenic rivers, and 10. rare and endangered plants. Rare plants considered were those: 1. with Federal status or under Federal review, and 2. on Virginia's list of 15 endangered plants.

3.0 EXISTING CONDITIONS

3.1 REGIONAL DESCRIPTION

Albemarle County lies in north central Virginia and is situated within two physiographic provinces: the Blue Ridge Physiographic Province and the Piedmont Physiographic Province. Elevation ranges from 235 feet (72m) where the Rivanna River crosses into Fluvanna County just south of Boyd Tavern, to 3,317 feet (1,011m) at the summit of Loft Mountain in the extreme northwestern corner of the county.

The Piedmont province makes up about 82 percent of the total 739 square mile area of the county. This province is characterized by gently sloping to moderately steep landscape which in places becomes steep. It is well dissected by many small streams and rivers that flow in narrow, meandering valleys. Along the lower tributaries of the major streams, entrenchment has been rapid and bluffs and V-shaped valleys are common. The walls of the valleys are steep, and they rise abruptly from the floodplains.

This province is broken in places by long, low hills and mountains. These include Ragged Mountain, Dudley Mountain, Fan Mountain, Bucks Mountain, Piney Mountain, and Southwest Mountain. Elevation ranges from 1,200 feet to 2,400 feet in these mountains. The low hills range from 600 to 1,200 feet in elevation. The smoothest relief in the Piedmont province is east of Southwest Mountain. The elevation ranges from 250 to 600 feet. Most of the soils are well drained throughout the Piedmont, but a few poorly drained soils are along streams, on toe slopes, and in a few saddles.

The Blue Ridge province makes up most of the western part of the county and is only 18 percent of the total land area. It is steep and rugged. It has been strongly dissected by many intermittent and permanent streams that have cut deep, narrow valleys bordered by steep rocky slopes and narrow ridges. Slopes are moderately steep to very steep. Elevation ranges from about 1,200 feet to 3,250 feet. The soils are stony, shallow to deep, and well drained to excessively drained.

The rocks of Albemarle County are igneous, sedimentary, and metamorphic. Geological formations located in the vicinity of the preliminary alignments of the Route 29 Corridor Study include three major fault lines and some slopes greater than 15%. Mineral production in Albemarle County is limited to crushed stone and sand. Past mining activities have involved production of iron ore, slate, clay, sandstone, and limestone. Limited production of amethysts, asbestos, barite, copper, felsite, garnets, gold, limonite, hematite, and pyrite has also occurred historically.

The general soil descriptions of Albemarle County are categorized into eight broad areas that have a distinctive pattern of soils, relief, and drainage. Each of these eight areas consists of one or more major soils and some minor soils. The areas are named for the major soils located within their borders. The general soil areas can be used to compare the suitability of large areas for general land use. The eight general soil area designations, however, are not suitable for planning the management of a farm nor for selecting a site for a road. The soils in any one area differ from place to place in drainage, depth, slope, and other characteristics that affect management.

The three general areas through which the preliminary alignments pass are the Braddock-Thurmont-Unison soils, the Hayesville-Ashe-Chester soils, and the Elioak-Hazel-Glenelg soils.

The Braddock-Thurmont-Unison soils are deep, well drained soils that have a clayey or loamy subsoil and are formed in colluvium material derived mainly from granite and greenstone that has washed out of the Blue Ridge. Some of the soils have rock fragments on the surface. Most of the soils are on gently sloping broad ridgetops and strongly sloping to moderately steep slopes. This area contains approximately 32 percent Braddock soils, 18 percent Thurmont soils, and 8 percent Unison soils. Soils of minor extent make up about 42 percent. The Braddock soils have a brown loam surface layer and a red clay subsoil. The surface layer is very stony in areas. The Thurmont soils have a brown loam surface layer and a yellow red clay loam subsoil. The surface layer is very stony in some areas. The Unison soils have a dark brown silt loam surface layer and a reddish brown clay with silty clay loam subsoil. The surface layer is very stony in places. About three-fourths of the Braddock-Thurmont-Unison acreage is used for cultivated crops, hay, and pasture, while the remainder is wood land and urban land.

The Hayesville-Ashe-Chester soils are well drained, deep and moderately deep soils that have a clayey or loamy subsoil. The area is formed in material weathered from granite and gneiss. It consists of deeply dissected, broad ridgetops and side slopes on uplands. The ridgetops are gently sloping and strongly sloping with the side slopes being moderately steep to steep. This area contains approximately 52 percent Hayesville soils, 23 percent Ashe soils and 14 percent Chester soils. Soils of minor extent make up about 11 percent. The Hayesville soils are mainly on broad ridgetops and side slopes and are deep and well drained. These have a strong brown loam surface layer and a red clay subsoil. The Ashe soils are mostly on side slopes and narrow ridgetops and are moderately deep and somewhat excessively drained. They have a dark brown loam surface layer and a strong brown loam subsoil. The Chester soils are on broad to narrow ridgetops and side slopes and are deep and well drained. They have a dark brown loam surface layer and a yellowish red clay loam subsoil.

About half of the Hayesville-Ashe-Chester soils area has been cleared, and is used for cropland and pasture. The remainder of the area is woodland and urban land. The hazard of erosion in this area is the major concern for the Route 29 Corridor Study.

The Elioak-Hazel-Glenelg soils are deep to moderately deep with well drained and excessively drained soils that have a clayey or loamy subsoil. This area is formed in material weathered from quartz mica schist, and has gently sloping and strongly sloping, narrow ridgetops and side slopes. Areas adjacent to streams are moderately steep and steep. This area contains about 22 percent Elioak soils, 18 percent Hazel soils, and 15 percent Glenelg soils. Soils of minor extent make up about 45 percent. The Elioak soils are deep, well drained, and gently sloping to moderately steep. They are on the highest positions on narrow ridgetops, and have a dark brown loam surface layer and a red silty clay subsoil. The Hazel soils are moderately deep, excessively drained, and strongly sloping to steep, and located on slopes leading down to drainage ways. They have a brown loam surface layer and a brown loam subsoil. The Glenelg soils are deep, well drained, and gently sloping to steep, and are located on narrow ridgetops and side slopes. They have a dark yellowish brown loam surface layer and yellowish red silty clay loam subsoil.

About one-fourth of the Elioak-Hazel-Glenelg soils area has been cleared, and is used for cropland and pasture. Most of the remaining area is woodland and a small portion is urban land.

Historically most of the county was once covered with central hardwood forests, and this is still true today although a goodly portion of the Piedmont province has now been converted to agriculture lands. In 1986, the USDA Forestry Service classified 275,629 acres or 58 percent of the total county acreage as timberland (capable of producing 20 cubic feet of industrial wood per acre per year). Most of the timberland is of the oak-hickory group (66%), Loblolly-shortleaf pine (20%), and oak-pine (12%).

The forests and farmlands of the county contain a typical complement of game and non-game summer, winter, migratory and permanent resident fauna. Deer, bear, turkey, squirrel, rabbits, quail, grouse, and dove are commonly hunted species. Wood ducks, mallards and Canada geese are found along the major streams and on the South Fork Rivanna River Reservoir.

Albemarle County also lies in the heart of Virginia's hunt country where horsemen still hunt foxes, both red and gray from horseback. On any weekend in late fall or winter during the season, one can see large groups of hunt club members riding to the hounds.

Other wildlife species that are known to inhabit the county include: beaver, bobcat, mink, Virginia opossum, muskrat, raccoon, river otter, striped skunk, woodchuck, various species of voles and mice, numerous species of snakes and amphibians, and over 175 species of avifauna.

3.2 GENERAL RESOURCES

The terrestrial resources in the study area include: wildlife lands (i.e. areas that are important for wildlife, either publicly or privately owned); natural areas that have locally designated purpose and values (i.e. lands obtained by or in conjunction with the National Park Service, the Virginia

Natural Heritage Program, or some private agency for public use in perpetuity as an unspoiled natural area); any rare and endangered plants that enjoy Federal status or are on the Virginia Natural Heritage Program's list of endangered plants; and outstanding trees as identified by the Virginia Native Plant Society or the Virginia Natural Heritage Program of the Department of Conservation and Historic Resources. Important wildlife fauna include game, non-game, and Federal endangered and threatened species.

A major component of terrestrial resources is the type of available habitat and the associated wildlife. Habitat includes factors such as food, cover, water, and the space required for an animal to survive and reproduce. Therefore, a change in habitat will affect wildlife populations. There are several general categories of habitat in the study area, each of which has a relative value. Areas that are primarily urban/suburban in character (including roadways), or composed of barren land and/or open water are generally poor wildlife habitat. Agricultural lands generally have a moderate habitat value. In some cases, small patches of agricultural land interspersed with escape and shelter habitats can be of exceptional value to wildlife. The highest quality wildlife habitat in the study area include forested areas, old fields, and the few existing wetlands.

The Virginia Department of Game and Inland Fisheries data base lists six wildlife species that may be found in Albemarle County which are endangered, threatened, or candidate species. These are the Loggerhead Shrike (State endangered), Indiana bat (State and Federal endangered), the eastern woodrat (Federal candidate), the eastern cougar (State and Federal endangered), and the James River Spiny Mussel (State endangered). The Bewicks Wren (State endangered) has also been known to nest in Albemarle County.

There are two known loggerhead shrike nests in Albemarle County, both of which are near the western border. The only known Indiana bat cave hibernacula are in the Southwest corner of the State and this species is not known from Virginia during the Spring and Summer months. The eastern woodrat is likely to occur in areas of rocky terrain within forested areas within the Blue Ridge Province, although no specific locational data exists at the present time. Locational information for the eastern cougar lists two unverified sightings of the animal in Albemarle County since 1970. Populations of the James River Spiny Mussel have been located in Mechum's River and Rocky Run in Albemarle County. Since both locations lie upstream of the proposed alignments, the mussel is not adversely affected unless this known range is extended downstream of the proposed alignments.

There are no habitats within the study area considered critical to threatened or endangered species of wildlife within Albemarle County. The Virginia Natural Heritage Program reviewed its files for any rare, threatened, or endangered species within the proposed alternates. This database revealed no populations of rare, threatened or endangered plants, animals or natural communities in the project area.

The study area also contains a number of rivers and streams that potentially qualify as National Wild and Scenic Rivers. These streams are a part of the Middle James River Basin and the York River Basin systems. The entire area of Albemarle County is part of the Chesapeake Bay Basin. To obtain this status each river must meet certain requirements. These criteria include characteristics of outstanding geologic, ecological, cultural, historic, scenic, botanical, recreation or other similar value(s) that are of multi-state or national significance. A river also must be generally undeveloped. If a river's characteristics should be altered, then it's eligibility could change.

Evaluation of streams in the project area according to National Park Service criteria for inclusion of a river in the National Wild and Scenic River System, as well as aspects of Virginia's Scenic Rivers Act, revealed that the following rivers meet both criteria: The North Fork of the Rivanna River east of U.S. Route 29; the South Fork of the Rivanna River west of the reservoir; Moormans River; Mechums River; Doyles River above its juncture with the Moormans River; and the Rivanna River southeast of the City of Charlottesville. Although these streams meet the criteria no action has been taken to include them in the Federal system. Segments of Moormans River and the Rivanna River have however, been included in Virginia's Scenic River System.

There are no wildlife management areas within Albemarle County. Three Natural Areas are in the county, Ivy Creek by the South Fork Rivanna River Reservoir, and Fernbrook Preserve along the North Fork Rivanna River east of Route 20 at Proffit. Fernbrook is 1 1/3 miles east of Alignment 6B and would not be impacted at all. Ivy Creek Natural Area is in the vicinity of Alignment 10, though not directly impacted by this alignment. McIntire Municipal Park, located along Shenks Brook north of the Route 250 bypass, is also classified as a natural area, though the primary use of this area is recreational, Alignment 7 may impact on this site at the south junction with Route 250.

3.3 TERRESTRIAL RESOURCES ALONG EACH ALIGNMENT

The study area provides a variety of habitats for many species. Vertebrate species are well represented within Albemarle County as a result of a mosaic of pastured farms and forested lands. Many farm ponds as well as a myriad of streams and rivers in the county provide aquatic habitat for many species, though the topography yields few wetlands for wetland-dependent species. Potential impacts to wildlife were addressed based on habitat impacts along each alignment. This assessment classifies barren, urban and suburban lands, roadways and open water as low in value for wildlife, agricultural lands as moderate, and forest, old fields, and wetlands as high in value for wildlife use.

Table 3.1 lists existing habitats along each study alignment in terms of total acreage along the 300-foot wide corridors. This table shows a pattern of greater percentages of forests and old fields on the east side of the study area, with more land devoted to agricultural uses on the west side. Wetlands consist of a very small percentage of lands on the alignments with a small amount of these areas in the form of open water. The greater percentage of open water along the western alignments represent the long crossings of the South Fork Rivanna River Reservoir.

TABLE 3.1
LAND COVER ACREAGES ALONG EACH STUDY ALIGNMENT

LAND COVER CLASSIFICATION	ALIGNMENT 6	6B	7	8,9	10	11	12	11N/12S	12N/11S
Barren and Urban/Suburban/ Roadway	71.4	30.6	47.7	116.0	45.2	33.8	44.6	33.5	44.8
Agricultural	14.4	46.9	21.8	0.0	50.3	136.3	226.3	177.8	186.5
Forested	179.6	198.2	153.3	0.0	90.7	125.7	148.8	135.6	169.2
Old Field/Shrub	31.6	18.1	40.4	0.0	0.8	24.7	12.4	7.5	14.5
Wetland	1.5	0.2	0.2	0.2	0.2	0.3	0.6	0.5	0.3
Water	3.1	1.1	1.8	0.1	0.3	5.7	4.4	4.9	4.7
TOTAL	301.6	295.1	265.2	116.3	187.5	326.5	437.1	359.8	420.0

4.0 IMPACTS

4.1 GENERAL IMPACTS

The only potential geologic impact of the proposed alignments would be the loss of potential mineral resources. The resources would be in the form of economically valuable pockets of sand and gravel. However, because the locations of sand and gravel pockets are unpredictable, it is not possible to pinpoint their occurrence along the proposed alignments. All other mining of valuable minerals occurs outside the boundaries of the proposed roadways.

During the construction of a roadway, compaction of soils and denudation of vegetation can result in increased erosion and sedimentation. Slope, soil texture, the amount of precipitation, and the degree of compliance with the erosion control ordinance will affect the soil loss potential. Increased erosion results in increased sedimentation, as evidenced in several of the feeder streams to the South Fork Rivanna River Reservoir. The improper use of soils may also result in ground or surface water pollution, landslides, flooding, drainage problems, failed septic systems, construction problems, and unproductive agricultural and forestal lands.

Urban/Suburban/Roadway cover is considered poor wildlife habitat. Therefore, a corridor will experience habitat degradation in proportion to the quality and acreages of habitats converted to this type acreage. Barren land and open water, though not of exceptional habitat value, are scarce in all corridors. Small patches of agricultural land interspersed with escape and shelter habitats can be of exceptional value to wildlife; however, large uninterrupted tracts are of limited value. Forests, oldfields, and wetlands provide quality wildlife habitat. Therefore, conversion of these acreages to roadway would provide the greatest potential impact to habitat loss.

Construction of a new road will displace animals dependant upon the type and quality of habitat lost. Displacement results in an increase of nearby populations, and as a result of overcrowding and a limited carrying capacity, an ultimate population reduction. A new roadway can fragment habitats, frequently resulting in a decrease in species or a disproportionate decrease in numbers. It may result in near isolation of populations of some species or increased road kills. A variety of factors, noise, air and other pollutants may cause stress in wildlife. In general, a new road will have greater detrimental impacts than an upgrade. No action alternative will generally have the least impacts of all alternatives.

4.2 SPECIFIC IMPACTS

Discussion of impacts along each alignment centers largely on habitat impacts as they relate to wildlife resources. Lands that are barren, urban, suburban, or consist of roadways and open water are considered of low value for wildlife. Agricultural fields are of moderate wildlife value, ranging from small fields with adjacent forests and hedge rows that provide better wildlife habitat, to large, unbroken fields that are of poorer value. Lands that are of highest value to wildlife are forested, old field/shrub areas and wetlands. A summary of geologic, soils and terrestrial impacts by alignment is shown in Tables 4.1 and 4.2.

TABLE 4.1
SUMMARY OF SOIL AND GEOLOGIC IMPACTS
ALONG PROPOSED ALIGNMENTS

ALIGNMENT	FLOODPLAINS CROSSED	MAJOR FAULTS CROSSED	ACRES OF SEVERELY ERODIBLE SOILS	ACRES OF PRIME FARM-LAND SOILS
6	7	0	3.95	89.5
6B	5	0	8.32	78.1
7	9	0	3.43	78.2
8,9	0	0	1.04	0.0
10	0	0	2.70	48.7
11	4	2	0.0	101.7
12	8	1	5.86	157.6
11N/12S	5	2	1.27	110.7
12N/11S	7	1	4.50	147.1

TABLE 4.2
ACRES OF HIGH, MODERATE, AND LOW VALUE WILDLIFE HABITAT FOR EACH ALIGNMENT

HABITAT ACRES

ALIGNMENT	HIGH VALUE		MODERATE VALUE		LOW VALUE		TOTAL ACRES
	ACRES	%	ACRES	%	ACRES	%	
6	212.7	70.5	14.4	4.8	74.5	24.7	301.6
6B	216.5	73.4	46.9	15.9	31.7	10.7	295.1
7	193.9	73.1	21.8	8.2	49.5	18.7	265.2
8,9	0.2	0.2	0.0	0.0	116.1	99.8	116.3
10	91.7	48.9	50.3	26.8	45.5	24.3	187.5
11	150.7	46.2	136.3	41.7	39.5	12.1	326.5
12	161.8	37.0	226.3	51.8	49.0	11.2	437.1
11N/12S	143.6	39.9	177.8	49.4	38.4	10.7	359.8
12N/11S	184.0	43.8	186.5	44.4	49.5	11.8	420.0

No lands considered vital to rare, threatened or endangered species are impacted by any study alternative. There are no lands designated as wildlife areas that would be impacted as a result of this project. No state or county designated scenic rivers are crossed by the alignments, and no State and county scenic highways are impacted. No impacts on vital mineral resources were identified during this study.

4.1.2.1 Alignment 6

Alignment 6 impacts on a total of 301.6 acres of lands east of existing Route 29. No geologic hazards occur along this route, though seven floodplains are crossed. Soils considered a severe erosion hazard comprise a total of 3.95 acres along this alignment, and 89.5 acres of soils designated as prime farmland soils would be impacted. Land cover along Alignment 6 is mostly forested (59.5%) and urban (23.7%), with only 4.8% of lands consisting of agricultural fields. Over two-thirds of the land along Alignment 6 are of high wildlife value, while one quarter of the alignment crosses low-value urban and open water areas.

4.1.2.2 Alignment 6B

Alignment 6B, the far eastern alignment impacts a total of 295.1 acres of land. There are no geologic hazards along this alignment, though 5 floodplains are crossed. Impacts on severely erodible soils are greatest of all alternatives along Alignment 6B, yet still only comprise 8.32 acres of the total. There are 78.1 acres of prime farmland soils along this alignment. Alignment 6B crosses the North Fork Rivanna River east of Route 29. Though this river is not currently designated as a Wild and Scenic River, and is not under study as a candidate for this designation, it does meet the criteria for inclusion in the National Wild and Scenic Rivers System.

As with all eastern alignments, land cover along this alignment is predominately forested (67.2%), with more land used for agricultural purposes (15.9%) and subsequently less urban lands (10.4%). Overall, wildlife habitat along this alignment would be rated as good, with 73% considered of high value, 16% of moderate value, and 11% low in value. This is slightly better than habitat values along Alignment 6, resulting from the more rural nature of this far eastern route.

4.1.2.3 Alignment 7

This alignment impacts on a total of 265.2 acres. Only 3.43 acres of severely erodible soils are impacted, and 78.2 acres are considered prime farmland soils. Nine floodplains are crossed by this alignment, more than any other of the study options. Also, a portion of McIntire Park north of the Route 250 bypass along Shenks Brook would be impacted on the southern end of the alignment. This impact would involve approximately 11 acres. Though classified as a natural area, this park is predominately open field that is of low to moderate value to wildlife. Land cover along Alignment 7 is similar to Alignment 6, as expected since most of the areas are common to both. Over half of the alignment is forested (57.8%), and little is agricultural (8.2%), with more land classified as old field, high in wildlife value. Overall, 73% of lands along this alignment were determined to be of high value, 8% of moderate value, and 19% of low value.

4.1.2.4 Alignments 8 and 9

The expressway options have the fewest impacts on terrestrial resources. A total of 116.3 acres of land would be impacted, one acre of which crosses severely erodible soils. No prime farmland soils or floodplains would be impacted by this option. This area along Route 29 is already highly developed, and wildlife value of the land is low along the majority of these options.

4.1.2.5 Alignment 10

Alignment 10, the near western option is the shortest of the alternatives (other than the expressway options), and impacts on only 187.5 acres. Of this total, 2.7 acres of soils that are a severe erosion hazard would be impacted along with 48.7 acres of prime farmland soils. No floodplains are crossed by this alignment. As the near western route with respect to the City of Charlottesville, nearly on quarter of the land along Alignment 10 would be considered urban or suburban habitat, low in terms of wildlife value. About one quarter of the land cover is agricultural (moderate value) and the remaining half forested (high wildlife value).

4.1.2.6 Alignment 11

Alignment 11 impacts on 326.5 acres, and contains no soils considered a severe erosion hazard. Prime farmland soils cover 101.7 acres of the total along this option, and four floodplains are crossed. In addition, this alignment crosses two fault lines along the northern segments. Land cover along Alignment 11 reflects the more agricultural nature of the lands west of existing Route 29, with 42% of the total as cultivated or pastoral fields. There is less forested land along this alignment (38%), as well as less urban and suburban lands (10%). Overall, land cover along Alignment 11 is split between high quality wildlife habitat (46%) and moderate habitat (42%), with the remaining areas low in wildlife value.

4.1.2.7 Alignment 12

This alignment is the longest of all study options and subsequently impacts on the greatest amount of terrestrial resources (437.1 acres). A total of 5.86 acres involve severely erodible soils, and 157.6 acres cross prime farmland soils. The northern portion of Alignment 12 crosses a fault line just west of Route 606, and a total of 8 floodplains are crossed. Over half (51.8%) of this alignment is over agricultural fields, and only 34.0% is forested. Overall, alignment 12 is similar to Alignment 11 in terms of habitat value, with slightly less of high wildlife value (37%), and more of moderate value (52%).

4.1.2.8 Alignment 11N/12S

This crossover option impacts on 359.8 acres of land, and crosses only 1.27 acres of severely erodible soils and 110.7 acres of prime farmland soils. Five floodplains are crossed, along with the two fault lines crossed by Alignment 11. Agricultural land predominates along this alignment (49%), followed by forested lands (38%). A total of 40% of lands are rated high in wildlife value, 49% of moderate value, and the remaining 11% as low in value.

4.1.2.9 Alignment 12N/11S

This northern crossover option impacts on 420.0 acres of land, including 4.50 acres of severely erodible soils, 147.1 acres of prime farmland soils, seven floodplains, and the one fault line described under Alignment 12. As with the other western alignments, land cover is predominately agricultural (44%) and forested (40%). Wildlife habitat values for this option are equal between lands of high and moderate value (44% each) with the remaining 12% of land impacted low in value.

5.0 MITIGATION

5.1 GEOLOGY AND SOILS

Where soils subject to severe erosion will be impacted, measures for reducing on-site erosion will be utilized. These measures will include the use of diversion ditches, dikes, sediment dams, minimizing the removal of vegetation, scheduling earthwork during dry periods of the year, and replanting vegetation as soon as possible after disturbance.

To prevent adverse situations, development should be avoided on soils with severe limitations. Existing regulations which address the proper use of soils includes the Soil Erosion and Sedimentation Ordinance, and Critical Slopes and Site Plan regulations in the Zoning Ordinance which requires that the soils be reviewed as to suitability for the intended development.

5.2 TERRESTRIAL RESOURCES

Highway construction and maintenance will utilize habitat management techniques. Replanting of rights-of-way with native plant species will commence promptly after construction to provide new habitat and reduce erosion. Long term impacts from highway operation and maintenance will be minimized through selection of pesticides and herbicides which have the least effect upon terrestrial organisms.

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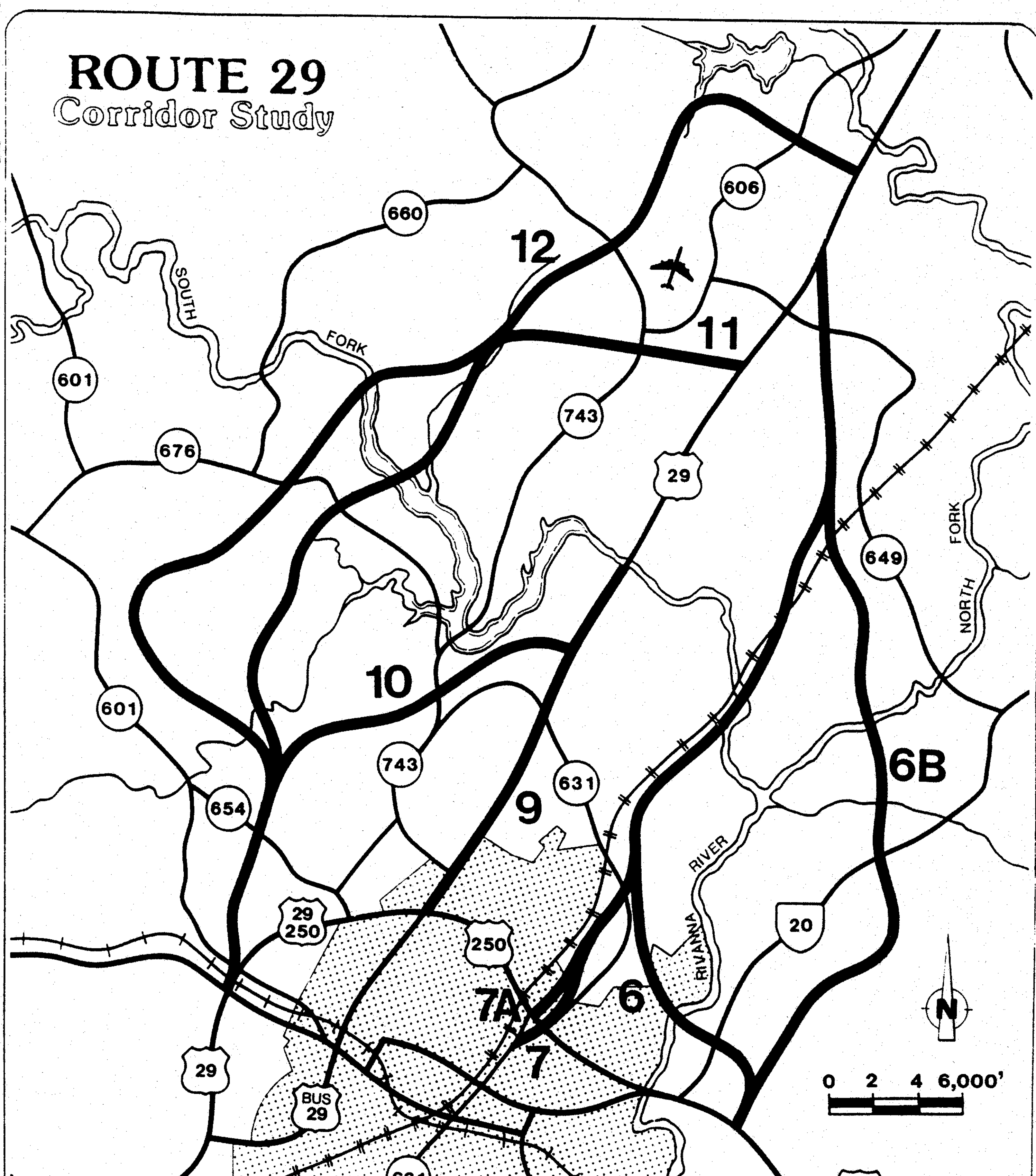
1.0 INTRODUCTION

The U.S. Route 29 Corridor Study was designed to identify and evaluate transportation alternatives for the improvement of traffic conditions within the existing Route 29 transportation corridor. The range of alternatives studied include upgrades to the existing roadway, and six bypass options with two crossover variations. The study area and proposed alignments are shown in Figure 1.1.

The project study area covers 63 square miles of Albemarle County, Virginia along Route 29 north of the City of Charlottesville. The area is characterized by upland deciduous forests and farmland crossed by numerous streams. Charlottesville is the largest urban area within the county, with several areas of growth extending north along Route 29. The population in Albemarle County in 1990 is projected to number 69,000, with 42,000 (61%) residing in the City of Charlottesville. This figure does not include the transient student population of the University of Virginia. Continued growth is expected in Albemarle County with current predictions projecting an average annual rate of 1.7%, the eighth highest growth rate for counties in the state. Areas west of Route 29 within the study area tend to be devoted to farming activities with some forestry lands to the northwest of Charlottesville. The farms in this section of the county are generally of greater acreage than the average and multi-faceted. Areas on the eastern side of the study area are generally devoted to farming although the average farm size is smaller.



Proposed Alignments of the Route 29 Corridor Study

Figure No. 1.1

2.0 STUDY AREA AND METHODS

2.1 TERRESTRIAL RESOURCES

2.1.1 Existing Conditions

Existing conditions were established by employing a land cover classification system which used a combination of aerial photography and ground truthing for the mapping of habitat types. Habitat was used, generally, as an indicator of the wildlife present. A variety of governmental and private agency contacts were made to assure that specific potentially important species and habitats were considered.

Geological characteristics and soils are described for both regional and alternate-wide scales.

Wildlife presence or absence was established not only by ground-truthing along each alternate but by an evaluation of habitat types based on acreage along alternates. This procedure provided information as to the type of species and possible population densities that might exist in a specific location.

Special concerns such as Endangered, Threatened, or Special Concern (ETS) species, Wild and Scenic Rivers, and Natural Areas were also investigated.

2.1.1.1 Geology

Geological characteristics are described for both regional and corridor - wide scales. Evaluation of possible impacts was confined to the area within the alternate corridor as possible impacts to geologic formations will occur only where such features would be in contact with the highway.

Characteristics and occurrences of geologic formations were obtained from various publications and maps of the United States Geological Survey, the Virginia Department of Conservation, Division of Mineral Resources, and the Albemarle County Planning Commission.

2.1.1.2 Soils

Information regarding the textures, slopes, stabilities and drainage of the soils found in the study area was obtained from the 1985 Soil Survey of Albemarle County, Virginia published by the Soil Conservation Service of the U.S. Department of Agriculture. Soil types which were determined to exhibit severe erodibility were mapped and the area underlain by severely erodible soils was calculated by alternate.

2.1.1.3 Land Cover

The land cover classification used in habitat analysis was described by Anderson et al. (1976). Designated cover types were as follows:

- Urban/Suburban/Roadway. These were areas of intensive human use with much of the land covered by structures. Included were: cities, towns, villages, strip developments along highways and roadways, and areas occupied by shopping centers, industrial and commercial complexes, and institutions. Small parcels of other types of land, such as agricultural land, surrounded and dominated by urban development were included in this classification. In other words, the urban category took precedence over others when criteria for more than one category were met. A heavily wooded residential area still fell within this category and not within forests.

- Barren Land. This was land of limited ability to support life, with less than one-third of the area having a vegetative cover. In general, these were areas of thin soil, sand, or rocks. Thus, such areas as sandy streambanks, bare exposed rock, and surface mines were included in this category. Also included were areas in transition from one land cover type to another, such as a forest bulldozed but upon which no construction had yet occurred. However, lands barren due to normal and regular activities of another category, such as a recently plowed field or a small clearcut within a larger forest segment, were still classified within their respective categories.

- Agricultural Land. This was land used primarily for production of food and fiber. This included croplands, pastures, orchards, vineyards, nurseries, confined feedlot operations, and the farmstead itself.

- Forest. Lands considered forested had a crown closure of at least 10%, and were stocked with trees capable of producing wood products. Land from which trees had been removed to less than 10% crown closure, but which were expected to return to forest lands, as in a clear cut, were retained as forest. The forest category included deciduous, evergreen, and mixed forest types.

- Oldfield/Shrub. These were previously cultivated or cleared areas in a natural transition (succession) to forest. Earlier stages are dominated by grasses, weeds, annual and perennial herbaceous plants, and small shrubs or woody species. Later stages are dominated by shrubs, various other woody species, and small trees.

- Wetland. Wetlands were those areas that were inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typical adapted for life in saturated soil conditions. For the sake of land cover classification purposes, there was no further breakdown of wetlands. However the wetland investigation included a precise designation of each wetland type, and quantitative and qualitative determinations were made.

- Water. These were areas of open water such as found in rivers, creeks, lakes, ponds, and reservoirs.

Land cover types were identified, delineated, quantified, and tabulated for each alternate corridor and crossover alternative. On 1" = 200' aerial photos blocks of habitat in the alternates' corridors were traced and labeled. These tracings were then measured and acreages for each habitat type were totaled for each alternate. These were then used in a comparison of alternates.

Land cover maps were ground-truthed by frequent visits to the study area. As additional checks on habitat mapping, 1985 USDA Soil Conservation Service maps of the Soil Survey of Albemarle County, Virginia, and USDA Forest Service maps were reviewed. Although the categories of habitat potentials depicted by both map series were not directly compatible to the study method, they provided a system for checking calculations of habitat types.

For simplicity, the forest, oldfield/shrub, and wetlands categories were combined when applied to wildlife since they constituted the major types of wildlife habitats. Thus, the occurrence of major wildlife habitat within an alternate corridor could be compared to habitat of less importance for wildlife (i.e. agricultural lands versus urban/suburban/roadway habitats) and acreages of prime habitats could then be compared between alternates.

2.1.1.4 Wildlife

Wildlife was considered generally as a function of habitat. However a variety of other factors were evaluated. Of specific importance was the proximity to the study area of Federal and state lands that served, or could serve as wildlife management areas; the established population densities of wildlife in Albemarle County based on information from the Department of Game and Inland Fisheries; the presence of natural areas with established wildlife values; and the existence of wildlife habitat on privately owned lands within the alternates' corridors. Factors specifically examined were: 1.) lands of known importance to wildlife, 2.) game species locations, habitats, and census and harvest figures including white-tailed deer, black bear, wild turkey, raccoon, opossum, gray (and red) fox, bobcat, muskrat, beaver, mink, and skunk, and 3.) possible secondary impacts on wildlife such as increased mortality due to road kills and secondary habitat manipulations along the alternates.

2.1.1.5 Endangered, Threatened and Special Concern (ETS) Species

The Virginia Department of Game and Inland Fisheries, Biota of Virginia data base was also consulted to obtain information on fauna species with a federal or state status that inhabit or might frequent Albemarle County. The Virginia Natural Heritage Program of the Department of Conservation was consulted to identify any exemplary, unique, rare, or endangered resources, especially flora, that exist or might exist in the study area.

Information on the rare avifauna of Albemarle County was obtained from the Virginia Society of Ornithology. The Virginia Native Plant Society provided general information on ETS fauna of the Commonwealth and Albemarle County. The possibility of any of these species being along any of the alternates, or the presence of suitable habitat for these in their corridors is indicated on each of the lists.

2.1.1.6 Wild and Scenic Rivers and Natural Areas

The National Park Service's minimum criteria for inclusion, or potential inclusion of a river in the National Wild and Scenic Rivers System was evaluated for streams in Albemarle County. The following were evaluation considerations: 1.) that portion of a river crossed by any of the alternates and therefore directly eliminated from the system, and 2.) the lengths of any designated stream (should any exist), upstream and downstream from an alternate's crossing.

Virginia also has a scenic rivers program administered by the Department of Conservation, Division of Parks and Recreation. This program was established in 1970 by the passage of the Virginia Scenic Rivers Act, (Title 10, Chapter 15, section 10-167 through 10-175 of the Code of Virginia). All of the rivers in the study area were evaluated according to the criteria of this Act.

The Scenic River Act was not designated to create an "instant" system but rather to provide a framework whereby individual rivers or river segments of high quality could be legislatively designated, as local interest and commitment to protection developed. Five sections of the Act combine to provide the basic protection afforded components to the Scenic Rivers System. These sections state:

1. it shall be the policy of the Commonwealth to protect and conserve certain rivers and their immediate environs which possess great natural and pastoral beauty. It further declares such preservation to be a beneficial purpose of state water resource policy.

2. it is a requirement that in all planning for the use and development of water and related land resources on a Scenic River, full consideration and evaluation of the river as a scenic resource shall be given before plans which would alter or destroy its scenic character are approved.

3. an Advisory Committee of local residents shall be appointed to review and comment on plans affecting the river and to assist and advise the Director of the Department of Conservation on matters relating to the protection and management of the river.

4. a legislative appointment shall be made of an agency to administer each component of the System in order to achieve the purposes of the Act.

5. once a river or stream segment is brought into the System, no dam or other impediment to the natural flow shall be constructed, operated or maintained unless specifically authorized by an act of the General Assembly.

Currently only two rivers in Albemarle County are designated as state scenic rivers (Figure 2.1).

- Moorman's River from the Charlottesville Reservoir to its junction with the Mechums River
- Rivanna River from the Woolen Mills Dam to the Fluvanna County line

The Scenic Overlay District of the Albemarle County Zoning Ordinance may also be applied to scenic waterways. A scenic stream designation restricts construction, grading and cutting of trees within 15 feet of the stream, and restricts construction and excessive cutting within 65 feet of the stream. The following stream is currently designated as a scenic stream (see Figure 2.1):

- Moorman's River from the bottom of the Charlottesville Water Supply Dam at Sugar Hollow to its confluence with the Mechums River.

The Natural Areas considered during the study were the Ivy Creek Natural Area, Fernbrook Preserve, and McIntire Park. These were the only areas meeting the definition of a natural area within the project area.

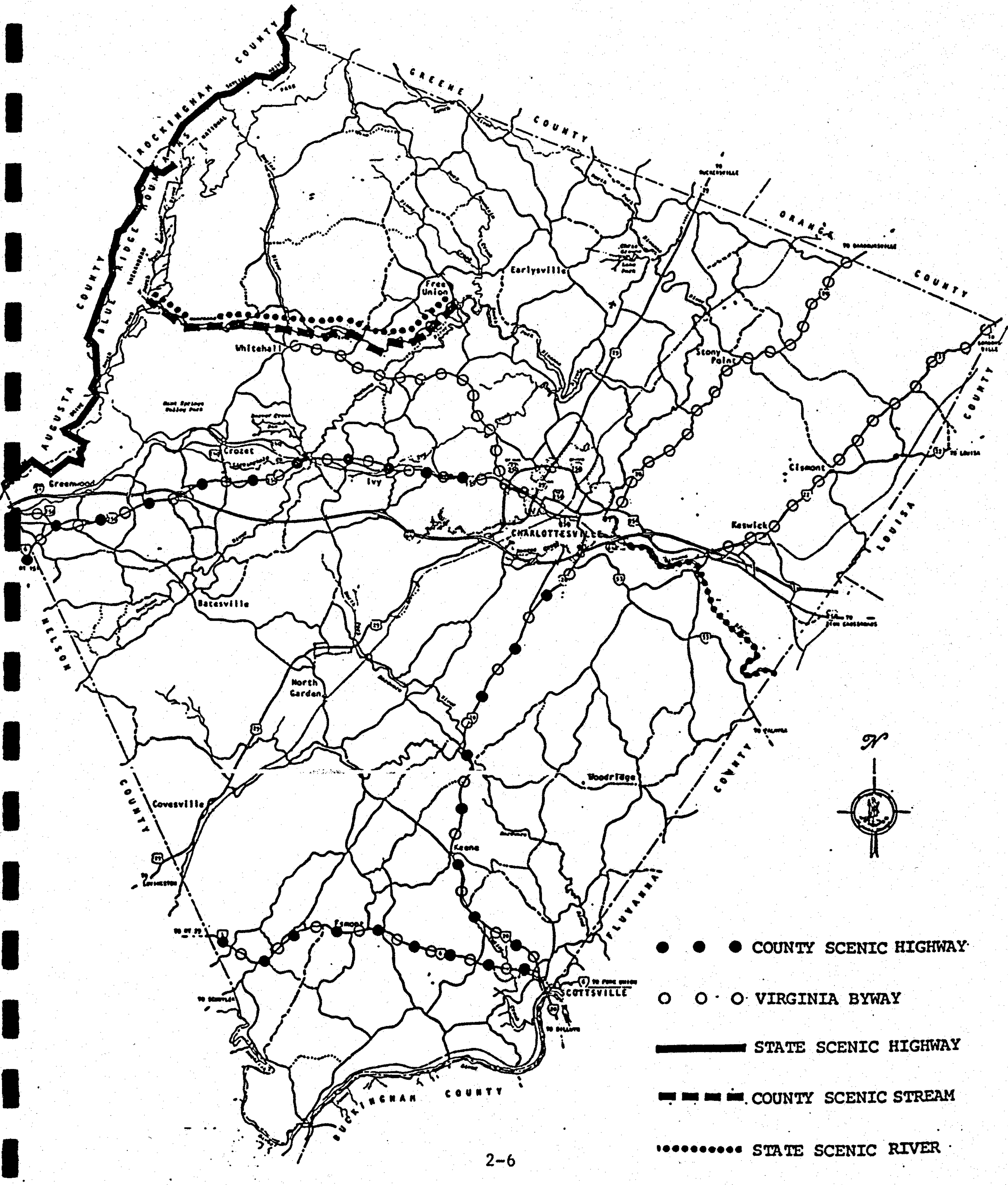
2.2 Impact Prediction

Land cover impact predictions were based primarily on the amount of acreage directly impacted by roadway construction along each alternate corridor. Consideration was not given to post construction revegetation activities because of lack of detailed project design information. It is generally recognized that these would be part of best management practices (BMP) during, and after construction and therefore could account for the return to certain unknown land cover types when followed. These activities were considered an integral part of mitigation planning for the project.

Assessment of possible impacts to geological features and to soils was confined to the area adjacent to and underlain by the proposed alternates as these would originate only where pertinent features are in contact with the highway.

Predictions of impacts to wildlife were based primarily on the acres of each habitat type within the corridors of the alternates. Loss or alteration of a habitat was considered to result in concomitant changes in wildlife species and abundance. A comparison of alternate corridors and their impacts therefore necessarily considered the number of acres of the seven habitat types and the importance of each habitat to wildlife. Special note was made of economically important species when they were of specific importance.

SCENIC RESOURCES - ROADS AND STREAMS



A listing was made of all publicly recognized significant natural resources, whether ownership was private, State, or Federal. In general, impacts were considered for these resources as either direct, i.e. within the corridor and that portion totally eliminated, or indirect. Indirect impacts consisted of the close association of a natural resource located near a corridor. Without detailed project design information, only general types of potential indirect impacts can be identified. For areas directly eliminated by the alternate corridor, totally or in part, acreages or other obvious impacts were noted. Impacts considered were wildlife lands (areas important to wildlife), those areas used by some species of non-game and transient endangered species, areas with a possible concentration of game species, natural areas, and the possible presence of rare and endangered flora.

Impacts on rare plants were considered only from a general sense. For some populations the location is only vaguely known, providing only an indication of their true locale.

For potentially Wild and Scenic Rivers the impacts considered were dependent upon: 1.) the width of the corridor, and therefore the length of stream directly removed from designation, 2.) whether the road was an upgrade or a new crossing, 3.) the area bounded by the stream corridor (0.25 miles on either side of the stream) and within 0.25 miles stream distance to the center line of the corridor (assumed to be the distance to which impacts like noise and scenery degradation were likely to occur), and 4.) the lengths of stream remaining up and down stream of the crossing (normally an unbroken segment must be a minimum of five miles to be considered for Wild and Scenic status; USDOI 1981).

Impacts to Natural Areas were considered only in a direct sense. If an alternate corridor was planned through any such area the acreage lost was calculated, irregardless of the legal feasibility of such action.

3.0 EXISTING CONDITIONS

3.1 TERRESTRIAL RESOURCES

3.1.1 Regional Study Area

Albemarle County lies in north central Virginia. It is bounded on the north by Greene and Orange counties, on the east by Louisa and Fluvanna counties, on the south by Buckingham County and on the west by Nelson and Augusta counties. The county is about 39 miles north and south and about 21 miles east and west. The total area of the county is about 741 square miles or 474,000 acres.

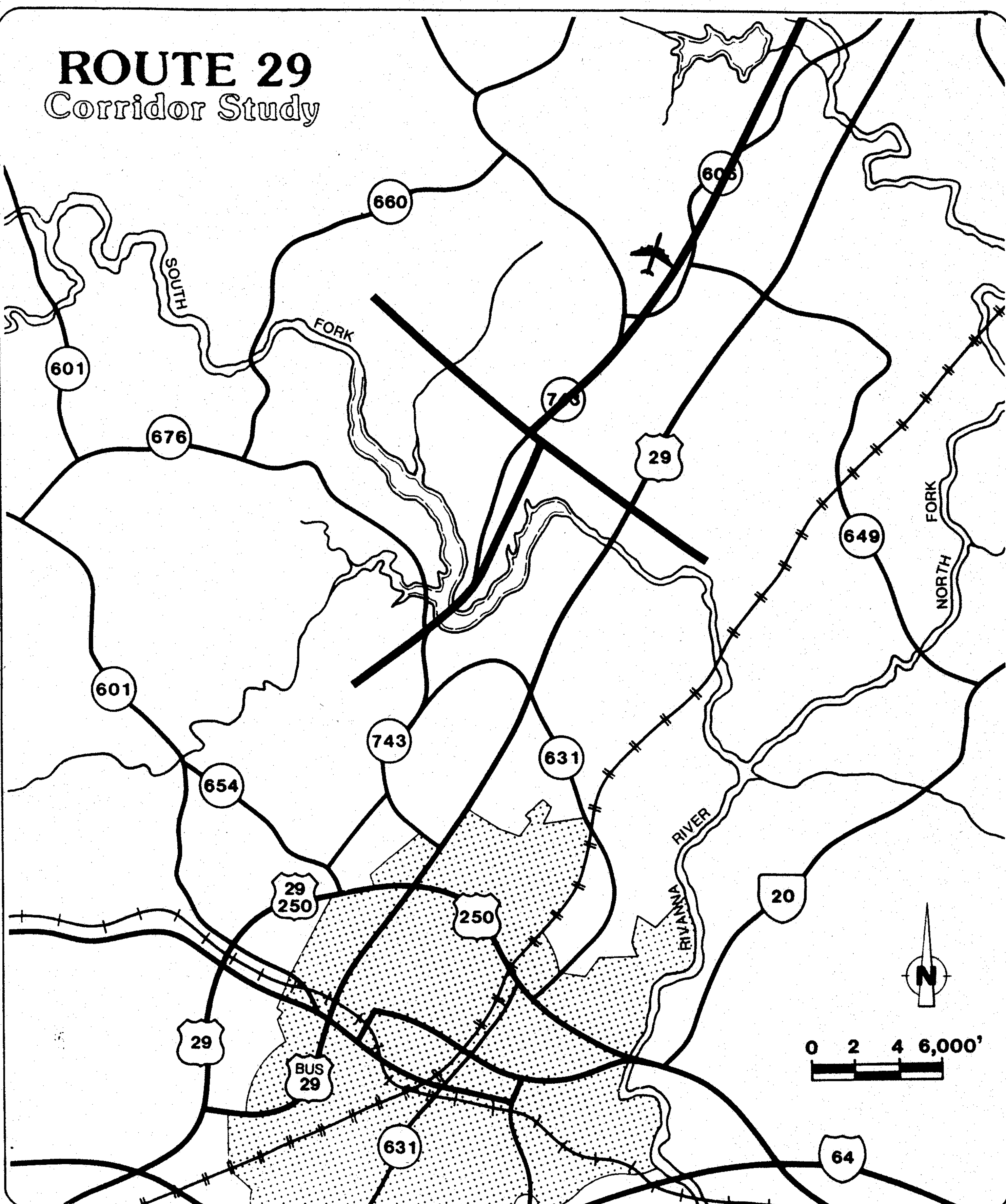
Albemarle County is within both the Piedmont and Blue Ridge physiographic provinces. Elevation ranges from 250 feet above sea level where the Rivanna River and James River leave the county to 3,317 feet at the summit of Loft Mountain in the extreme northwestern corner of the county. The Piedmont province makes up about 82 percent of the county. It is well dissected by many small streams and rivers that flow in narrow, meandering valleys. The landscape of this province is mostly gently sloping to moderately steep, but in places it is steep. Along the lower tributaries of the major streams, entrenchment has been rapid and bluffs and V-shaped valleys are common. The walls of the valleys are steep, and rise abruptly from the floodplains. Most of the soils are well drained throughout the Piedmont, with only a few poorly drained soils along streams, on toe slopes, and in a few saddles.

The Blue Ridge province makes up most of the western part of the county and is only 18 percent of the total land area. It is steep and rugged. It has been strongly dissected by many intermittent and permanent streams that have cut deep, narrow valleys bordered by steep rocky slopes and narrow ridges. Slopes are moderately steep to very steep. The soils are stony, shallow to deep, and well drained to excessively drained.

3.1.1.1 Geology

Topographic map sheets of Albemarle County are available from the U.S. Geological Survey. The 7 1/2 minute Series, 1:2400 scale, utilizes 22 map sheets to illustrate the county. The topographic maps used during this study included the Charlottesville West, Charlottesville East, and the Earlysville, Virginia quadrangles. These three maps covered the area of all study alignments. Geological formations located in the vicinity of the preliminary alignments of the Route 29 Corridor Study are shown in figures 3.1 and 3.2, illustrating major fault lines and major slopes.

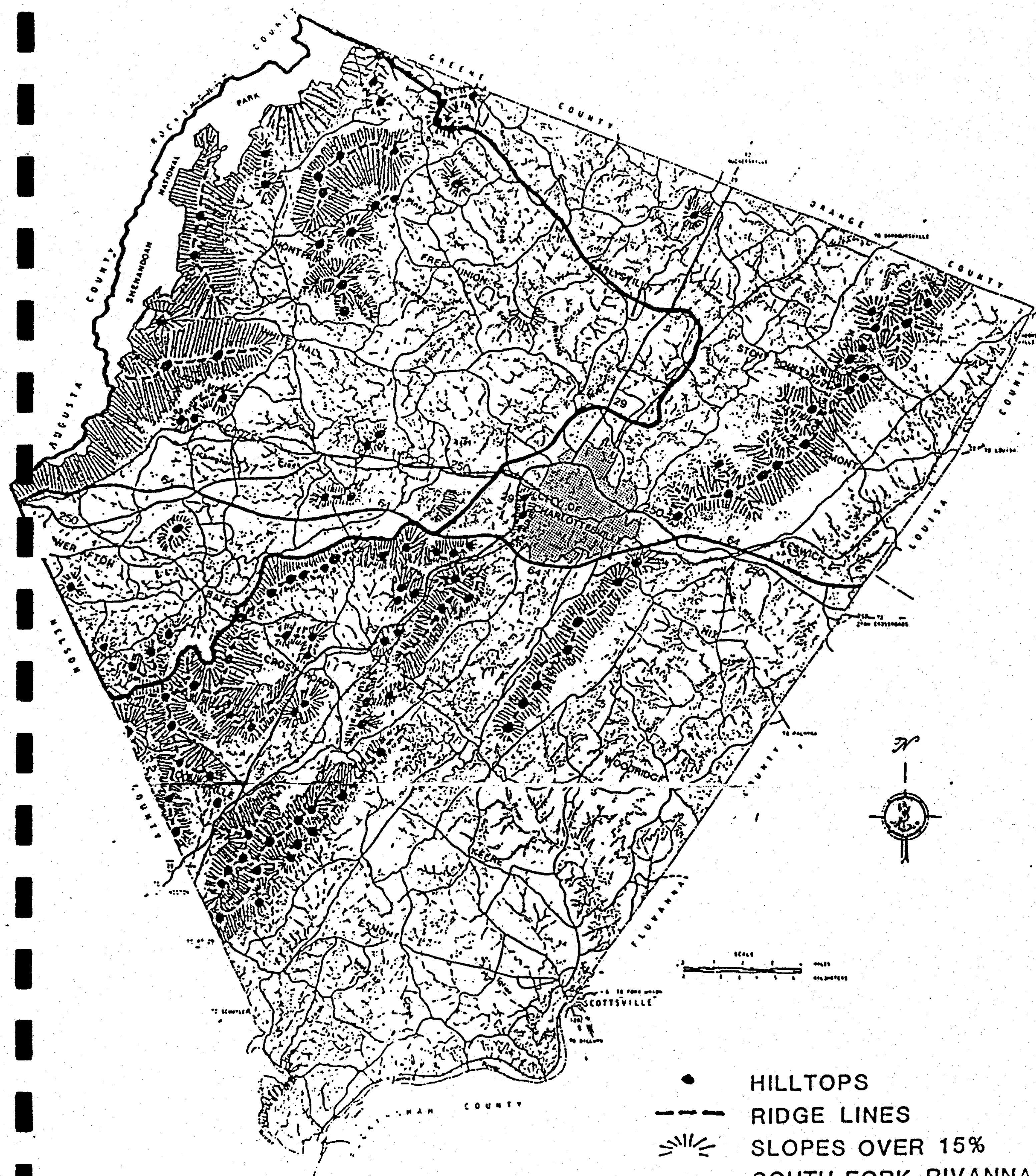
The northwest edge of the county is the location of the Blue Ridge Mountains. Pasture Fence Mountain and Bucks Elbow Mountain are part of this chain. Topography occurring from the foot of the Blue Ridge eastward to Southwest Mountain is typical of the Piedmont area which is dotted with mountains. One such group is the Ragged Mountains, south of Charlottesville, which have elevations ranging from 1200 feet to over 2400 feet and are separated by valleys having elevations from 800 feet to 500 feet. Another group is the Fox Mountains, in the northwest part of the county, with a maximum elevation of 2400 feet.



Major Fault Lines

Figure No. 3.1

FIGURE 3.2 MAJOR SLOPES



Southwestern Mountain extends in a northeast - southwest direction, with Charlottesville located on its western edge. The highest peaks on this mountain vary in elevation from over 1800 feet to 1300 feet above sea level. As the mountain extends southwestward it is locally known as Carter Mountain and Green Mountain, and has a gradual decrease in elevation.

The portion of the Piedmont plateau which lies east of Southwest Mountain has an elevation between 500 and 600 feet above sea level. The plane varies between 400 and 500 feet in elevation in the vicinity of James and Rivanna Rivers.

Albemarle County is drained by the James River and three of its major tributaries - the Rivanna River, the Rockfish River, the Hardware River and their tributaries. The headwaters of the North Anna River and the South Anna River extend into the county near Barboursville and Gordonsville, respectively. The tributaries of the James River flow in meandering, entrenched channels and have drainage patterns that are, in places, a well defined trellis pattern, and in other places a poorly defined pattern.

Historically, Albemarle County has been predominantly forested. In 1986, the USDA Forest Service still classified 58 percent or 275,629 acres of the total county acreage as timberland (capable of producing 20 cubic feet of industrial wood per acre per year). Most of the timberland is of the oak-hickory group (66%), while loblolly-shortleaf pine (20%) and oak-pine (12%) make up the major remaining groups.

The 1982 U.S. Census of Agriculture classified 201,409 acres or 43 percent of the total county acreage as "land in farms". This means that approximately 41 percent or 197,381 acres of land is cleared or relatively open. The major farming activities of Albemarle County include beef cattle production, the horse industry, hay farming and vineyards and orchards. Because the county's agricultural lands are interspersed with more natural habitats, forming a mosaic of land covers, its farms also support a variety of wildlife.

Thirteen geologic formations exist in Albemarle County. These are listed within the Precambrian, Cambrian or Precambrian, Cambrian, Ordovician, and Triassic Ages on Table 3.1. The three formations over which the preliminary alignments lay, include the Lovingston, Lynchburg and Catoctin formations. East of the Fox Mountain Dome occurs the Lovingston gneiss, known as the basement complex, overlain by the Rockfish conglomerate, the Lynchburg gneiss (restricted), the Johnson Mill graphite slate, the Charlottesville formation and the Swift Run formation which is at the base of the Catoctin greenstone. The Swift Run formation and the Catoctin greenstone are considered to be younger in age than Precambrian.

At the upper level of the Precambrian series of rocks are the Charlottesville formation, in the eastern part of the county, and the Virginia Blue Ridge formation, in the western part of the county. The rocks deposited on the Lovingston basement complex are known to be over 60,000 feet in thickness and were deposited in a Precambrian geosyncline which extended upward into Cambrian Age.

TABLE 3.1
GEOLOGIC FORMATIONS OF ALBEMARLE COUNTY

AGE	FORMATION NAME	CHARACTER
Triassic	Newark, three facies	First an eastern facies, poorly sorted red, sandy, silt-like material grading upward into second facies, a fan-glomerate composed of large rounded fragments of Catoctin, granite and quartz followed by a third facies, red, gray and green, silty sandstone and occasionally quartz pebble conglomerates.
		Diabase dikes: essentially composed of labradorite and pyroxene and characterized by ophitic texture; maximum thickness 300 feet.
		Gabbro dikes: medium grained, highly epidotized, chloritized green gabbro; maximum thickness 100 feet.
		Felsite dikes: cryptocrystalline aggregate of quartz and potassium feldspar: maximum thickness 66 feet.
Ordovician		Alaskite dikes: essentially composed of orthoclase and microcline with subordinate quartz. Few or no basic constituents.
		Amphibolite dikes: crystalloblastic rocks consisting mostly of amphibole and plagioclase.
Cambrian	Everona limestone	A thin to thick bedded blue-black limestone sandy limestone and, in places siliceous white marble.
	Erwin quartzite (Antiedam)	Massive layers of depositional quartzite separated by layers of fine grained, shaly sandstones.

TABLE 3.1
GEOLOGIC FORMATIONS OF ALBEMARLE COUNTY (continued)

AGE	FORMATION NAME	CHARACTER
Cambrian or Pre-cambrian	Loudoun formation (Unicoi-Weverton)	Upper part sandstones, shaly sandstones and pink paper bedded shales, then mica-ceous sandstone and glassy ferruginous sandstone then, at base, three greenstone lava flows separated by coarse arkosic quartzitic sandstone with a 10 foot conglomerate at base and a 175 foot acid lava flow at top.
	Catoctin formation with alaskite dikes	Originally a series of basaltic lava flows separated by layers of sediments, now a greenstone with patches of epidote.
		Greenstone feeder dike
		Sandstone lens
	Swift Run formation with amphibolite and metapyroxenite dikes	A series of detrital quartzite and tuf-faceous slates and greenstone flows at its type location.
	Mechum River formation	Composed of Swift Run formation and thinned down western edge of Charlottes-ville, Lynchburg and Rockfish formations mapped as a unit.
Precambrian	Virginia Blue Ridge complex	Includes granodiorite, hypersthene gran-odiorite and the Marshall and Crozet granites.
	Charlottesville for-mation with 6 or more metapyroxenite dikes	Primarily massive layers of quartz biotite gneiss, calcareous in places; also a few beds of sericitic and graph-itic schist.
	Johnson Mill formation	Massive graphite slate containing pyrite stringers and blobs.
	Lynchburg formation (Restricted)	Fine grained silty sediments, meta-morphosed in part, varved-like layers of graphitic and sericitic schist and thick beds of quartz biotite gneiss.

TABLE 3.1
GEOLOGIC FORMATIONS OF ALBEMARLE COUNTY (continued)

AGE	FORMATION NAME	CHARACTER
Precambrian	Rockfish conglomerate	Basal 100 foot boulder conglomerate followed by coarse metamorphosed sandstone.
	Lovingston formation with injections of igneous rock	Coarse grained quartz monzonite, variable in composition.

Source: Virginia Division of Mineral Resources, Bulletin #77, Geology and Mineral Resources of Albemarle County, Virginia

A belt of sedimentary rocks composed of the Loudoun formation and the Everona limestone, both of Cambrian age, occurs east of Southwest Mountain in a synclinal fold slightly parallel to the axis of the Southwest Mountain. The Everona limestone occupies the center of this fold.

Two Triassic basins are located in Albemarle County. The Scottsville Triassic basin, east of Green Mountain in the southern part of the county, covers much of the area between Green Mountain and Howardsville. Extending into the county's northern edge is the Culpepper Triassic basin. This basin extends less than a mile into the county.

Throughout the county are many diabase dikes of Triassic age. The general direction of these dikes is north-south. Amphibolite dikes occur near Mays Chapel, south of Charlottesville. Alaskite dikes are found near Monticello, and on Highway 20 one-half mile south of Carter Bridge. Felsite dikes occur around Charlottesville and north into Green County. Metapyroxenite dikes altered, in some locations, to serpentine and soapstone form the county's south border to the north border between Southwest Mountain and the Mechum River fault-bounded trough.

Mineral production in Albemarle County is limited to crushed stone and sand. Crushed stone of greenstone is produced near Shadwell, and crushed stone of granite gneiss is produced at Red Hill. Sand is produced by two companies at four locations on the Rivanna River. The Shadwell, Red Hill and Rivanna River locations are not impacted by the proposed alignments.

Other minerals and rocks found within Albemarle County which have been produced in the past include iron ore, slate, clay, sandstone, and limestone. Other minerals known to exist in the county, but relatively unimportant, are amethysts, asbestos, barite, copper, felsite, garnets, gold, limonite, hematite, and pyrite.

The most prominent minerals found in Albemarle County are not located within the Route 29 study area, however, data regarding these mineral resources are presented in Table 3.2. The localities are listed, followed by a listing of the minerals. For convenience, the name of the nearest town or prominent geographic feature is given in Table 3.2

Though no impact on the Route 29 study area exists, mining records were reviewed to obtain a generalized location for early mining activities in the county. Some of the recorded mining was found to have occurred as early as 1878. Table 3.3 lists the location of mining activities and the mining product.

There are relatively few geologic hazards in the project area. As shown in Figure 3.1 the proposed alignments cross three major fault lines. The major zones of faulting are traversed by the proposed alignments 11 and 12. Several existing secondary highways such as 743, 606, 676, 805, as well as Route 29 also traverse one or more of the three major fault lines.

TABLE 3.2 MINERAL RESOURCES IN ALBEMARLE COUNTY

Locality	Minerals
Alberene soapstone quarry - Alberene	Actinolite-tremolite, apatite, ferroan dolomite, erythrite, galena, ilmenite, magnetite, talc
Brian Fork - near Schuyler (excavation on Route 6)	Geothite pseudomorphs after pyrite
Esmont slate quarry - Esmont	Dolomite, linonite pseudomorphs after pyrite, siderite
Faber lead mine - near Faber	Cerussite, chalcopyrite, fluorite, argentiferous galena, sphalerite, pyromorphite
Martin Marietta quarry - near Charlottesville	Epidote, muscovite crystals, pyrite, quartz
Old Dominion soapstone quarry - near Old Dominion	Actinolite-tremolite, apatite, chalcopyrite, chlorite, cobaltite, dolomite, erythrite, galena, ilmenite, magnesite, magnetite, pyrite, talc
Stony Point Mine - near Charlottesville	Chalcopyrite, cuprite, geothite, malachite, siderite

TABLE 3.3 MINING ACTIVITES IN ALBEMARLE COUNTY

Mineral	Location
Soapstone	West of Green Mountain to Nelson County; and North Gardens area
Pyrite	Stony Point, 6 miles NE of Charlottesville at the NW base of Southwest Mountain
Copper	West foot slopes of Southwest Mountain
Lead & Zinc	2 miles NE of Faber
Slate	Esmont, Keswick, and Buck Island Creek areas

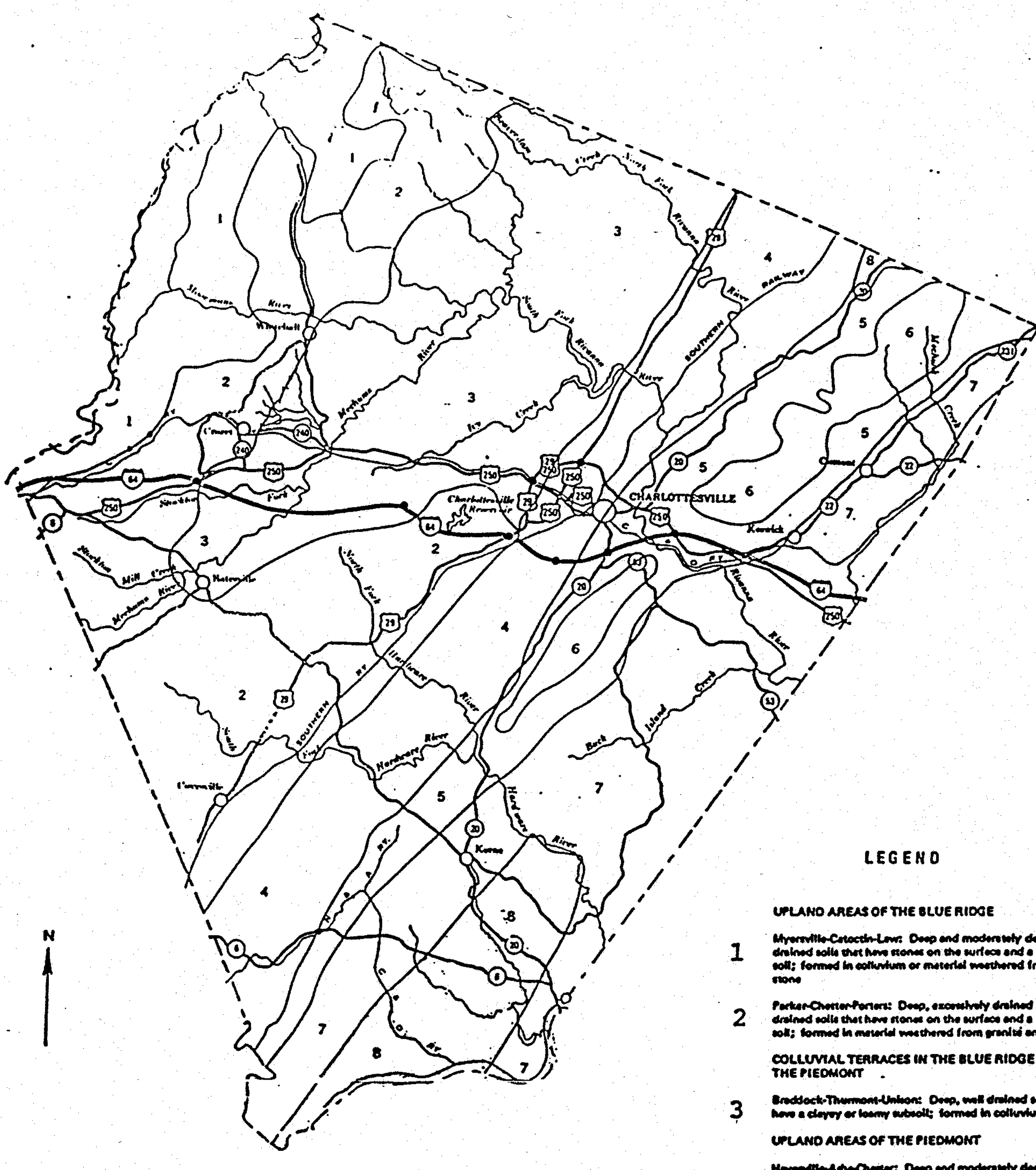
3.1.1.2 Soils

The general soil descriptions of Albemarle County are categorized into eight broad areas that have a distinctive pattern of soils, relief, and drainage (Figure 3.3). Each of these eight areas consists of one or more major soils and some minor soils. The areas are named for the major soils located within their borders. The general soil areas can be used to compare the suitability of large areas for general land use. The eight general soil area designations, however, are not suitable for planning the management of a farm nor for selecting a site for a road. The soils in any one area differ from place to place in drainage, depth, slope, and other characteristics that affect management. A detailed description of soils is provided in later text listing general facts, principle hazards and limitations.

The three general areas through which the preliminary alignments pass are the Braddock-Thurmont-Unison soils, the Hayesville-Ashe-Chester soils, and the Elioak-Hazel-Glenelg soils (Figure 3.4).

The Braddock-Thurmont-Unison soils are deep, well drained soils that have a clayey or loamy subsoil and are formed in colluvium material derived mainly from granite and greenstone that has washed out of the Blue Ridge. Some of the soils have rock fragments on the surface. Most of the soils are on gently sloping broad ridgetops and strongly sloping to moderately steep slopes. This area contains approximately 32 percent Braddock soils, 18 percent Thurmont soils, and 8 percent Unison soils. Soils of minor extent make up about 42 percent. The Braddock soils have a brown loam surface layer and a red clay subsoil. The surface layer is very stony in areas. The Thurmont soils have a brown loam surface layer and a yellow red clay loam subsoil. The surface layer is very stony in some areas. The Unison soils have a dark brown silt loam surface layer and a reddish brown clay with silty clay loam subsoil. The surface layer is very stony in places. About three-fourths of the Braddock-Thurmont-Unison acreage is used for cultivated crops, hay, and pasture, while the remainder is wood land and urban land.

The Hayesville-Ashe-Chester soils are well drained, deep and moderately deep soils that have a clayey or loamy subsoil. The area is formed in material weathered from granite and gneiss. It consists of deeply dissected, broad ridgetops and side slopes on uplands. The ridgetops are gently sloping and strongly sloping with the side slopes being moderately steep to steep. This area contains approximately 52 percent Hayesville soils, 23 percent Ashe soils and 14 percent Chester soils. Soils of minor extent make up about 11 percent. The Hayesville soils are mainly on broad ridgetops and side slopes and are deep and well drained. These have a strong brown loam surface layer and a red clay subsoil. The Ashe soils are mostly on side slopes and narrow ridgetops and are moderately deep and somewhat excessively drained. They have a dark brown loam surface layer and a strong brown loam subsoil. The Chester soils are on broad to narrow ridgetops and side slopes and are deep and well drained. They have a dark brown loam surface layer and a yellowish red clay loam subsoil.



GENERAL SOIL MAP
ALBEMARLE COUNTY, VIRGINIA

0 4 Miles

LEGEND

UPLAND AREAS OF THE BLUE RIDGE

1 **Myersville-Catoctin-Lew:** Deep and moderately deep, well drained soils that have stones on the surface and a loamy subsoil; formed in colluvium or material weathered from greenstone

2 **Parker-Chester-Porters:** Deep, excessively drained and well drained soils that have stones on the surface and a loamy subsoil; formed in material weathered from granite and gneiss

COLLUVIAL TERRACES IN THE BLUE RIDGE AND ON THE PIEDMONT

3 **Braddock-Thurmont-Unison:** Deep, well drained soils that have a clayey or loamy subsoil; formed in colluvium

UPLAND AREAS OF THE PIEDMONT

4 **Hayesville-Ashe-Chester:** Deep and moderately deep, well drained and somewhat excessively drained soils that have a clayey or loamy subsoil; formed in material weathered from granite and gneiss

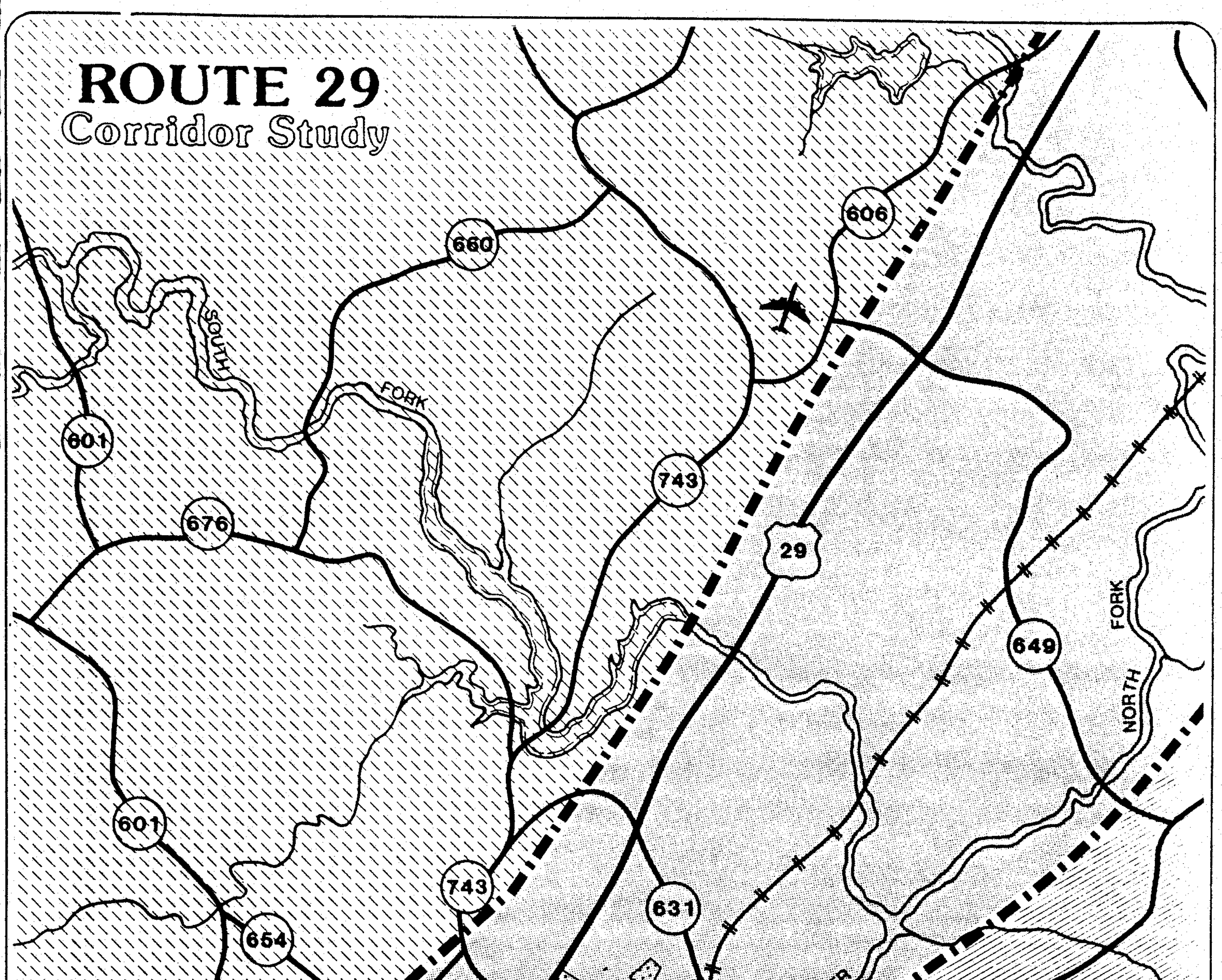
5 **Elioak-Hazel-Glenelg:** Deep and moderately deep, well drained and excessively drained soils that have a clayey or loamy subsoil; formed in material weathered from quartz mica schist

6 **Rabun-Myersville-Catoctin:** Deep and moderately deep, well drained soils that have a clayey or loamy subsoil; formed in material weathered from greenstone

7 **Manteo-Nason-Tatum:** Shallow and deep, somewhat excessively drained and well drained soils that have a loamy or clayey subsoil; formed in material weathered from sericite schist

8 **Totier-Klinesville-Rapidan:** Deep and shallow, well drained soils that have a clayey or loamy subsoil; formed in material weathered from red shale and conglomerate

Figure 3.3



BRADDOCK-THURMONT-UNLSON
HAYESVILLE-ASHE-CHESTER
ELLOAK-HAZEL-GLENELG
RAYBUN-MYERSVILLE-CATOCTIN

General Soils Map

Figure No. 3.4

About half of the Hayesville-Ashe-Chester soils area has been cleared, and is used for cropland and pasture. The remainder of the area is woodland and urban land. The hazard of erosion in this area is the major concern of the Route 29 Corridor Study.

The Elioak-Hazel-Glenelg soils are deep to moderately deep with well drained and excessively drained soils that have a clayey or loamy subsoil. This area is formed in material weathered from quartz mica schist, and has gently sloping and strongly sloping, narrow ridgetops and side slopes. Areas adjacent to streams are moderately steep to steep. This area contains about 22 percent Elioak soils, 18 percent Hazel soils, and 15 percent Glenelg soils. Soils of minor extent make up about 45 percent. The Elioak soils are deep, well drained, and gently sloping to moderately steep. They are on the highest positions on narrow ridgetops, and have a dark brown loam surface layer and a red silty clay subsoil. The Hazel soils are moderately deep, excessively drained, and strongly sloping to steep, and located on slopes leading down to drainage ways. They have a brown loam surface layer and a brown loam subsoil. The Glenelg soils are deep, well drained, and gently sloping to steep, and are located on narrow ridgetops and side slopes. They have a dark yellowish brown loam surface layer and yellowish red silty clay loam subsoil.

About one-fourth of the Elioak-Hazel-Glenelg soils area has been cleared, and is used for cropland and pasture. Most of the remaining area is woodland and a small portion is urban land. Soils along the proposed alignments are shown in the soil survey maps provided by the Soil Conservation Service in Figures 3.5 through 3.11. Soils considered to be a severe erosion hazard are highlighted on these figures, and the acreage impacted along each study alignment listed in Table 3.4. These areas would require special equipment and methods to prevent excessive loss of soil during construction activities. Table 3.5, Erosion Factor K, addressed the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of the six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand and organic matter (up to 4 percent) and on soil structure and permeability. Vales of K range from 0.05 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion. The highest K-factor values found within the proposed alignments were 0.49 and 0.43.

A list of soils found along the study alignments is shown in Table 3.6. Prime farmland soils are listed in Table 3.7, while Tables 3.8 and 3.9 list physical, chemical, and engineering index properties of the soils found on the soil survey maps. The data relating soil properties were collected during the course of the soil survey, and are provided in the soil survey of Albemarle County (U.S. Department of Agriculture, 1985). This data may be needed to determine suitability of materials and the methods required for road construction.

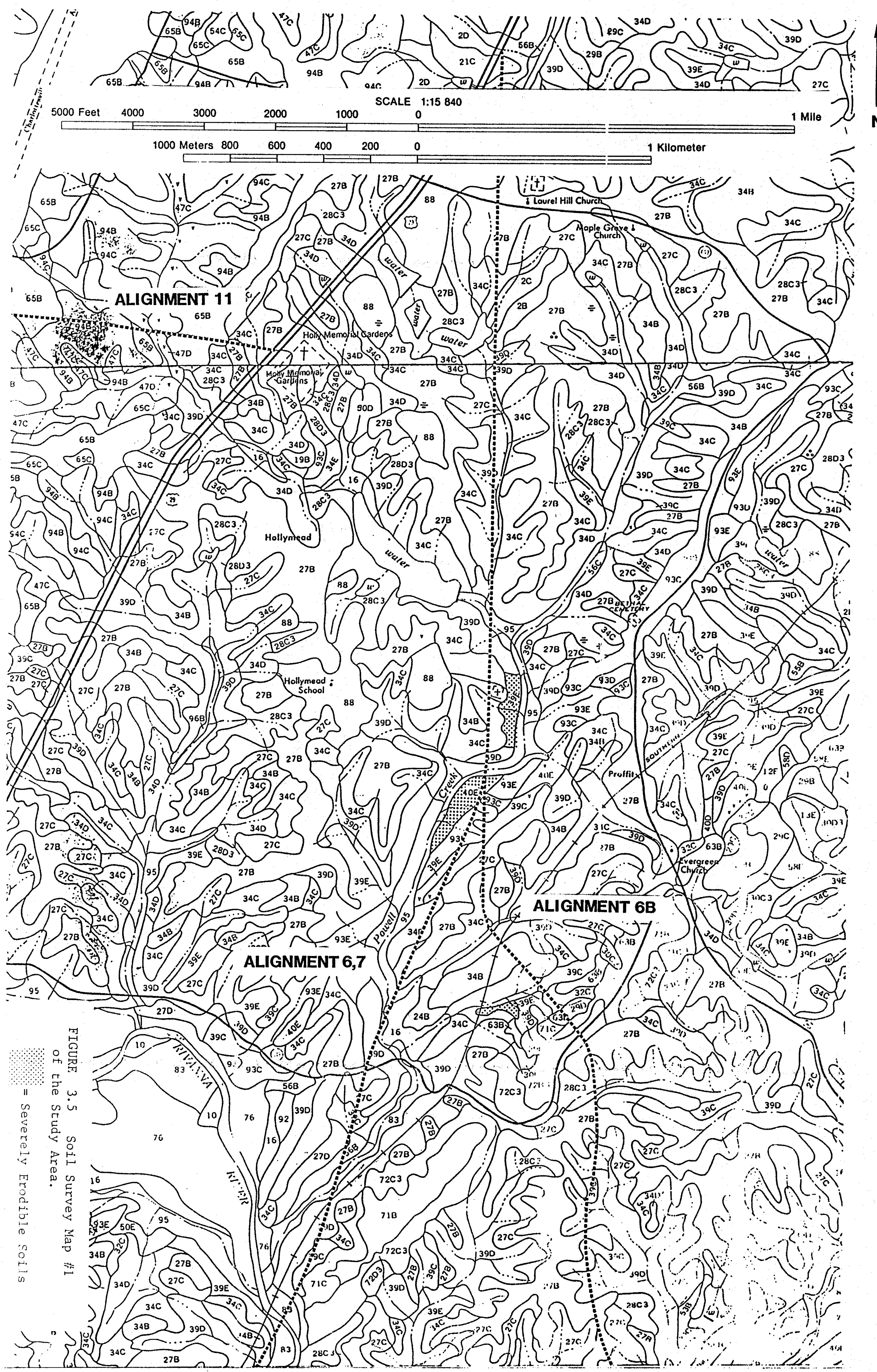


FIGURE 3.5 Soil Survey Map #1 of the Study Area.

= Severely Erodible Soils

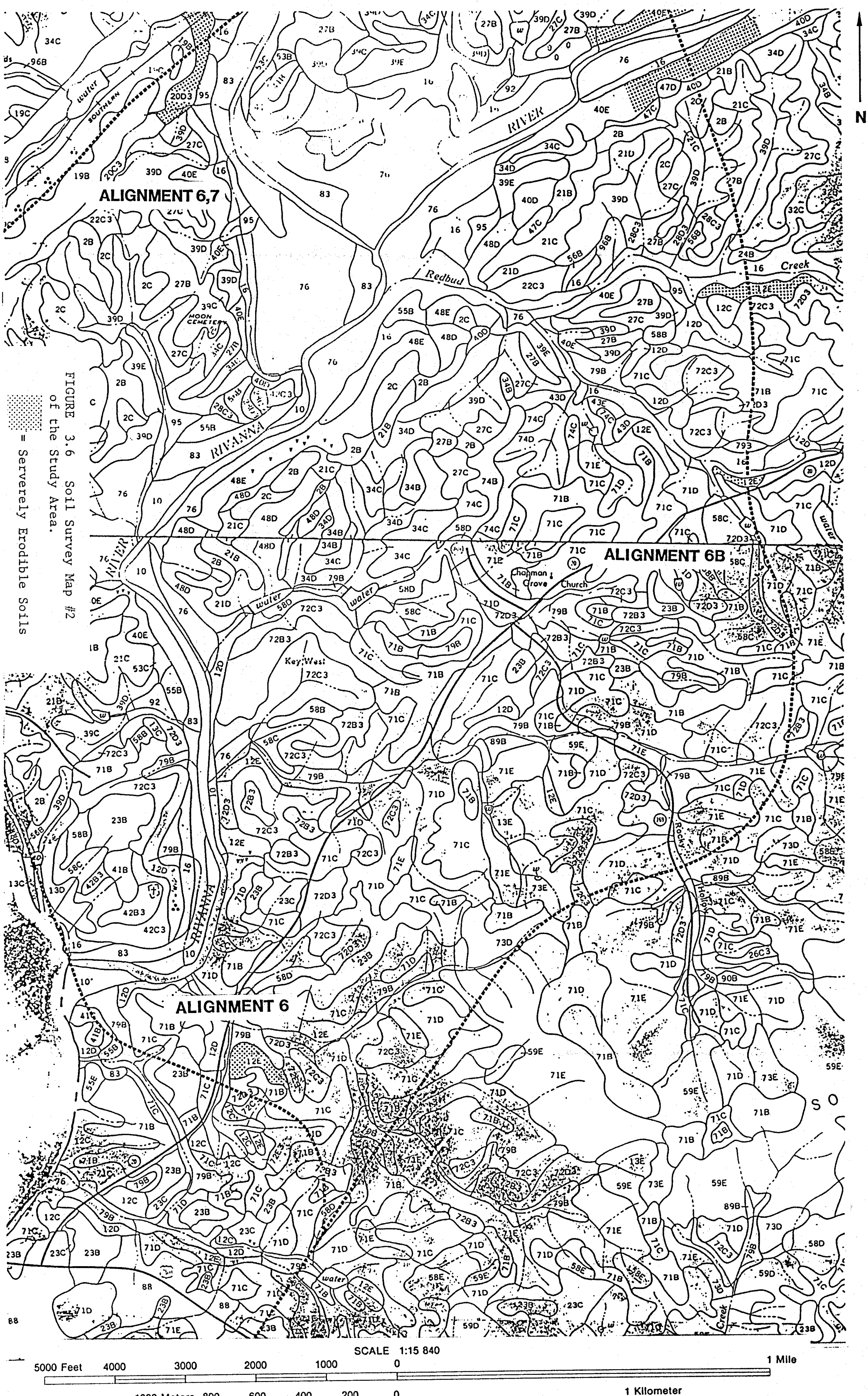


FIGURE 3.6 Soil Survey Map #2 of the Study Area.

= Serverely Erodible Soils

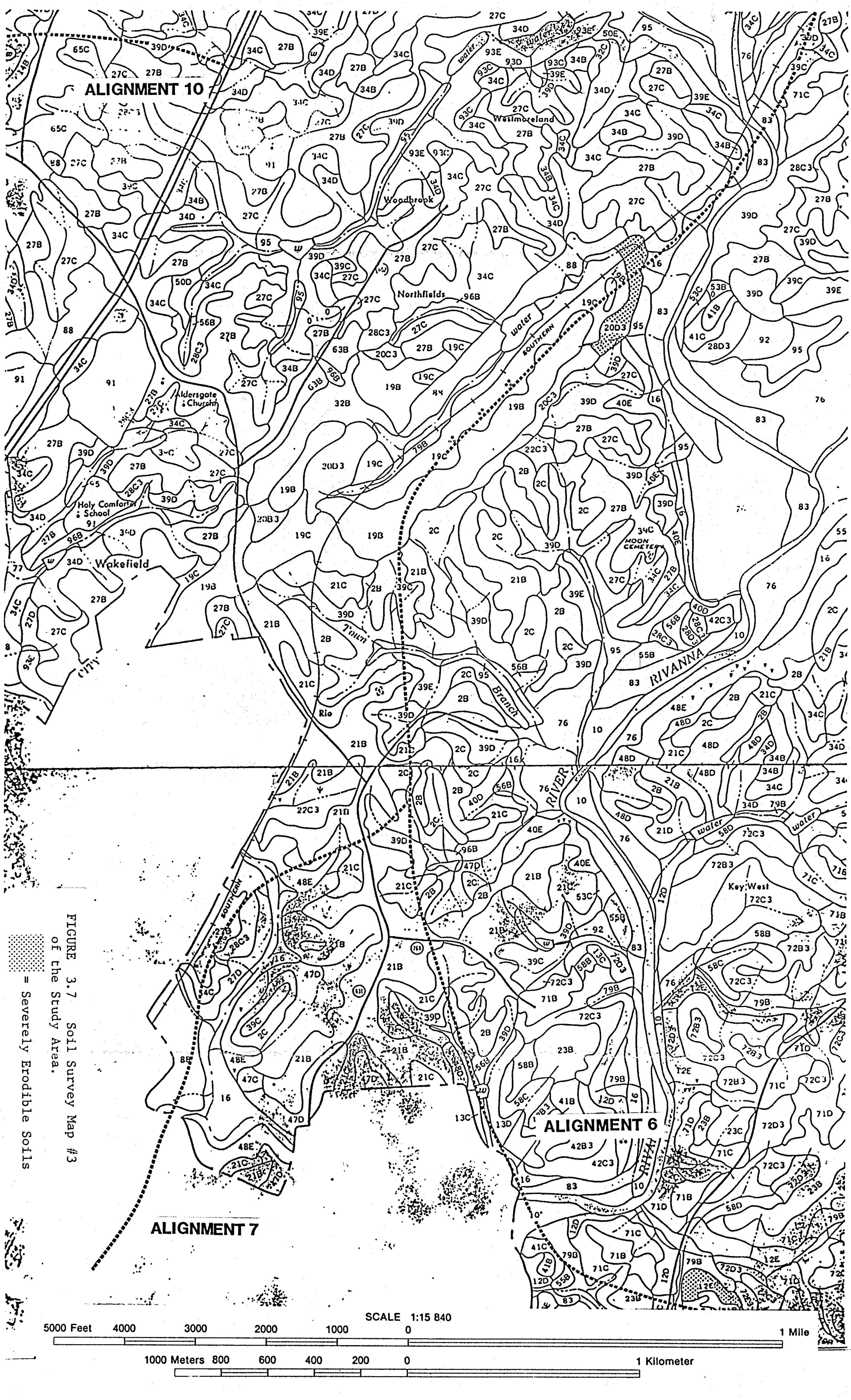


FIGURE 3.7 Soil Survey Map #3 of the Study Area.

= Severely Erodible Soils

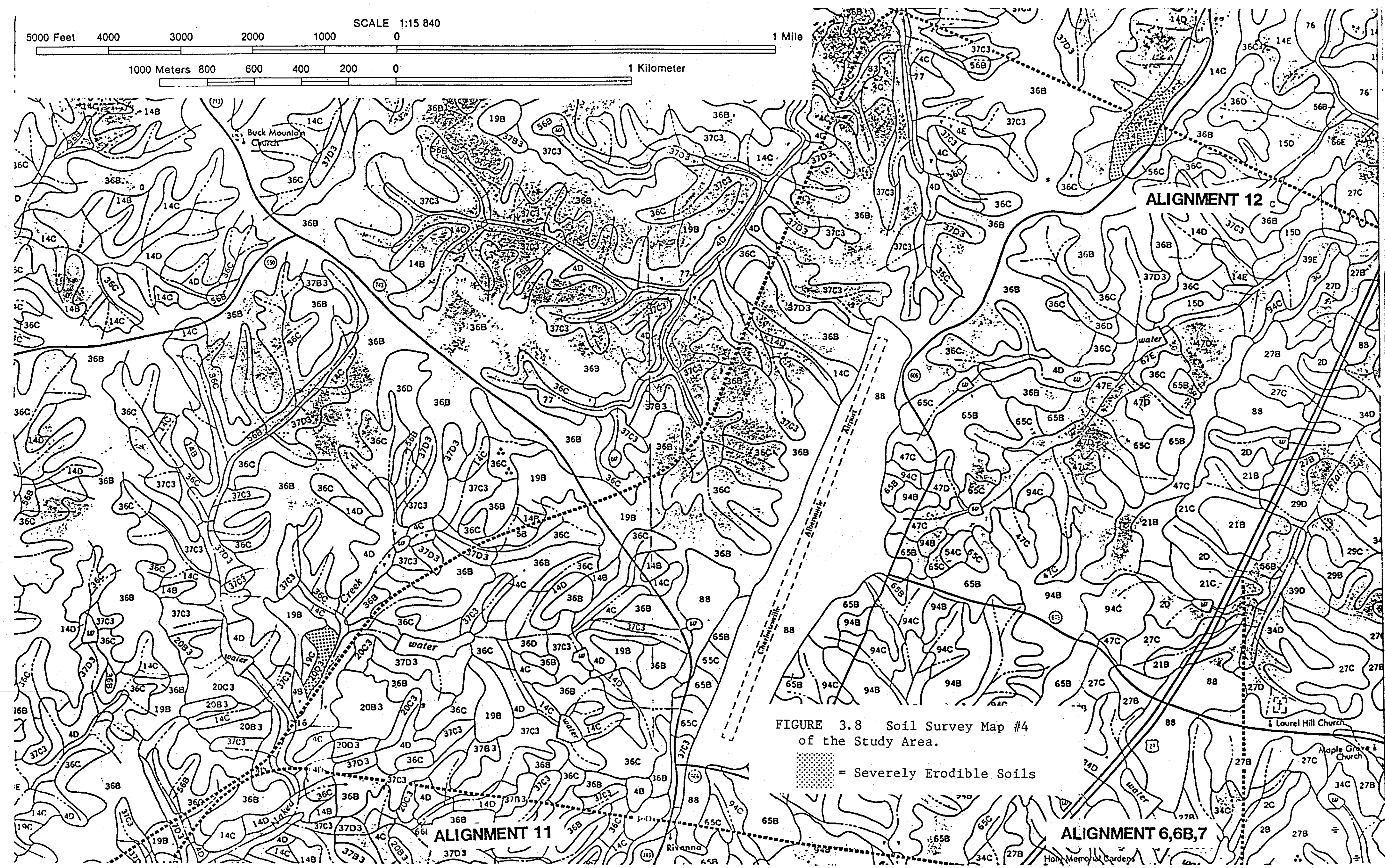


FIGURE 3.8 Soil Survey Map #4 of the Study Area.

= Severely Erodible Soils

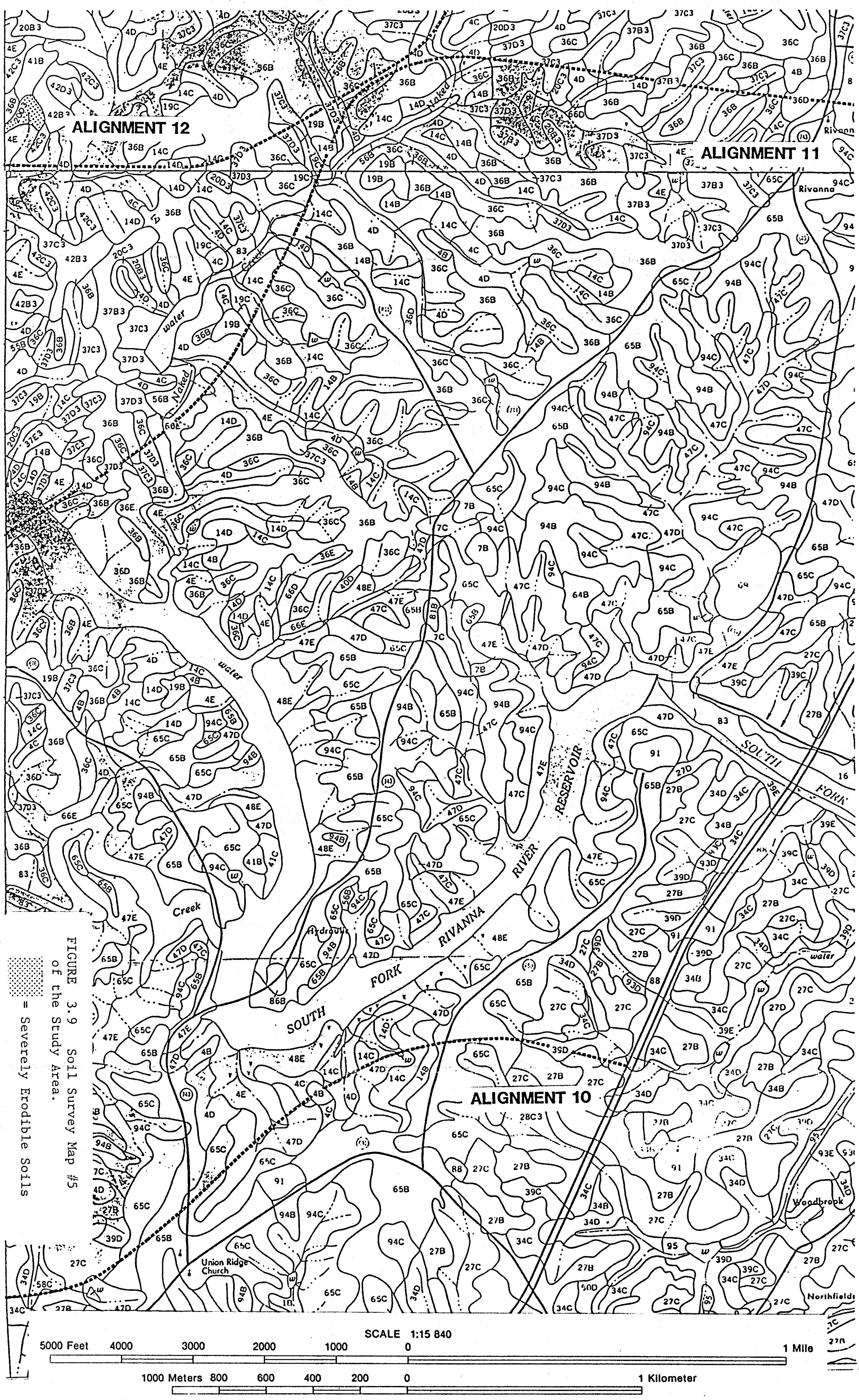


FIGURE 3.9 Soil Survey Map #5 of the Study Area.

= Severely Erodible Soils

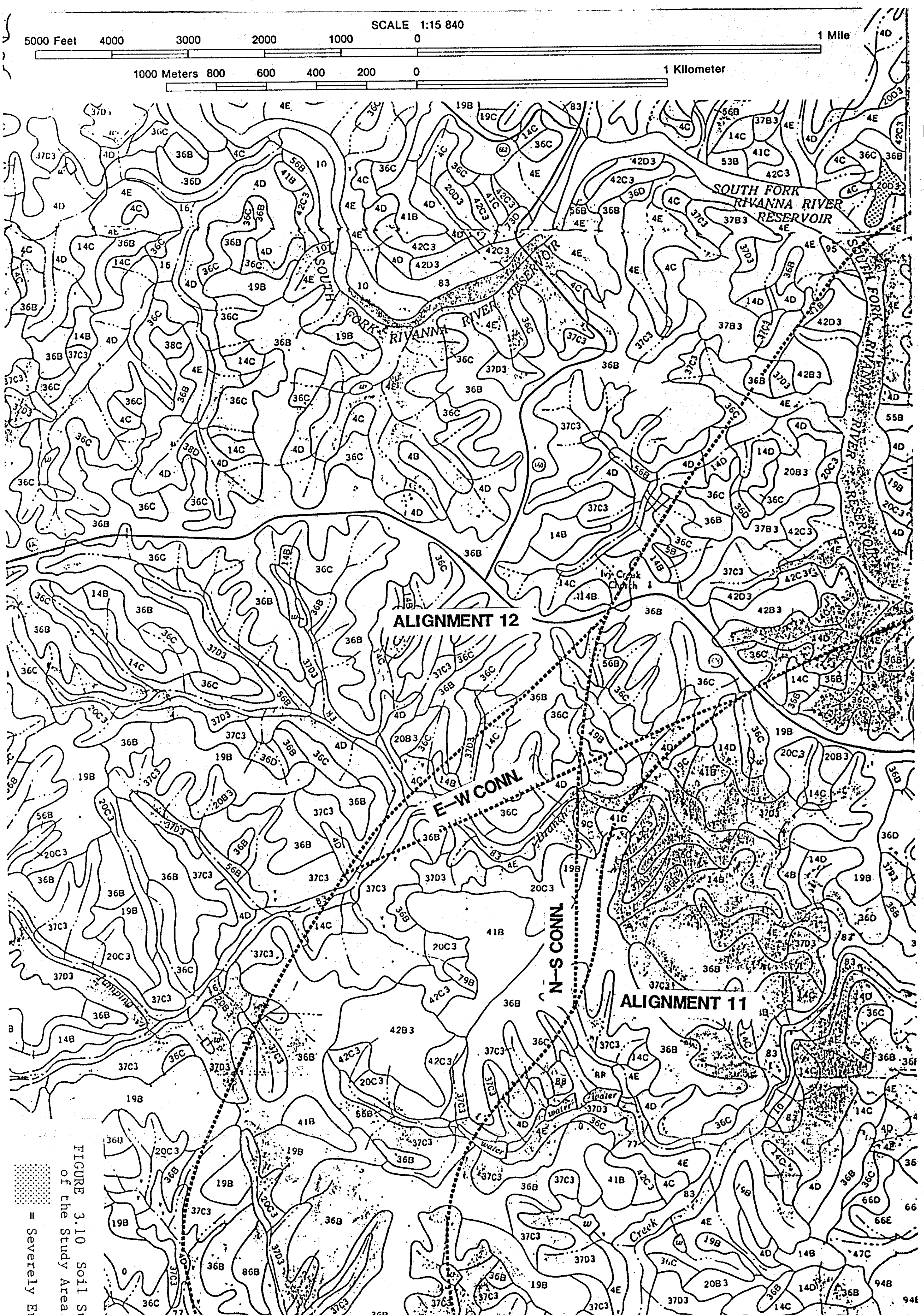


FIGURE 3.10 Soil Survey Map #6 of the Study Area.

= Severely Erodible Soils

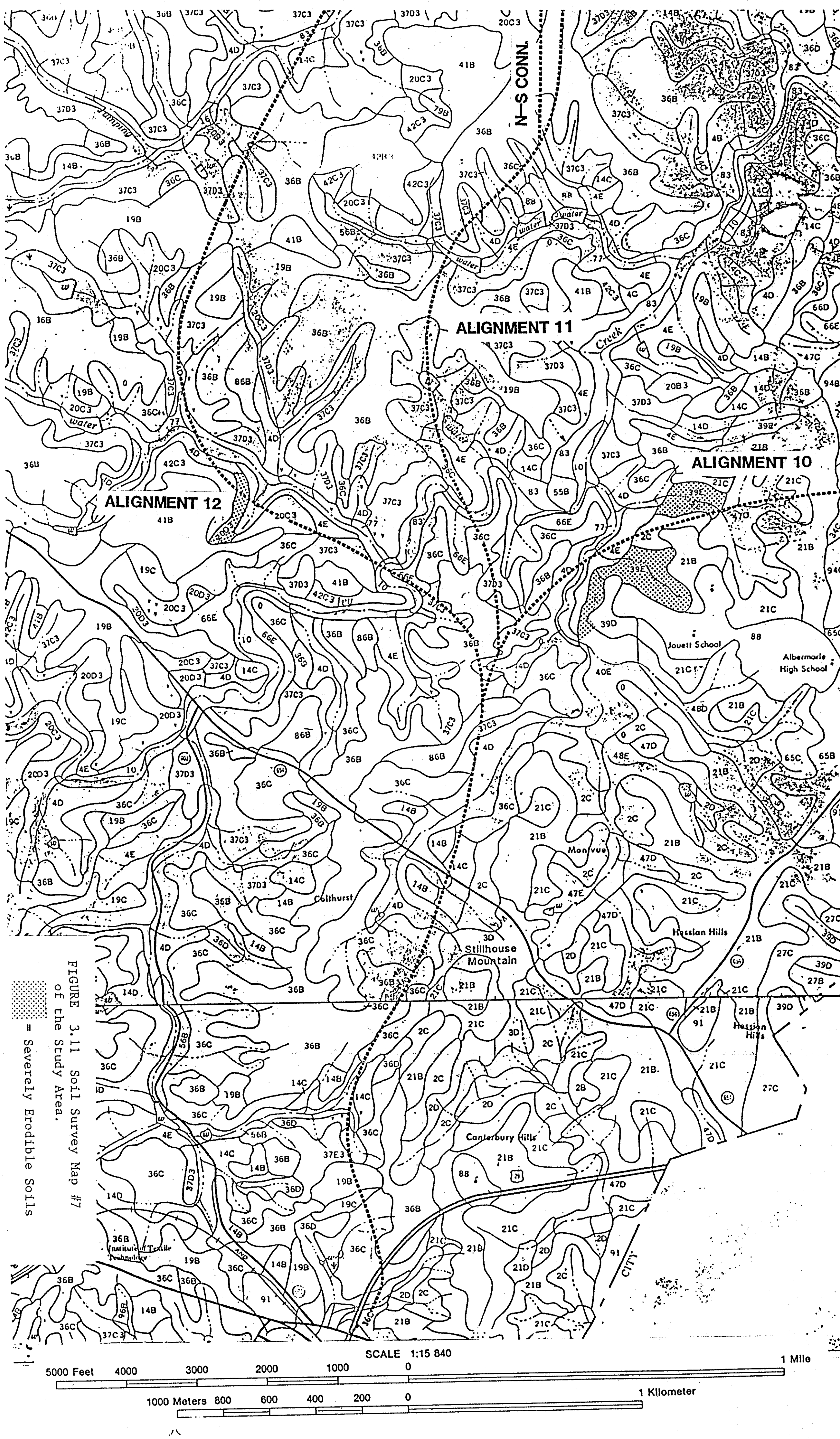


FIGURE 3.11 Soil Survey Map #7 of the Study Area.

= Severely Erodible Soils

TABLE 3.4
SEVERE EROSION HAZARD ACREAGE ALONG PROPOSED ALIGNMENTS

ALIGNMENT	SEVERE EROSION HAZARD ACREAGE
6	3.95
6B	8.32
7	3.43
8,9	1.04
10	2.70
11	0.0
12	5.86
11N-12S	1.27
12N-11S	4.50

TABLE 3.5
EROSION FACTOR K

Map Symbol/Soil Name	Depth (in.)	Erosion Factor K
2B, 2C, 2D	0-5	0.37
Albemarle	5-30	0.37
	30-38	0.28
4B, 4C, 4D, 4E	0-10	0.24
Ashe	10-19	0.17
	19-24	0.17
5B	0-12	0.37
Belvoir	12-19	0.37
	19-28	0.28
10	0-10	0.10
Buncombe	10-60	0.10
12D, 12E, 13C	0-5	0.32
Catoctin	5-18	0.24
	18-28	0.24
14B, 14C, 14D, 14E	0-7	0.32
Chester	7-41	0.43
	41-60	0.49
15D	0-7	0.32
Chester	7-41	0.43
	41-60	0.49
16	0-8	0.28
Chewacla	8-60	0.32
19B, 19C	0-8	0.37
Cullen	8-60	0.24
	60-67	0.24
20C3	0-8	0.37
Cullen	8-60	0.24
	60-67	0.24
21B, 21C	0-8	0.37
Culpeper	8-30	0.28
	30-37	0.17

TABLE 3.5
EROSION FACTOR K
(continued)

Map Symbol/Soil Name	Depth (in.)	Erosion Factor K
23B Davidson	0-4 4-10 10-63	0.28 0.32 0.24
24B Dogue	0-10 10-70	0.37 0.28
27B, 27C, 27D 28C3 Elioak	0-8 8-39 39-72	0.32 0.28 0.49
29D, 30C3 Fauguier	0-6 6-34	0.32 0.28
32C Fluvanna	0-8 8-48 48-60	0.37 0.28 0.28
34B, 34C, 34D Glenelg	0-8 8-28 28-80	0.37 0.43 0.49
36B, 36C, 36D, 37B3, 37C3, 37D3, 37E3 Hayesville	0-7 7-58 58-83	0.20 0.24 0.20
39C, 39D, 39E Hazel	0-10 10-20 20-30	0.32 0.24 0.24
40D, 40E Hazel	0-10 10-20 20-30	0.24 0.24 0.24
41B, 41C, 42B3 42C3 Hiwassee	0-8 8-64	0.28 0.28
47D Louisburg	0-5 5-60	0.24 0.24

TABLE 3.5
EROSION FACTOR K
(continued)

Map Symbol/Soil Name	Depth (in.)	Erosion Factor K
48D, 48E	0-5	0.10
Louisburg	5-60	0.24
55B	0-7	0.37
McQueen	7-42	0.37
	42-52	0.37
	52-64	0.32
56B	0-14	0.37
Meadowville	14-46	0.28
	46-73	0.28
58C, 58D	0-7	0.37
Myersville	7-28	0.32
	28-44	0.32
63B	0-9	0.49
Orange	9-33	0.28
	33-60	0.28
65B, 65C	0-6	0.20
Pacolet	6-32	0.28
	32-60	0.28
66E	0-14	0.17
Parker	14-38	0.20
	38-67	0.20
71B, 71C, 71D	0-6	0.32
71E	6-48	0.28
Rabun	48-63	0.28
72B3, 72C3, 72D3	0-4	0.32
Rabun	4-48	0.28
	48-63	0.28
73D, 73E	0-6	0.20
Rabun	6-48	0.28
	48-63	0.28
76	0-12	0.32
Riverview	12-35	0.24
	35-60	0.17

TABLE 3.5
EROSION FACTOR K
(continued)

Map Symbol/Soil Name	Depth (in.)	Erosion Factor K
77 Riverview	0-12	0.32
	12-35	0.24
	35-60	0.17
79B Starr	0-18	0.28
	18-68	0.28
83 Toccoa	0-9	0.24
	9-66	0.10
86B Turbeville	0-12	0.32
	12-75	0.24
88 Udorthents	---	---
91 Urban land	---	---
93C, 93E Watt	0-10	0.32
	10-18	0.24
	18-28	0.20
94B, 94C Wedowee	0-7	0.24
	7-11	0.28
	11-30	0.28
95 Wehadkee	0-10	0.32
	10-52	0.32
96B Worsham	0-9	0.37
	9-54	0.28
	54-60	0.28

TABLE 3.6
COMPOSITE LIST OF SOILS ALONG PROJECT ALTERNATIVES

NAME	MAP SYMBOL	SLOPE (%)	SURFACE SOIL	SUBSOIL	DRAINAGE	*FACTORS AFFECTING HIGHWAY LOCATION
Albemarle Fine Sandy Loam	2B	2-7	Fine Sand Loam	Clay Loam	Well Drained	Moderate: low strength, frost action
Albemarle Fine Sandy Loam	2C	7-15	Fine Sandy Loam	Clay Loam	Well Drained	Moderate: low strength, slope, frost action
Albemarle Fine Sandy Loam	2D	15-25	Fine Sandy Loam	Clay Loam	Well Drained	Severe: slope
Ashe Loam	4B	2-7	Loam	Loam	Somewhat Exces-sively Drained	Moderate: depth to rock, slope
Ashe Loam	4C	7-15	Loam	Loam	Somewhat Exces-sively Drained	Moderate: depth to rock, slope
Ashe Loam	4D	15-25	Loam	Loam	Somewhat Exces-sively Drained	Severe: slope
Ashe Loam	4E	25-45	Loam	Loam	Somewhat Exces-sively Drained	Severe: slope
Belvoir Loam	5B	2-7	Loam	Loam-Clay Loam	Somewhat Poorly Drained	Severe: wetness
Buncombe Loamy Sand	10	0-2	Loamy Sand	Not Classified	Exces-sively Drained	Severe: flooding

TABLE 3.6
COMPOSITE LIST OF SOILS ALONG PROJECT ALTERNATIVES
(continued)

NAME	MAP SYMBOL	SLOPE (%)	SURFACE SOIL	SUBSOIL	DRAINAGE	*FACTORS AFFECTING HIGHWAY LOCATION
Catoctin Silt Loam	12D	15-25	Silt Loam	Silt Loam-Silty Clay Loam	Well Drained	Severe: slope
Catoctin Silt Loam	12E	25-45	Silt Loam	Silt Loam-Silty Clay Loam	Well Drained	Severe: slope
Catoctin Very Stony Silt Loam	13C	7-15	Silt Loam	Silt Loam-Silty Clay Loam	Well Drained	Moderate: depth to rock, slope, large stones
Chester Loam	14B	2-7	Loam	Clay Loam	Well Drained	Moderate: frost action
Chester Loam	14C	7-15	Loam	Loam-Clay Loam	Well Drained	Moderate: slope, frost action
Chester Loam	14D	15-25	Loam	Loam-Clay Loam	Well Drained	Severe: slope
Chester Loam	14E	25-45	Loam	Loam-Clay Loam	Well Drained	Severe: slope
Chester Very Stony Loam	15D	7-15	Loam	Loam-Clay Loam	Well Drained	Severe: low strength, slope
Chewacla Silt Loam	16	0-2	Loam	Silt Loam-Silty Clay Loam	Somewhat Poorly Drained	Severe: low strength, wetness, flooding
Cullen Loam	19B	2-7	Loam	Clay-Clay Loam	Well Drained	Severe: low strength
Cullen Loam	19C	7-15	Loam	Clay-Clay Loam	Well Drained	Severe: low strength

TABLE 3.6
COMPOSITE LIST OF SOILS ALONG PROJECT ALTERNATIVES
(continued)

NAME	MAP SYMBOL	SLOPE (%)	SURFACE SOIL	SUBSOIL	DRAINAGE	*FACTORS AFFECTING HIGHWAY LOCATION
Cullen Clay Loam	20C3	7-15	Clay Loam	Clay Loam-Clay	Well Drained	Severe: low strength
Culpeper Fine Sandy Loam	21B	2-7	Fine Sandy Loam	Clay Loam-Clay-Sandy Clay Loam	Well Drained	Severe: low strength
Culpeper Fine Sandy Loam	21C	7-15	Fine Sandy Loam	Clay Loam-Clay-Sandy Clay Loam	Well Drained	Severe: low strength
Davidson Clay Loam	23B	2-7	Clay Loam	Clay	Well Drained	Severe: low strength
Dogue Silt Loam	24B	2-7	Silt Loam	Clay-Clay Loam	Moderately Well Drained	Severe: low strength
Elioak Loam	27B	2-7	Loam	Silty Clay Loam-Silty Clay	Well Drained	Severe: low strength
Elioak Loam	27C	7-15	Loam	Silty Clay Loam-Silty Clay	Well Drained	Severe: low strength
Elioak Loam	27D	15-25	Loam	Silty Clay Loam-Silty Clay	Well Drained	Severe: low strength, slope
Elioak Clay Loam	28C3	7-15	Loam	Silty Clay-Silty Clay Loam	Well Drained	Severe: low strength
Fauquier Silt Loam	29D	15-25	Silt Loam	Clay-Silty Clay	Well Drained	Severe: slope, low strength
Fauquier Silty Clay Loam	30C3	7-15	Silty Clay Loam	Clay-Silty Clay	Well Drained	Severe: low strength

TABLE 3.6
COMPOSITE LIST OF SOILS ALONG PROJECT ALTERNATIVES
(continued)

NAME	MAP SYMBOL	SLOPE (%)	SURFACE SOIL	SUBSOIL	DRAINAGE	*FACTORS AFFECTING HIGHWAY LOCATION
Fluvanna Silt Loam	32C	7-15	Silt Loam	Clay-Silty Clay	Well Drained	Severe: low strength
Glenelg Loam	34B	2-7	Loam	Silty Clay Loam	Well Drained	Moderate: frost action
Glenelg Loam	34C	7-15	Loam	Silty Clay Loam	Well Drained	Severe: low strength
Glenelg Loam	34D	15-25	Loam	Silty Clay Loam	Well Drained	Severe: slope
Hayesville Loam	36B	2-7	Loam	Clay-Clay Loam	Well Drained	Slight
Hayesville Loam	36C	7-15	Loam	Clay-Clay Loam	Well Drained	Moderate: slope
Hayesville Loam	36D	15-25	Loam	Clay-Clay Loam	Well Drained	Severe: slope
Hayesville Clay Loam	37B3	2-7	Clay Loam	Clay-Clay Loam	Well Drained	Slight
Hayesville Clay Loam	37C3	7-15	Clay Loam	Clay-Clay Loam	Well Drained	Moderate: slope
Hayesville Clay Loam	37D3	15-25	Clay Loam	Clay-Clay Loam	Well Drained	Severe: slope
Hayesville Clay Loam	37E3	25-45	Clay Loam	Clay-Clay Loam	Well Drained	Severe: slope
Hazel Loam	39C	7-15	Loam	Loam	Exces-sively Drained	Moderate: depth to rock, slope, frost action
Hazel Loam	39D	15-25	Loam	Loam	Exces-sively Drained	Severe: slope

TABLE 3.6
COMPOSITE LIST OF SOILS ALONG PROJECT ALTERNATIVES
(continued)

NAME	MAP SYMBOL	SLOPE (%)	SURFACE SOIL	SUBSOIL	DRAINAGE	*FACTORS AFFECTING HIGHWAY LOCATION
McQueen Loam	55B	2-7	Loam	Clay-Clay Loam	Well Drained	Severe: low strength
Meadowville Loam	56C	7-15	Loam	Loam-Clay Loam	Well to Moderately Well Drained	Severe: low strength
Myersville Silt Loam	58C	7-15	Silt Loam	Silty Clay Loam-Silt Loam	Well Drained	Severe: low strength
Myersville Silt Loam	58D	15-25	Silt Loam	Silty Clay Loam-Silt Loam	Well Drained	Severe: low strength, slope
Orange Silt Loam	63B	2-7	Silt Loam	Silty Clay-Clay	Somewhat Poorly to Mod. Well Drained	Severe: low strength, shrink-swell
Pacolet Sandy Loam	65B	2-7	Sandy Loam	Clay Loam-Clay	Well Drained	Severe: low strength
Pacolet Sandy Loam	65C	7-15	Sandy Loam	Clay Loam-Clay	Well Drained	Severe: low strength
Parker Very Stony Loam	66E	25-45	Stony Loam	Cobbly Loam	Exces-sively Drained	Severe: slope
Rabun Clay Loam	71B	2-7	Clay Loam	Clay	Well Drained	Moderate: low strength
Rabun Clay Loam	71C	7-15	Clay Loam	Clay	Well Drained	Moderate: low strength, slope
Rabun Clay Loam	71D	15-25	Clay Loam	Clay	Well Drained	Severe: slope
Rabun Clay Loam	71E	25-45	Clay Loam	Clay	Well Drained	Severe: slope

TABLE 3.6
COMPOSITE LIST OF SOILS ALONG PROJECT ALTERNATIVES
(continued)

NAME	MAP SYMBOL	SLOPE (%)	SURFACE SOIL	SUBSOIL	DRAINAGE	*FACTORS AFFECTING HIGHWAY LOCATION
Rabun Clay	72B3	2-7	Clay	Clay	Well Drained	Moderate low strength
Rabun Clay	72C3	7-15	Clay	Clay	Well Drained	Moderate: low strength, slope
Rabun Clay	72D3	15-25	Clay	Clay	Well Drained	Severe: slope
Rabun Very Stony Clay Loam	73D	15-25	Clay Loam	Clay	Well Drained	Severe: slope
Rabun Very Stony Clay Loam	73E	15-45	Clay Loam	Clay	Well Drained	Severe: slope
Riverview Loam	76	nearly level	Loam	Silt Loam-Loam	Well Drained	Severe: flooding
Riverview-Chewacla Complex	77	nearly level	Loam	Silt Loam-Loam	Well Drained & Somewhat Poorly Drained	Severe: flooding, low strength, wetness
Starr Silt Loam	79B	2-7	Silt Loam	Silty Clay Loam	Well Drained	Severe: flooding
Toccoa Fine Sandy Loam	83	nearly level	Fine Sandy Loam	Not Classified	Well Drained	Severe: flooding
Turbeville Loam	86B	2-7	Loam	Clay-Clay Loam	Well Drained	Severe: low strength
Udorthents Loamy	88	2-25	Loamy Where Exposed	Not Classified	Not Classified	Not Classified (fill material)
Urban Land	91	0-10	**	**	**	**

TABLE 3.6
COMPOSITE LIST OF SOILS ALONG PROJECT ALTERNATIVES
(continued)

NAME	MAP SYMBOL	SLOPE (%)	SURFACE SOIL	SUBSOIL	DRAINAGE	*FACTORS AFFECTING HIGHWAY LOCATION
Watt Channery Silt Loam	93C	7-15	Silt Loam	Silt Loam	Somewhat Exces- sively Drained	Moderate: low strength, large stones
Watt Channery Silt Loam	93E	25-45	Silt Loam	Silt Loam	Somewhat Exces- sively Drained	Severe: slope
Wedowee Sandy Loam	94B	2-7	Sandy Loam	Clay-Sandy Clay Loam- Clay Loam	Well Drained	Severe: low strength
Wedowee Sandy Loam	94C	7-15	Sandy Loam	Clay-Sandy Clay Loam- Clay Loam	Well Drained	Severe: low strength
Wehadkee Silt Loam	95	0-2	Silt Loam	Silty Clay Loam-Silty Loam	Poorly Drained	Severe: flooding, wetness
Worsham Loam	96B	2-7	Loam	Clay	Poorly Drained	Severe: wetness, low strength

* Definition of limitations:

Slight - Soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome.

Moderate - Soil properties or site features are not favorable for the indicated use. Special planning, design or maintenance is needed to overcome or minimize the limitations.

Severe - Soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

** Consists of areas where more than 80 percent of the surface is covered by asphalt, concrete, buildings, or other impervious surfaces.

TABLE 3.7

PRIME FARMLAND SOILS

[Only the soils considered prime farmland are listed. Urban or built-up areas of the soils listed are not considered prime farmland. If a soil is prime farmland only under certain conditions, the conditions are specified in parentheses after the soil name]

Map symbol	Soil name
1B	Abell silt loam, 2 to 7 percent slopes
2B	Albemarle fine sandy loam, 2 to 7 percent slopes
6	Bermudian silt loam
7B	Braddock loam, 2 to 7 percent slopes
14B	Chester loam, 2 to 7 percent slopes
16	Chewacla silt loam (where drained and protected from flooding)
19B	Cullen loam, 2 to 7 percent slopes
21B	Culpeper fine sandy loam, 2 to 7 percent slopes
23B	Davidson clay loam, 2 to 7 percent slopes
24B	Dogue silt loam, 2 to 7 percent slopes
25B	Dyke silt loam, 2 to 7 percent slopes
27B	Elioak loam, 2 to 7 percent slopes
29B	Fauquier silt loam, 2 to 7 percent slopes
32B	Fluvanna silt loam, 2 to 7 percent slopes
34B	Glenelg loam, 2 to 7 percent slopes
36B	Hayesville loam, 2 to 7 percent slopes
41B	Hiwassee loam, 2 to 7 percent slopes
49B	Manassas silt loam, 2 to 7 percent slopes
53B	Masada loam, 2 to 7 percent slopes
54B	Mayodan loam, 2 to 7 percent slopes
55B	McQueen loam, 2 to 7 percent slopes
56B	Meadowville loam, 2 to 7 percent slopes
57B	Mount Lucas silt loam, 2 to 7 percent slopes (where drained)
58B	Myersville silt loam, 2 to 7 percent slopes
62B	Nason silt loam, 2 to 7 percent slopes
65B	Pacolet sandy loam, 2 to 7 percent slopes
68B	Penn silt loam, 2 to 7 percent slopes
71B	Rabun clay loam, 2 to 7 percent slopes
74B	Rapidan silt loam, 2 to 7 percent slopes
76	Riverview loam (where protected from flooding)
77	Riverview-Chewacla complex (where drained and protected from flooding)
78	Rowland silt loam (where drained and protected from flooding)
79B	Starr silt loam, 2 to 7 percent slopes
80B	Tatum silt loam, 2 to 7 percent slopes
81B	Thurmont loam, 2 to 7 percent slopes
83	Toccoa fine sandy loam (where protected from flooding)
84B	Totier silt loam, 2 to 7 percent slopes
86B	Turbeville loam, 2 to 7 percent slopes
89B	Unison silt loam, 2 to 7 percent slopes
94B	Wedowee sandy loam, 2 to 7 percent slopes

TABLE 3.8

PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH					Pct
1B---------------- Abell	0-12	10-27	1.25-1.55	0.6-6.0	0.12-0.20	4.5-5.5	Low-----------	0.28	4	---	.5-2
	12-36	30-45	1.35-1.65	0.6-2.0	0.11-0.17	4.5-5.5	Moderate------	0.28			
	36-60	10-27	1.45-1.65	0.6-6.0	0.08-0.18	4.5-5.5	Low-----------	0.28			
2B, 2C, 2D-------- Albemarle	0-5	10-27	1.35-1.55	2.0-6.0	0.15-0.20	4.5-5.5	Low-----------	0.37	3	---	1-2
	5-30	20-35	1.30-1.50	0.6-2.0	0.13-0.18	4.5-5.5	Low-----------	0.37			
	30-38	5-25	1.20-1.40	2.0-6.0	0.10-0.15	4.5-5.5	Low-----------	0.28			
	38	---	---	---	---	---	-------------	----			
3C, 3D, 3E-------- Albemarle	0-5	10-25	1.35-1.55	2.0-6.0	0.12-0.17	4.5-5.5	-------------	----	---	---	1-2
	5-30	20-35	1.30-1.50	0.6-2.0	0.13-0.18	4.5-5.5	Low-----------	0.37			
	30-38	5-25	1.20-1.40	2.0-6.0	0.10-0.15	4.5-5.5	Low-----------	0.28			
	38	---	---	---	---	---	-------------	----			
4B, 4C, 4D, 4E--- Ashe	0-10	10-25	1.35-1.60	2.0-6.0	0.13-0.18	4.5-6.0	Low-----------	0.24	2	---	1-3
	10-19	10-25	1.35-1.60	2.0-6.0	0.10-0.14	4.5-6.0	Low-----------	0.17			
	19-24	5-15	1.45-1.65	2.0-6.0	0.08-0.12	4.5-6.0	Low-----------	0.17			
	24	---	---	---	---	---	-------------	----			
5B---------------- Belvoir	0-12	7-25	1.30-1.60	0.6-6.0	0.10-0.18	4.5-5.5	Low-----------	0.37	4	---	.5-2
	12-19	20-35	1.35-1.65	0.6-2.0	0.13-0.18	4.5-5.5	Moderate------	0.37			
	19-28	15-30	1.70-1.90	0.06-0.2	0.07-0.11	4.5-5.5	Low-----------	0.28			
	28-45	10-30	1.35-1.65	0.6-2.0	0.10-0.15	4.5-5.5	Low-----------	0.28			
	45-72	10-45	1.25-1.55	0.06-2.0	0.10-0.15	4.5-5.5	Moderate------	0.28			
6----------------- Bermudian	0-4	10-25	1.25-1.40	0.6-6.0	0.12-0.16	4.5-6.0	Low-----------	0.37	4	---	2-3
	4-45	17-35	1.30-1.50	0.6-6.0	0.12-0.16	4.5-6.0	Low-----------	0.28			
	45-60	5-20	1.35-1.55	6.0-20	0.04-0.08	4.5-6.0	Low-----------	0.17			
7B, 7C, 7D-------- Braddock	0-8	10-25	1.20-1.50	0.6-6.0	0.14-0.19	3.6-5.5	Low-----------	0.32	4	---	1-2
	8-60	35-55	1.20-1.50	0.6-2.0	0.12-0.17	4.5-5.5	Moderate------	0.24			
8C3--------------- Braddock	0-4	27-40	1.20-1.50	0.6-2.0	0.14-0.19	4.5-5.5	Low-----------	0.32	3	---	.5-1
	4-60	35-55	1.20-1.50	0.6-2.0	0.12-0.17	4.5-5.5	Moderate------	0.24			
9B, 9C, 9D-------- Braddock	0-8	10-25	1.00-1.20	0.6-6.0	0.14-0.19	3.6-5.5	Low-----------	0.20	4	---	1-2
	8-60	35-55	1.20-1.50	0.6-2.0	0.14-0.19	3.6-5.5	Moderate------	0.24			
~~10~~ Buncombe	~~0-10~~	~~3-12~~	~~1.60-1.75~~	~~>6.0~~	~~0.06-0.10~~	6.1-6.5	Low-----------	~~0.10~~	~~5~~	---	.5-1
	10-60	3-12	1.60-1.75	>6.0	0.03-0.07	4.5-6.0	Low-----------	0.10			
11D*, 11E*: Cataska----------	0-5	12-22	1.30-1.40	2.0-20	0.10-0.14	4.5-5.5	Low-----------	0.15	1	---	.5-2
	5-20	12-22	1.30-1.45	2.0-20	0.04-0.09	4.5-5.5	Low-----------	0.15			
	20-38	---	---	---	---	---	-------------	----			
	38	---	---	---	---	---	-------------	----			
Hartleton---------	0-7	10-25	1.20-1.40	0.6-6.0	0.10-0.14	4.5-5.5	Low-----------	0.15	3	---	.5-2
	7-32	15-27	1.40-1.60	0.6-6.0	0.06-0.10	4.5-5.5	Low-----------	0.20			
	32-44	15-27	1.40-1.60	0.6-6.0	0.04-0.08	4.5-5.5	Low-----------	0.20			
	44	---	---	---	---	---	-------------	----			
12C, 12D, 12E, 13C, 13D, 13E--- Catoctin	0-5	5-20	1.20-1.50	2.0-6.0	0.14-0.20	5.1-6.5	Low-----------	0.32	2	---	1-3
	5-18	10-35	1.20-1.50	2.0-6.0	0.08-0.16	5.1-6.5	Low-----------	0.24			
	18-28	10-25	1.20-1.50	2.0-6.0	0.04-0.15	5.6-7.3	Low-----------	0.24			
	28	---	---	---	---	---	-------------	----			

TABLE 3.8

PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	G/cm^3	In/hr	In/in	pH					Pct
32B, 32C---------- Fluvanna	0-8	5-27	1.25-1.55	2.0-6.0	0.10-0.15	4.5-5.5	Low-----------	0.37	4	---	1-3
	8-48	35-65	1.30-1.60	0.06-0.6	0.10-0.17	4.5-5.5	Moderate------	0.28			
	48-60	20-40	1.30-1.60	0.06-0.6	0.05-0.09	4.5-5.5	Moderate------	0.28			
33C--------------- Fluvanna	0-8	5-27	1.25-1.55	2.0-6.0	0.10-0.15	4.5-5.5	Low-----------	0.24	4	---	1-3
	8-48	35-65	1.30-1.60	0.06-0.6	0.10-0.17	4.5-5.5	Moderate------	0.28			
	48-60	30-40	1.30-1.60	0.06-0.6	0.05-0.09	4.5-5.5	Moderate------	0.28			
34B, 34C, 34D, 34E------------- Glenelg	0-8	15-25	1.20-1.40	0.6-2.0	0.14-0.24	4.5-5.5	Low-----------	0.32	3	---	1-3
	8-28	20-32	1.40-1.60	0.6-2.0	0.10-0.20	4.5-5.5	Low-----------	0.43			
	28-80	5-20	1.40-1.60	0.6-2.0	0.10-0.19	4.5-5.5	Low-----------	0.49			
35C*: Hartleton--------	0-7	10-25	1.20-1.40	0.6-6.0	0.10-0.14	4.5-5.5	Low-----------	0.15	3	---	.5-2
	7-32	15-27	1.40-1.60	0.6-6.0	0.06-0.10	4.5-5.5	Low-----------	0.20			
	32-44	15-27	1.40-1.60	0.6-6.0	0.04-0.08	4.5-5.5	Low-----------	0.20			
	44	---	---	---	---	---	-------------	----			
Cataska----------	0-5	12-22	1.30-1.40	2.0-20	0.10-0.14	4.5-5.5	Low-----------	0.15	1	---	.5-2
	5-20	12-22	1.30-1.45	2.0-20	0.04-0.09	4.5-5.5	Low-----------	0.15			
	20-38	---	---	---	---	---	-------------	----			
	38	---	---	---	---	---	-------------	----			
36B, 36C, 36D, 36E, 37B3, 37C3, 37D3, 37E3------- Hayesville	0-7	10-25	1.35-1.60	2.0-6.0	0.12-0.20	4.5-5.5	Low-----------	0.20	5	---	1-2
	7-58	30-50	1.20-1.35	0.6-2.0	0.15-0.20	4.5-5.5	Low-----------	0.24			
	58-83	20-40	1.30-1.40	0.6-2.0	0.12-0.20	4.5-5.5	Low-----------	0.20			
38C, 38D, 38E---- Hayesville	0-7	12-26	1.20-1.50	2.0-6.0	0.12-0.20	4.5-5.5	Low-----------	0.24	4	---	1-2
	7-58	35-65	1.30-1.60	0.6-2.0	0.15-0.20	4.5-5.5	Low-----------	0.28			
	58-83	25-40	1.25-1.55	0.6-2.0	0.12-0.20	4.5-5.5	Low-----------	0.28			
39C, 39D, 39E---- Hazel	0-10	5-20	1.20-1.50	2.0-6.0	0.14-0.19	4.5-5.5	Low-----------	0.32	2	---	.5-2
	10-20	10-18	1.20-1.50	2.0-6.0	0.12-0.17	4.5-5.5	Low-----------	0.24			
	20-30	10-18	1.30-1.55	2.0-6.0	0.12-0.15	4.5-5.5	Low-----------	0.24			
	30	---	---	---	---	---	-------------	----			
40D, 40E---------- Hazel	0-10	5-18	1.20-1.50	2.0-6.0	0.11-0.16	4.5-5.5	Low-----------	0.24	2	---	.5-2
	10-20	10-18	1.20-1.50	2.0-6.0	0.10-0.15	4.5-5.5	Low-----------	0.24			
	20-30	10-18	1.20-1.50	2.0-6.0	0.10-0.14	4.5-5.5	Low-----------	0.24			
	30	---	---	---	---	---	-------------	----			
41B, 41C, 42B3, 42C3, 42D3------- Hiwassee	0-8	10-35	1.35-1.55	0.6-2.0	0.12-0.15	4.5-6.5	Low-----------	0.28	5	---	.5-2
	8-64	35-60	1.30-1.45	0.6-2.0	0.12-0.15	4.5-6.5	Low-----------	0.28			
43B, 43C, 43D, 43E------------- Klinesville	0-4	10-25	1.20-1.40	2.0-6.0	0.08-0.12	4.5-6.0	Low-----------	0.20	2	---	.5-2
	4-10	10-20	1.40-1.60	2.0-6.0	0.06-0.10	4.5-6.0	Low-----------	0.20			
	10-14	10-20	1.40-1.60	2.0-6.0	0.04-0.08	4.5-6.0	Low-----------	0.20			
	14	---	---	---	---	---	-------------	----			
44C, 44D, 45C, 45D------------- Lew	0-7	10-25	1.00-1.20	0.6-6.0	0.13-0.15	4.5-6.0	Low-----------	0.17	4	---	1-3
	7-60	28-40	1.20-1.50	0.6-2.0	0.11-0.16	4.5-6.0	Moderate------	0.17			
46B--------------- Lignum	0-9	10-25	1.20-1.50	0.6-2.0	0.14-0.20	4.5-5.5	Low-----------	0.43	3	---	.5-2
	9-38	35-55	1.25-1.55	0.06-0.6	0.10-0.18	4.5-5.5	Moderate------	0.28			
	38-58	20-40	1.25-1.55	0.2-0.6	0.10-0.18	4.5-5.5	Low-----------	0.28			
	58	---	---	---	---	---	-------------	----			
47C, 47D, 47E---- Louisburg	0-5	5-15	1.25-1.55	6.0-20	0.09-0.12	4.5-6.0	Low-----------	0.24	2	---	.5-1
	5-60	10-25	1.25-1.55	6.0-20	0.10-0.12	4.5-6.0	Low-----------	0.24			
	60	---	---	---	---	---	-------------	----			

TABLE 3.8

PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	G/cm^3	In/hr	In/in	pH					Pct
48D, 48E---------- Louisburg	0-5	5-15	1.25-1.55	6.0-20	0.03-0.07	4.5-6.0	Low-----------	0.10	2	---	.5-1
	5-60	10-25	1.25-1.55	6.0-20	0.06-0.10	4.5-6.0	Low-----------	0.24			
	60	---	---	---	---	---	-------------	----			
49B--------------- Manassas	0-18	10-27	1.25-1.55	0.6-6.0	0.14-0.20	4.5-5.5	Low-----------	0.37	4	---	2-4
	18-64	20-35	1.30-1.60	0.6-6.0	0.16-0.20	4.5-5.5	Low-----------	0.24			
50D, 50E---------- Manor	0-8	10-25	1.20-1.40	0.6-2.0	0.17-0.21	4.5-6.0	Low-----------	0.43	3	---	1-3
	8-18	10-25	1.30-1.50	0.6-2.0	0.14-0.20	4.5-6.0	Low-----------	0.32			
	18-62	5-20	1.25-1.50	0.6-6.0	0.10-0.17	4.5-6.0	Low-----------	0.49			
51B, 51C, 51D, 51E--------------- Manteo	0-6	7-27	1.25-1.55	2.0-6.0	0.10-0.16	3.6-5.5	Low-----------	0.28	1	---	.5-2
	6-18	10-35	1.35-1.65	2.0-6.0	0.07-0.14	3.6-5.5	Low-----------	0.28			
	18	---	---	---	---	---	-------------	----			
52D, 52E---------- Manteo	0-6	7-27	1.25-1.55	2.0-6.0	0.07-0.13	3.6-5.5	Low-----------	0.28	1	---	.5-2
	6-18	10-35	1.35-1.65	2.0-6.0	0.07-0.14	3.6-5.5	Low-----------	0.28			
	18	---	---	---	---	---	-------------	----			
53B, 53C---------- Masada	0-7	5-20	1.20-1.50	2.0-6.0	0.10-0.17	4.5-5.5	Low-----------	0.32	4	---	1-3
	7-33	35-55	1.30-1.60	0.6-2.0	0.10-0.17	4.5-5.5	Moderate------	0.24			
	33-62	30-40	1.30-1.60	0.6-2.0	0.10-0.17	4.5-5.5	Moderate------	0.24			
54B, 54C---------- Mayodan	0-10	5-20	1.30-1.55	>6.0	0.11-0.17	4.5-6.0	Low-----------	0.24	4	---	1-2
	10-53	35-60	1.30-1.60	0.6-2.0	0.12-0.18	4.5-5.5	Low-----------	0.24			
	53-60	---	---	---	0.02-0.06	4.5-5.5	Low-----------	----			
55B--------------- McQueen	0-7	12-25	1.30-1.55	0.6-2.0	0.14-0.20	6.1-6.5	Low-----------	0.37	4	---	.5-2
	7-42	35-55	1.20-1.45	0.06-0.2	0.14-0.18	4.5-5.5	Moderate------	0.37			
	42-52	27-40	1.25-1.50	0.2-0.6	0.14-0.18	4.5-5.5	Low-----------	0.37			
	52-64	12-32	1.30-1.50	0.2-0.6	0.14-0.18	4.5-5.5	Low-----------	0.32			
56B, 56C---------- Meadowville	0-14	10-27	1.00-1.25	2.0-6.0	0.17-0.20	4.5-6.0	Low-----------	0.37	3	---	2-4
	14-46	20-35	1.20-1.50	0.6-6.0	0.14-0.19	4.5-6.0	Moderate------	0.28			
	46-73	20-50	1.20-1.50	0.6-6.0	0.11-0.17	4.5-6.0	Moderate------	0.28			
57B--------------- Mount Lucas	0-10	10-20	1.20-1.30	0.6-2.0	0.18-0.22	5.1-6.5	Low-----------	0.37	4	---	1-2
	10-48	17-32	1.30-1.60	0.06-0.6	0.12-0.16	5.1-7.3	Moderate------	0.28			
	48-64	5-20	1.30-1.70	0.06-0.2	0.04-0.12	5.6-7.3	Low-----------	0.28			
58B, 58C, 58D, 58E--------------- Myersville	0-7	5-20	1.20-1.50	2.0-6.0	0.14-0.20	4.5-6.0	Low-----------	0.37	4	---	1-3
	7-28	18-35	1.20-1.50	0.6-2.0	0.14-0.18	4.5-6.0	Low-----------	0.32			
	28-44	10-32	1.20-1.50	0.6-2.0	0.08-0.16	4.5-6.0	Low-----------	0.32			
	44-65	---	---	---	---	---	-------------	----			
59C, 59D, 59E---- Myersville	0-7	5-20	1.20-1.50	2.0-6.0	0.14-0.20	4.5-6.0	Low-----------	0.32	4	---	1-3
	7-28	18-35	1.20-1.50	0.6-2.0	0.14-0.18	4.5-6.0	Low-----------	0.32			
	28-44	10-32	1.20-1.50	0.6-2.0	0.08-0.16	4.5-6.0	Low-----------	0.32			
	44-65	---	---	---	---	---	-------------	----			
60C*, 60D*, 60E*: Myersville-------	0-7	5-20	1.20-1.50	2.0-6.0	0.14-0.20	4.5-6.0	Low-----------	0.32	4	---	1-3
	7-28	18-35	1.20-1.50	0.6-2.0	0.14-0.18	4.5-6.0	Low-----------	0.32			
	28-44	10-32	1.20-1.50	0.6-2.0	0.08-0.16	4.5-6.0	Low-----------	0.32			
	44-65	---	---	---	---	---	-------------	----			
Catoctin---------	0-5	5-20	1.20-1.50	2.0-6.0	0.14-0.20	5.1-6.5	Low-----------	0.32	2	---	1-3
	5-18	10-35	1.20-1.50	2.0-6.0	0.08-0.16	5.1-6.5	Low-----------	0.24			
	18-28	10-25	1.20-1.50	2.0-6.0	0.04-0.15	5.6-7.3	Low-----------	0.24			
	28	---	---	---	---	---	-------------	----			

TABLE 3.8

PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	G/cm^3	In/hr	In/in	pH					Pct
61D*, 61E*:											
Myersville-------	0-7	5-20	1.20-1.50	2.0-6.0	0.14-0.20	4.5-6.0	Low-----------	0.32	4	---	1-3
	7-28	18-35	1.20-1.50	0.6-2.0	0.14-0.18	4.5-6.0	Low-----------	0.32			
	28-44	10-32	1.20-1.50	0.6-2.0	0.08-0.16	4.5-6.0	Low-----------	0.32			
	44-65	---	---	---	---	---	---------------	----			
Rock outcrop.											
62B, 62C, 62D----- Nason	0-8	10-25	1.25-1.55	0.6-2.0	0.14-0.20	4.5-6.5	Low-----------	0.37	4	---	1-3
	8-39	35-50	1.30-1.60	0.6-2.0	0.12-0.19	4.5-5.5	Moderate------	0.28			
	39-50	10-25	1.25-1.55	0.6-2.0	0.15-0.20	4.5-5.5	Low-----------	0.28			
63B--------------- Orange	0-9	10-25	1.25-1.55	0.6-2.0	0.14-0.20	5.1-6.5	Low-----------	0.49	3	---	1-3
	9-33	35-60	1.35-1.65	0.06-0.2	0.10-0.19	5.1-6.5	High----------	0.28			
	33-60	10-35	1.35-1.65	0.2-0.6	0.13-0.20	5.6-7.8	Low-----------	0.28			
64B--------------- Orange	0-9	10-25	1.25-1.55	0.6-2.0	0.14-0.20	5.1-6.5	Low-----------	0.24	2	---	1-3
	9-33	35-60	1.10-1.40	0.06-0.2	0.10-0.19	5.1-6.5	High----------	0.24			
	33-60	10-35	1.30-1.60	0.2-0.6	0.13-0.20	5.6-7.8	Low-----------	0.24			
65B, 65C---------- Pacolet	0-6	8-20	1.00-1.50	2.0-6.0	0.08-0.12	4.5-6.5	Low-----------	0.20	3	3	.5-2
	6-32	35-65	1.30-1.50	0.6-2.0	0.12-0.15	4.5-6.0	Low-----------	0.28			
	32-60	15-30	1.20-1.50	0.6-2.0	0.08-0.15	4.5-6.0	Low-----------	0.28			
66C, 66D, 66E, 67D, 67E--------- Parker	0-14	10-20	1.30-1.50	2.0-6.0	0.06-0.14	4.5-5.5	Low-----------	0.17	5	---	1-2
	14-38	10-25	1.30-1.55	2.0-6.0	0.10-0.14	4.5-5.5	Low-----------	0.20			
	38-67	5-20	1.35-1.60	6.0-20	0.04-0.08	4.5-5.5	Low-----------	0.20			
68B, 68C, 68D---- Penn	0-7	10-20	1.20-1.40	0.6-6.0	0.16-0.20	3.6-5.5	Low-----------	0.32	3	---	1-3
	7-21	18-32	1.40-1.60	0.6-6.0	0.14-0.18	3.6-6.0	Low-----------	0.24			
	21-29	18-25	1.40-1.60	0.6-6.0	0.04-0.08	5.1-6.5	Low-----------	0.24			
	29	---	---	---	---	---	---------------	----			
69*. Pits											
70C, 70D, 70E---- Porters	0-8	10-20	1.15-1.45	0.6-2.0	0.12-0.16	4.5-6.0	Low-----------	0.17	4	---	3-5
	8-26	15-35	1.25-1.55	0.6-2.0	0.14-0.20	4.5-6.0	Low-----------	0.24			
	26-32	5-20	1.20-1.50	2.0-6.0	0.10-0.17	4.5-6.0	Low-----------	----			
	32-59	---	---	---	---	---	---------------	----			
71B, 71C, 71D, 71E------------- Rabun	0-6	18-35	1.20-1.50	0.6-2.0	0.12-0.18	5.1-6.5	Low-----------	0.32	[illegible]	[illegible]	[illegible]
	6-48	35-80	1.30-1.60	0.6-2.0	0.12-0.18	5.1-6.5	Low-----------	0.28			
	48-63	27-50	1.30-1.60	0.6-2.0	0.10-0.15	5.1-6.5	Low-----------	0.28			
72B3, 72C3, 72D3, 72E3------------ Rabun	0-4	30-50	1.20-1.50	0.6-2.0	0.10-0.15	5.1-6.5	Low-----------	0.32	3	---	<.5
	4-48	35-80	1.30-1.60	0.6-2.0	0.12-0.18	5.1-6.5	Low-----------	0.28			
	48-63	27-50	1.30-1.60	0.6-2.0	0.10-0.15	5.1-6.5	Low-----------	0.28			
73C, 73D, 73E---- Rabun	0-6	18-35	1.20-1.50	0.6-2.0	0.10-0.15	5.1-6.5	Low-----------	0.20	4	---	1-2
	6-48	35-80	1.20-1.50	0.6-2.0	0.12-0.18	5.1-6.5	Low-----------	0.28			
	48-63	27-50	1.20-1.50	0.6-2.0	0.06-0.12	5.1-6.5	Low-----------	0.28			
74B, 74C, 74D---- Rapidan	0-6	15-27	1.20-1.50	0.6-6.0	0.14-0.20	5.1-7.3	Low-----------	0.37	4	---	1-4
	6-54	35-65	1.35-1.55	0.6-2.0	0.10-0.19	5.1-6.0	Moderate------	0.32			
	54-70	20-40	1.30-1.50	0.6-2.0	0.05-0.10	5.1-6.0	Low-----------	0.17			
75C3, 75D3-------- Rapidan	0-6	27-35	1.25-1.55	0.6-2.0	0.16-0.19	5.1-7.3	Low-----------	0.37	3	---	.1-2
	6-54	35-65	1.35-1.55	0.6-2.0	0.10-0.19	5.1-6.0	Moderate------	0.32			
	54-70	20-40	1.30-1.50	0.6-2.0	0.05-0.10	5.1-6.0	Low-----------	0.17			
76---------------- Riverview	0-12	10-27	1.25-1.50	0.6-2.0	0.16-0.24	4.5-5.5	Low-----------	0.32	5	---	.5-2
	12-35	18-35	1.25-1.55	0.6-2.0	0.15-0.22	4.5-5.5	Low-----------	0.24			
	35-60	4-35	1.30-1.55	2.0-6.0	0.07-0.11	4.5-5.5	Low-----------	0.17			

TABLE 3.8

PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodi-bility group	Organic matter
								K	T		
	In	Pct	G/cm^3	In/hr	In/in	pH					Pct
77*:											
Riverview--------	0-12	10-27	1.25-1.50	0.6-2.0	0.16-0.24	4.5-5.5	Low-----------	0.32	5	---	.5-2
	12-35	18-35	1.25-1.55	0.6-2.0	0.15-0.22	4.5-5.5	Low-----------	0.24			
	35-60	4-35	1.30-1.55	2.0-6.0	0.07-0.11	4.5-5.5	Low-----------	0.17			
Chewacla---------	0-8	10-27	1.30-1.60	0.6-2.0	0.15-0.24	4.5-6.5	Low-----------	0.28	5	---	1-4
	8-60	18-35	1.30-1.50	0.6-2.0	0.15-0.24	4.5-6.5	Low-----------	0.32			
78--------------- Rowland	0-11	10-20	1.10-1.30	0.2-2.0	0.14-0.18	4.5-6.0	Low-----------	0.43	4	---	2-4
	11-38	15-32	1.20-1.50	0.2-2.0	0.14-0.18	4.5-6.0	Low-----------	0.28			
	38-60	15-32	1.20-1.50	0.2-2.0	0.12-0.16	4.5-6.0	Low-----------	0.28			
79B-------------- Starr	0-18	15-35	1.20-1.50	0.6-2.0	0.14-0.18	5.1-6.5	Moderate------	0.28	5	---	.5-2
	18-68	18-35	1.20-1.50	0.6-2.0	0.14-0.18	5.1-6.5	Moderate------	0.28			
80B, 80C--------- Tatum	0-6	12-27	1.10-1.40	0.6-2.0	0.14-0.20	4.5-5.5	Low-----------	0.37	4	---	0-2
	6-42	45-60	1.40-1.60	0.6-2.0	0.10-0.19	4.5-5.5	Moderate------	0.28			
	42-51	20-40	1.40-1.60	0.6-2.0	0.12-0.18	4.5-5.5	Low-----------	0.28			
	51	---	---	---	---	---	--------------	-----			
81B, 81C, 81D---- Thurmont	0-10	10-25	1.20-1.40	2.0-6.0	0.10-0.15	4.5-5.5	Low-----------	0.32	4	---	.5-2
	10-46	18-35	1.30-1.50	0.6-2.0	0.13-0.19	4.5-5.5	Low-----------	0.20			
	46-56	18-30	1.30-1.50	0.6-2.0	0.07-0.12	4.5-5.5	Low-----------	0.20			
	56-68	10-20	1.20-1.40	0.6-2.0	0.04-0.08	4.5-5.5	Low-----------	0.20			
82C, 82D--------- Thurmont	0-10	10-25	1.20-1.40	2.0-6.0	0.10-0.15	4.5-5.5	Low-----------	0.24	4	---	.5-2
	10-46	18-35	1.30-1.50	0.6-2.0	0.13-0.18	4.5-5.5	Low-----------	0.20			
	46-56	18-30	1.30-1.50	0.6-2.0	0.07-0.12	4.5-5.5	Low-----------	0.20			
	56-68	10-20	1.20-1.40	0.6-2.0	0.04-0.08	4.5-5.5	Low-----------	0.20			
83--------------- Toccoa	0-9	3-17	1.35-1.45	2.0-6.0	0.09-0.12	5.1-6.5	Low-----------	0.24	5	---	1-2
	9-66	2-19	1.40-1.50	2.0-6.0	0.09-0.12	5.1-6.5	Low-----------	0.10			
84B, 84C--------- Totier	0-8	12-27	1.20-1.50	0.6-2.0	0.20-0.24	4.5-6.0	Low-----------	0.37	4	---	2-4
	8-40	35-60	1.30-1.60	0.6-2.0	0.12-0.19	4.5-6.0	Moderate------	0.28			
	40-49	20-35	1.30-1.60	0.6-2.0	0.06-0.12	4.5-6.0	Low-----------	0.28			
	49-63	---	---	---	---	---	--------------	-----			
85C3------------- Totier	0-8	27-35	1.20-1.50	0.6-2.0	0.18-0.22	4.5-6.0	Moderate------	0.37	3	---	1-2
	8-40	35-60	1.30-1.60	0.6-2.0	0.12-0.19	4.5-6.0	Moderate------	0.28			
	40-49	20-35	1.30-1.60	0.6-2.0	0.06-0.12	4.5-6.0	Low-----------	0.28			
	49-63	---	---	---	---	---	--------------	-----			
86B, 86C--------- Turbeville	0-12	10-25	1.20-1.55	2.0-6.0	0.10-0.17	4.5-5.5	Low-----------	0.32	5	---	.5-2
	12-75	30-60	1.30-1.50	0.6-2.0	0.13-0.16	4.5-5.5	Moderate------	0.24			
87B, 87C, 87D---- Tusquitee	0-9	10-20	1.20-1.40	2.0-6.0	0.11-0.22	5.1-6.0	Low-----------	0.24	4	---	4-5
	9-45	20-35	1.25-1.50	0.6-2.0	0.15-0.21	5.1-6.0	Low-----------	0.20			
	45-63	10-20	1.30-1.55	2.0-6.0	0.08-0.14	5.1-6.0	Low-----------	0.20			
88. Udorthents											
89B, 89C--------- Unison	0-6	10-25	1.35-1.65	0.6-6.0	0.14-0.20	4.5-6.0	Low-----------	0.32	4	---	1-3
	6-58	30-70	1.30-1.60	0.6-2.0	0.12-0.18	4.5-6.0	Moderate------	0.24			
	58-60	30-50	1.30-1.60	0.6-6.0	0.08-0.16	4.5-6.0	Moderate------	0.28			
90B, 90C, 90D---- Unison	0-6	10-25	1.35-1.65	0.6-6.0	0.11-0.17	4.5-6.0	Low-----------	0.24	4	---	1-3
	6-58	30-70	1.30-1.60	0.6-2.0	0.12-0.18	4.5-6.0	Moderate------	0.24			
	58-60	30-50	1.30-1.60	0.6-6.0	0.08-0.16	4.5-6.0	Moderate------	0.24			
91*. Urban land											
92--------------- Wahee	0-9	10-27	1.20-1.50	0.2-2.0	0.15-0.20	4.5-6.0	Low-----------	0.28	5	---	.5-5
	9-60	35-55	1.40-1.60	0.06-0.2	0.12-0.20	3.6-5.5	Moderate------	0.28			

TABLE 3.8

PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodi-bility group	Organic matter
								K	T		
	In	Pct	G/cm^3	In/hr	In/in	pH					Pct
93C, 93D, 93E----- Watt	0-10	10-27	1.30-1.60	2.0-6.0	0.08-0.12	4.0-5.5	Low-----------	0.32	2	---	.5-1
	10-18	18-32	1.35-1.65	2.0-6.0	0.08-0.12	4.0-5.5	Low-----------	0.24			
	18-28	5-27	1.35-1.65	2.0-6.0	0.04-0.08	4.0-5.5	Low-----------	0.20			
94B, 94C--------- Wedowee	0-7	6-20	1.25-1.50	2.0-6.0	0.10-0.18	4.5-5.5	Low-----------	0.24	3	---	.5-1
	7-11	14-30	1.30-1.50	0.6-2.0	0.12-0.18	4.5-5.5	Low-----------	0.28			
	11-30	35-45	1.25-1.55	0.6-2.0	0.12-0.18	4.5-5.5	Moderate------	0.28			
	30-60	---	---	---	---	---	--------------	----			
95--------------- Wehadkee	0-10	15-40	1.35-1.50	0.6-2.0	0.15-0.24	5.1-6.5	Low-----------	0.32	5	---	2-5
	10-52	18-35	1.30-1.50	0.6-2.0	0.16-0.20	5.1-6.5	Low-----------	0.32			
	52-62	---	---	---	---	---	--------------	----			
96B-------------- Worsham	0-9	10-25	1.25-1.55	0.6-2.0	0.14-0.20	4.5-5.5	Low-----------	0.37	4	---	1-3
	9-54	30-55	1.35-1.65	0.06-0.6	0.10-0.16	4.5-5.5	Moderate------	0.28			
	54-60	10-40	1.20-1.50	0.2-0.6	0.08-0.19	4.5-5.5	Moderate------	0.28			

Source: Soil Survey of Albemarle County, Virginia, 1985.

TABLE 3.9

ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
1B------------------ Abell	0-12	Silt loam---------	SM, ML	A-2, A-4	0	90-100	75-100	50-95	25-85	<30	NP-7
	12-36	Clay, clay loam, silty clay loam.	CL, CH	A-6, A-7	0-5	90-100	75-95	70-95	65-90	30-60	15-30
	36-60	Loam, sandy loam, silt loam.	SM, ML	A-2, A-4	0-5	75-100	75-100	60-95	30-85	<30	NP-7
2B, 2C, 2D-------- Albemarle	0-5	Fine sandy loam	SM, SC, ML, CL	A-4	0	95-100	90-100	65-95	40-75	14-30	NP-10
	5-30	Sandy clay loam, clay loam.	SC, CL	A-2, A-4, A-6	0	95-100	90-100	75-100	30-80	25-45	8-20
	30-38	Fine sandy loam, sandy loam, gravelly sandy loam.	SM, ML, CL-ML, CL	A-2, A-4	0	90-100	90-100	60-85	30-55	12-30	NP-10
	38	Weathered bedrock	---	---	---	---	---	---	---	---	---
3C, 3D, 3E-------- Albemarle	0-5	Very stony fine sandy loam.	SM, SC, ML, CL	A-4	3-15	90-100	85-100	60-90	36-70	14-30	NP-10
	5-30	Sandy clay loam, clay loam.	SC, CL	A-2, A-4, A-6	0	95-100	90-100	75-100	30-80	25-45	8-20
	30-38	Fine sandy loam, sandy loam, gravelly sandy loam.	SM, ML, CL-ML, CL	A-2, A-4	0	90-100	90-100	60-85	30-55	12-30	NP-10
	38	Weathered bedrock	---	---	---	---	---	---	---	---	---
4B, 4C, 4D, 4E--- Ashe	0-10	Loam--------------	SM, SM-SC, ML, CL-ML	A-4	0-15	90-100	85-100	65-95	40-55	<25	NP-7
	10-19	Loam, sandy loam, fine sandy loam.	SM, SM-SC	A-4	5-30	85-100	80-95	60-95	35-49	<25	NP-7
	19-24	Sandy loam--------	SM	A-2, A-4	15-30	75-95	70-95	55-95	30-49	---	NP
	24	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
5B------------------ Belvoir	0-12	Loam--------------	ML, SM, CL-ML, SM-SC	A-4	0	90-100	80-100	60-90	25-80	10-30	NP-10
	12-19	Sandy clay loam, clay loam, loam.	SC, CL, SM, ML	A-4, A-6	0	90-100	80-100	75-90	40-80	25-45	7-25
	19-28	Sandy loam, clay loam, loam.	ML, CL, SM, SC	A-2, A-4	0-5	90-100	80-100	60-90	30-70	20-40	NP-20
	~~28-45~~	~~Sandy clay loam, clay loam, loam.~~	~~SM, SC, CL, ML~~	~~A-2, A-4~~	~~0-10~~	~~90-100~~	~~80-100~~	~~55-80~~	~~30-70~~	~~15-35~~	~~NP-15~~
	45-72	Loam, sandy clay loam, clay.	SM, SC, CL, ML	A-2, A-4, A-6	0-10	90-100	80-100	50-90	40-80	15-50	NP-30
6------------------- Bermudian	0-4	Silt loam---------	ML	A-4	0	90-100	90-100	70-90	60-80	---	---
	4-45	Silt loam, gravelly silty clay loam, shaly sandy clay loam.	ML, SM, SC	A-4, A-6, A-7	0-10	65-90	60-80	55-75	40-60	30-45	8-15
	45-60	Stratified sand to gravelly sand.	ML, GM, SM, CL-ML	A-2, A-4, A-1	0-15	40-95	25-90	20-80	20-65	<20	NP-5
7B, 7C, 7D-------- Braddock	0-8	Loam--------------	CL, SM, ML, SC	A-2, A-4	0-5	85-100	75-95	50-85	25-65	<30	NP-10
	8-60	Clay loam, gravelly sandy clay, clay.	MH, CH, CL, SC	A-7, A-2	0-15	70-95	70-90	45-90	20-80	42-60	15-33
8C3----------------- Braddock	0-4	Clay loam---------	ML, CL	A-6, A-7	0-10	70-95	70-90	65-90	50-85	35-50	15-25
	4-60	Clay loam, gravelly sandy clay, clay.	MH, CH, CL, SC	A-7, A-2	0-15	70-95	70-90	45-90	20-80	42-60	15-33

TABLE 3.9

ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
9B, 9C, 9D-------- Braddock	0-8	Very stony loam	CL, SM, SC, ML	A-2, A-4	5-20	85-100	75-95	50-85	25-65	<30	NP-10
	8-60	Clay loam, gravelly sandy clay, cobbly clay.	MH, CH, CL, SC	A-7, A-2	0-30	60-95	50-90	40-90	30-80	42-60	15-30
10---------------- Buncombe	0-10	Loamy sand--------	SM, SP-SM	A-2, A-3	0	98-100	98-100	90-97	7-32	---	NP
	10-60	Loamy sand, sand	SM, SP-SM	A-2, A-3	0	98-100	98-100	98-100	7-32	---	NP
11D*, 11E*: Cataska----------	0-5	Very stony loam	CL-ML, ML, GM, GM-GC	A-4	10-30	45-80	45-75	40-70	40-60	<28	NP-6
	5-20	Slaty silt loam, channery silt loam, very channery silt loam.	GM-GC, GM, GP-GM	A-2, A-1	10-25	15-50	10-45	10-40	10-35	<28	NP-7
	20-38	Weathered bedrock	---	---	---	---	---	---	---	---	---
	38	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Hartleton--------	0-7	Very stony loam	SM, ML	A-4	20-40	80-95	70-90	60-90	45-80	---	---
	7-32	Channery silt loam, very channery loam, channery silty clay loam.	GM, ML, SM	A-2, A-4	25-65	60-90	45-80	40-80	30-75	20-30	NP-7
	32-44	Very channery loam, very shaly silt loam.	SM, GM, ML	A-1, A-2, A-4	55-85	40-80	25-70	20-70	15-60	20-30	NP-7
	44	Weathered bedrock	---	---	---	---	---	---	---	---	---
12C, 12D, 12E---- Catoctin	0-5	Silt loam--------	ML, CL, CL-ML	A-4	0-5	80-95	80-90	60-85	50-80	<30	NP-8
	5-18	Channery silt loam, channery silty clay loam.	SM, SC, CL, GM	A-2, A-4, A-6	0-25	50-80	35-75	30-60	25-60	20-34	2-12
	18-28	Very channery silt loam, channery silt loam.	SM, GM, GC, SC	A-2, A-4, A-1, A-3	10-40	30-75	10-60	9-55	7-50	<28	NP-8
	28	Weathered bedrock	---	---	---	---	---	---	---	---	---
13C, 13D, ~~13E~~ Catoctin	~~0-5~~	~~Very stony silt~~ loam.	~~ML, CL,~~ CL-ML	~~A-4~~	~~5-20~~	[illegible]	~~75-85~~	~~70-80~~	~~60-70~~	~~<30~~	~~NP-8~~
	5-18	Channery silt loam, channery silty clay loam, cobbly silt loam.	SM, SC, CL, GM	A-2, A-4, A-6	0-25	50-80	35-75	30-60	25-60	20-34	2-12
	18-28	Very channery silt loam, channery silt loam.	SM, SC, GC, GM	A-2, A-4, A-1, A-3	10-40	30-75	10-60	9-55	7-50	<28	NP-8
	28	Weathered bedrock	---	---	---	---	---	---	---	---	---
14B, 14C, 14D, 14E------------ Chester	0-7	Loam--------------	ML, CL	A-4, A-6, A-7	0-10	90-100	90-100	75-90	55-75	33-47	8-12
	7-41	Silty clay loam, silt loam, channery loam.	ML, CL, SM, SC	A-4, A-6, A-7	0-10	85-100	55-100	50-95	40-70	30-50	8-17
	41-60	Loam--------------	SM, SC, ML	A-2, A-4, A-7	0-10	80-100	70-100	70-95	30-65	<47	<16

TABLE 3.9

ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
15C, 15D, 15E----- Chester	0-7	Very stony loam	ML, CL	A-4, A-6, A-7	3-10	80-100	75-90	65-90	55-75	33-47	8-12
	7-41	Silty clay loam, silt loam, loam.	ML, CL	A-4, A-6, A-7	0-5	85-100	80-100	70-100	50-90	30-50	8-17
	41-60	Loam, sandy loam	SM, SC, ML	A-2, A-4, A-7	0-5	85-100	80-100	50-95	25-65	<45	<16
16---------------- Chewacla	0-8	Silt loam---------	ML, CL, CL-ML	A-4, A-6, A-7	0	98-100	95-100	70-100	55-90	25-49	4-20
	8-60	Silt loam, silty clay loam, clay loam.	ML, CL	A-4, A-6, A-7	0	96-100	95-100	80-100	51-98	30-49	4-22
17---------------- Craigsville	0-8	Loam--------------	ML, SM, CL-ML, SC	A-2, A-4	0-25	80-95	75-95	45-90	30-85	<25	NP-10
	8-23	Gravelly sandy loam, cobbly loam, very gravelly sandy loam.	SM, GM, GC, SC	A-1, A-2, A-4	25-60	50-80	30-65	25-60	15-40	<25	NP-10
	23-60	Very gravelly loamy sand, very gravelly sandy loam, very cobbly sandy loam.	GC, GM, GP-GM, GM-GC	A-1, A-2	35-75	35-55	30-50	20-45	10-25	<25	NP-8
18B--------------- Creedmoor	0-8	Loam--------------	SM, SM-SC	A-4, A-2	0-3	98-100	95-100	70-90	30-49	<25	NP-7
	8-22	Sandy clay loam, clay loam.	CL	A-7	0-3	98-100	95-100	85-95	60-80	40-50	20-30
	22-70	Clay, silty clay, sandy clay.	CH	A-7	0-3	98-100	95-100	85-97	70-95	51-79	25-49
19B, 19C, 19D---- Cullen	0-8	Loam--------------	CL	A-6, A-7, A-4	0	90-100	85-100	75-95	50-75	25-40	7-20
	8-60	Clay, clay loam	MH	A-7	0	90-100	85-100	75-100	65-95	50-70	15-35
	60-67	Clay loam, clay, loam.	CH, MH, CL, ML	A-7, A-6	0	90-100	85-100	75-100	50-85	35-60	11-30
20B3, 20C3, 20D3- Cullen	0-8	Clay loam---------	CL, ML	A-7	0	90-100	85-100	75-100	60-80	35-50	11-25
	8-60	Clay, clay loam	MH	A-7	0	90-100	85-100	75-100	65-95	50-70	15-35
	60-67	Clay loam, clay, loam.	CH, MH, CL, ML	A-7, A-6	0	90-100	85-100	75-100	50-85	35-60	11-30
21B, 21C, 21D---- ~~Culpeper~~	0-8	Fine sandy loam	SM, ML, ~~CL-ML~~, SM-SC	A-4	0-5	90-100	85-100	60-95	36-70	<30	NP-8
	8-30	Clay loam, clay	ML, CL, MH, CH	A-7	0-5	95-100	80-100	75-95	55-90	40-65	15-35
	30-37	Sandy clay loam, clay loam.	ML, SM	A-2, A-4, A-6, A-7	0-5	90-100	80-100	70-95	30-75	30-50	5-20
	37-45	Fine sandy loam, gravelly fine sandy loam.	SM, SM-SC, SC	A-4, A-2, A-1	0-15	75-100	50-100	30-75	20-50	10-30	NP-10
22C3-------------- Culpeper	0-8	Clay loam---------	ML, SM	A-2, A-4, A-6, A-7	0-5	90-100	80-100	70-95	30-75	30-50	5-20
	8-30	Clay loam, clay	ML, CL, MH, CH	A-7	0-5	95-100	80-100	75-95	55-90	40-65	15-35
	30-37	Sandy clay loam, clay loam.	ML, SM	A-2, A-4, A-6, A-7	0-5	90-100	80-100	70-95	30-75	30-50	5-20
	37-45	Fine sandy loam, gravelly fine sandy loam.	SM, SM-SC, SC	A-4, A-2, A-1	0-15	75-100	50-100	30-75	20-50	10-30	NP-10

TABLE 3.9

ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
23B, 23C---------- Davidson	0-4	Clay loam--------	CL, SC, CL-ML, SM-SC	A-6, A-4	0	94-100	84-100	75-95	40-70	25-40	5-18
	4-10	Clay loam--------	CL	A-6	0	96-100	90-100	75-95	50-75	25-40	11-25
	10-63	Clay--------------	CL, CH, ML, MH	A-7, A-6	0	96-100	95-100	85-100	65-85	35-65	15-35
	63-88	Clay, clay loam, sandy clay loam.	CL, ML	A-4, A-6, A-7	0	95-100	90-100	75-100	50-80	20-50	7-25
24B--------------- Dogue	0-10	Silt loam--------	ML, CL, SM, SC	A-4	0	95-100	75-100	60-100	40-85	<30	NP-10
	10-70	Clay loam, clay, sandy clay loam.	CL, CH, SC	A-6, A-7	0	95-100	75-100	65-100	40-90	35-60	16-40
25B, 25C---------- Dyke	0-8	Silt loam--------	ML, CL	A-6, A-7	0-5	90-100	75-100	70-100	60-90	20-35	10-20
	8-64	Clay, silty clay, silty clay loam.	MH, CH, ML, CL	A-7, A-6	0-15	85-100	75-100	65-90	55-80	35-60	10-30
26B3, 26C3, 26D3- Dyke	0-8	Clay loam--------	ML, CL	A-6, A-7	0-5	90-100	75-100	70-100	70-90	30-50	15-30
	8-64	Clay, silty clay, silty clay loam.	MH, CH, ML, CL	A-7, A-6	0-15	85-100	75-100	65-90	55-80	35-60	10-30
27B, 27C, 27D---- Elioak	0-8	Silt loam--------	ML, CL, SM	A-4, A-6, A-7	0-10	90-100	80-100	55-100	35-85	30-45	5-20
	8-39	Silty clay loam, clay loam, silty clay.	CL, CH, MH, ML	A-6, A-7	0-5	90-100	90-100	70-100	50-90	35-58	11-26
	39-72	Silt loam, loam, gravelly fine sandy loam.	ML, SM, GM	A-4, A-5, A-2	0-5	65-100	65-100	60-100	30-85	35-50	NP-10
28C3, 28D3-------- Elioak	0-8	Clay loam--------	ML, CL, SM	A-4, A-6, A-7	0-10	90-100	80-100	55-100	35-85	30-45	5-20
	8-39	Silty clay loam, clay loam, silty clay.	CL, CH, MH, ML	A-6, A-7	0-5	90-100	90-100	70-100	50-90	35-58	11-26
	39-72	Silt loam, loam, gravelly fine sandy loam.	ML, SM, GM	A-4, A-5, A-2	0-5	65-100	65-100	60-100	30-85	35-50	NP-10
29B, 29C, 29D, 29E--------------- Fauquier	0-6	Silt loam--------	CL, CL-ML	A-4, A-6	0	80-100	75-100	65-95	50-95	22-34	4-14
	6-34	Silty clay loam, clay, silty clay.	CL, CH, MH, SC	A-6, A-7	0-5	80-100	75-100	50-95	45-95	36-70	16-36
	34-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
30C3, 30D3-------- Fauquier	0-6	Silty clay loam	CL, CL-ML	A-4, A-6	0	80-100	75-100	65-95	50-95	22-34	4-14
	6-34	Silty clay loam, clay, silty clay.	CL, CH, MH, SC	A-6, A-7	0-5	80-100	75-100	50-95	45-95	36-70	16-36
	34-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
31C, 31D---------- Fauquier	0-6	Very stony silt loam.	SM-SC, CL, CL-ML, GC	A-4, A-6	5-25	60-80	55-70	50-60	45-60	22-34	4-14
	6-34	Silty clay loam, clay, gravelly silty clay.	CL, CH, MH, SC	A-6, A-7	0-5	80-100	70-100	50-95	45-95	36-70	16-36
	34-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
32B, 32C---------- Fluvanna	0-8	Silt loam--------	SM, SC, ML, CL	A-2, A-4, A-6	0	85-100	80-100	55-100	30-90	16-35	NP-16
	8-48	Clay, silty clay, silty clay loam.	MH, CH	A-7	0	95-100	95-100	85-100	70-95	50-80	25-50
	48-60	Clay loam, silty clay loam, gravelly clay loam.	CL, GC, SC	A-6, A-7, A-2	0-5	50-100	45-100	40-100	30-95	30-50	11-25

TABLE 3.9

ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
33C---------------- Fluvanna	0-8	Very stony silt loam.	SM, SC, ML, CL	A-2, A-4, A-6	5-25	85-100	80-100	55-100	30-90	<30	NP-16
	8-48	Clay, silty clay, silty clay loam.	MH, CH	A-7	0-5	95-100	95-100	85-100	70-95	50-80	25-50
	48-60	Clay loam, silty clay loam, gravelly clay loam.	CL, GC, SC	A-6, A-7, A-2	0-5	50-100	45-100	40-100	30-95	35-50	11-25
34B, 34C, 34D, 34E-------------- Glenelg	0-8	Loam---------------	ML	A-4, A-6	0	90-100	85-100	75-95	50-80	32-40	7-12
	8-28	Channery silt loam, silty clay loam, loam.	GM, ML, SM	A-4, A-6, A-7	0-10	60-100	55-90	50-90	35-85	34-46	9-15
	28-80	Loam, sandy loam, channery loam.	GM, SM, ML	A-1, A-2, A-4	0-50	60-100	15-95	15-90	10-70	<40	NP-6
35C*: Hartleton--------	0-7	Very stony loam	SM, ML	A-4	20-40	80-95	70-90	60-90	45-80	---	---
	7-32	Channery silt loam, very channery loam, channery silty clay loam.	GM, ML, SM	A-2, A-4	25-65	60-90	45-80	40-80	30-75	20-30	NP-7
	32-44	Very channery loam, very shaly silt loam.	SM, GM, ML	A-1, A-2, A-4	55-85	40-80	25-70	20-70	15-60	20-30	NP-7
	44	Weathered bedrock	---	---	---	---	---	---	---	---	---
Cataska----------	0-5	Very stony loam	CL-ML, ML, GM, GM-GC	A-4	10-30	45-80	45-75	40-70	40-60	<28	NP-6
	5-20	Slaty silt loam, channery silt loam, very channery silt loam.	GM-GC, GM, GP-GM	A-2, A-1	10-25	15-50	10-45	10-40	10-35	<28	NP-7
	20-38	Weathered bedrock	---	---	---	---	---	---	---	---	---
	38	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
36B, 36C, 36D, 36E-------------- Hayesville	0-7	Loam---------------	SM, SC, ML, CL	A-4	0	90-100	85-95	70-95	35-60	<25	NP-10
	7-58	Clay loam, clay	ML, MH, CL, CH	A-6, A-7	0	90-100	85-100	70-100	55-75	36-55	11-25
	58-83	Sandy clay loam, clay loam.	SM, ML, MH, CL	A-6, A-7	0-5	90-100	90-100	85-95	45-65	36-55	11-25
37B3, 37C3, 37D3, 37E3-------------- Hayesville	0-7	Clay loam---------	SM, SC, ML, CL	A-4	0	90-100	85-95	70-95	35-60	<25	NP-10
	7-58	Clay loam, clay	ML, MH, CL, CH	A-6, A-7	0	90-100	85-100	70-100	55-75	36-55	11-25
	58-83	Sandy clay loam, clay loam.	SM, ML, MH, CL	A-6, A-7	0-5	90-100	90-100	85-95	45-65	36-55	11-25
38C, 38D, 38E----- Hayesville	0-7	Very stony loam	SM, SC, ML, CL	A-4, A-6	5-25	90-100	85-100	60-95	36-75	<35	NP-15
	7-58	Clay loam, clay	ML, MH, CL, CH	A-6, A-7	0-5	90-100	85-100	75-100	60-95	35-70	11-30
	58-83	Sandy clay loam, clay loam.	SM, ML, MH, CL	A-2, A-6, A-7	0-5	90-100	85-100	70-100	30-80	30-55	11-25

TABLE 3.9

ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
39C, 39D, 39E---- Hazel	0-10	Loam---------------	ML, CL-ML	A-4	0-10	80-100	75-100	65-95	50-80	20-32	2-8
	10-20	Channery fine sandy loam, channery sandy loam, silt loam.	SM, SC, ML, GM	A-2, A-4, A-1	0-30	60-95	50-95	30-95	15-85	20-32	NP-8
	20-30	Channery fine sandy loam, channery loam, channery silt loam.	SM, SM-SC, GM, ML	A-2, A-4, A-1	0-30	60-80	45-70	30-70	20-60	20-32	NP-8
	30	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
40D, 40E--------- Hazel	0-10	Very stony loam	SM, SM-SC, SC	A-2, A-4	5-15	65-80	45-70	40-55	30-50	15-30	2-8
	10-20	Channery fine sandy loam, channery sandy loam, silt loam.	SM, SC, ML, GM	A-2, A-4, A-1	5-30	60-95	50-95	30-95	15-85	20-32	NP-8
	20-30	Channery fine sandy loam, channery loam, channery silt loam.	SM, SM-SC, GM, ML	A-2, A-4, A-1	0-30	60-80	45-70	30-70	20-60	20-32	NP-8
	30	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
41B, 41C--------- Hiwassee	0-8	Loam---------------	CL, ML, CL-ML	A-7, A-6, A-4	0-2	95-100	95-100	90-100	50-85	25-49	5-23
	8-64	Clay, silty clay, clay loam.	CL, ML, MH	A-7, A-7, A-6	0-2	95-100	95-100	80-100	51-95	40-80	12-36
42B3, 42C3, 42D3- Hiwassee	0-8	Clay loam---------	CL, ML, CL-ML	A-7, A-6, A-4	0-2	95-100	95-100	90-100	50-85	25-49	5-23
	8-64	Clay, silty clay, clay loam.	CL, ML, MH	A-7, A-7, A-6	0-2	95-100	95-100	80-100	51-95	40-80	12-36
43B, 43C, 43D, 43E-------------- Klinesville	0-4	Channery silt loam	GM, SM	A-2, A-4	0-10	55-85	45-60	35-50	25-40	---	---
	4-10	Channery silt loam, very shaly silt loam.	GM, GP, SM, SP	A-2, A-1, A-4	0-10	25-75	15-55	10-50	4-40	20-35	NP-9
	10-14	Channery silt loam, very shaly silt loam.	GM, GP, SM, SP	A-2, A-1	0-20	15-60	10-50	10-40	4-30	20-35	NP-7
	14	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
44C, 44D--------- Lew	0-7	Very stony silt loam.	ML, GM, CL, GC	A-2, A-4	5-70	35-85	30-75	28-70	25-60	<28	NP-8
	7-60	Channery clay loam, very channery silty clay loam.	ML, MH, GM, SM	A-2, A-4, A-6, A-7	15-70	40-90	30-75	28-75	25-70	32-56	8-20
45C, 45D--------- Lew	0-7	Extremely stony silt loam.	ML, GM, CL, GC	A-2, A-4	5-70	35-85	30-75	28-70	25-60	<28	NP-8
	7-60	Channery clay loam, very channery silty clay loam.	ML, MH, GM, SM	A-2, A-4, A-6, A-7	15-70	40-90	30-75	28-75	25-70	32-56	8-20

TABLE 3.9

ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification Unified	Classification AASHTO	Fragments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
46B-------------- Lignum	0-9	Silt loam---------	CL	A-4, A-6	0	95-100	95-100	80-100	55-90	20-35	9-19
	9-38	Silty clay loam, silty clay,	CH, CL	A-7	0-5	80-100	75-95	70-85	55-85	45-65	22-36
	38-58	Sandy clay loam, gravelly sandy clay loam, gravelly silty clay loam.	SC, CL, ML, SM	A-4, A-6, A-7, A-2	0-15	70-85	35-80	30-80	20-75	30-50	8-18
	58	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
47C, 47D, 47E---- Louisburg	0-5	Sandy loam--------	SM, SM-SC	A-2	0-15	80-100	75-95	50-80	25-35	<30	NP-6
	5-60	Sandy loam--------	SM, SM-SC	A-2, A-4	0-15	85-100	75-98	53-78	25-40	<40	NP-7
	60	Weathered bedrock	---	---	---	---	---	---	---	---	---
48D, 48E--------- Louisburg	0-5	Very stony sandy loam	SM	A-2, A-1	25-38	83-95	70-83	43-65	14-23	---	NP
	5-60	Stony sandy loam	SM, SM-SC	A-2, A-4	25-38	83-95	75-83	50-70	25-39	<40	NP-7
	60	Weathered bedrock	---	---	---	---	---	---	---	---	---
49B-------------- Manassas	0-18	Silt loam---------	ML, CL, CL-ML	A-4	0	90-100	85-100	75-100	55-90	20-34	2-15
	18-64	Silt loam, silty clay loam, clay loam.	CL, ML	A-6, A-4	0	90-100	85-100	80-100	60-95	30-45	7-20
50D, 50E--------- Manor	0-8	Loam--------------	ML	A-4, A-6	0	95-100	80-100	70-100	50-90	32-40	6-12
	8-18	Loam, silt loam, channery loam.	SM, ML, GM	A-4, A-6	0-10	70-95	60-95	50-95	35-85	26-40	4-12
	18-62	Loam, sandy loam, channery sandy loam.	SM, ML, CL-ML, SM-SC	A-1, A-2, A-4, A-6	0-5	70-100	60-100	35-95	20-75	20-40	2-12
51B, 51C, 51D, 51E-------------- Manteo	0-6	Channery silt loam.	GM, ML, CL, GC	A-4	10-25	60-100	55-95	50-90	36-85	18-32	2-15
	6-18	Very channery silt loam, channery silt loam, channery clay loam.	GM, GC, ML, CL	A-1, A-2, A-4, A-6	15-40	40-90	30-90	30-85	20-80	18-38	2-20
	18	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
52D, 52E--------- ~~Manteo~~	0-6	Very channery silt loam.	GM, ML, CL, GC	A-1, A-2, A-4, A-6	25-40	45-90	35-90	30-85	20-80	18-32	2-15
	6-18	Very channery silt loam, channery silt loam, channery clay loam.	GM, GC, ML, CL	A-1, A-2, A-4, A-6	15-40	40-90	30-90	30-85	20-80	18-38	2-20
	18	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
53B, 53C--------- Masada	0-7	Loam--------------	ML, SM, SC, CL	A-4	0-5	90-100	75-100	60-85	35-70	<30	NP-8
	7-33	Clay loam, clay, gravelly clay.	MH, ML, CH, CL	A-7	0-10	80-100	70-100	65-90	50-80	45-65	20-35
	33-62	Clay loam, gravelly clay loam.	CL	A-6, A-7	0-10	80-100	70-100	65-90	50-80	30-45	15-25
54B, 54C--------- Mayodan	0-10	Loam--------------	SM, ML, SM-SC	A-2, A-4	0-5	92-100	90-100	49-75	30-65	<36	NP-5
	10-53	Clay, clay loam, sandy clay.	MH, CH	A-7	0-2	95-100	95-100	95-100	50-90	60-80	28-40
	53-60	Weathered bedrock	---	---	---	---	---	---	---	---	---

TABLE 3.9

ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
55B-------------- McQueen	0-7	Loam--------------	ML, CL-ML	A-4	0	95-100	95-100	85-100	70-95	<40	NP-10
	7-42	Silty clay, clay loam, clay.	ML, CL	A-7, A-6	0	95-100	95-100	90-100	85-98	30-50	10-25
	42-52	Clay loam, silty clay loam, sandy clay loam.	ML, CL	A-6, A-4, A-7	0	95-100	95-100	90-100	60-90	28-43	8-20
	52-64	Sandy clay loam, clay loam, sandy loam.	CL, SM-SC, SC, ML	A-2, A-4, A-6	0	95-100	95-100	50-100	15-65	<35	NP-20
56B, 56C--------- Meadowville	0-14	Loam--------------	ML, CL, CL-ML	A-4	0	90-100	75-100	65-95	50-85	18-32	2-10
	14-46	Loam, silty clay loam, clay loam.	CL, ML	A-4, A-6, A-7	0	90-100	75-100	65-95	50-85	28-50	8-20
	46-73	Sandy clay loam, sandy clay.	SC, CL, MH, CH	A-2, A-6, A-7	0-5	75-95	75-95	60-85	25-55	30-55	10-24
57B-------------- Mount Lucas	0-10	Silt loam---------	ML	A-4	0-5	95-100	80-100	75-95	60-90	---	---
	10-48	Silt loam, gravelly silty clay loam, sandy clay loam.	ML, GM, SM	A-4, A-2, A-7, A-5	0-10	70-95	55-95	45-95	30-90	30-49	3-15
	48-64	Gravelly clay loam, gravelly loam, gravelly loamy sand.	SP-SM, SM, ML, GM	A-2, A-4, A-6, A-1	0-10	45-80	30-70	15-70	10-55	25-40	NP-11
58B, 58C, 58D, 58E-------------- Myersville	0-7	Silt loam---------	ML, CL, CL-ML	A-4	0-3	95-100	95-100	80-95	55-85	18-28	2-10
	7-28	Silty clay loam, clay loam, channery clay loam.	CL	A-6	0-3	70-95	60-95	55-90	50-85	28-38	12-20
	28-44	Silt loam, channery silt loam, very channery clay loam.	CL, CL-ML, GM, GC	A-1, A-2, A-3, A-4	0-3	25-90	20-85	12-75	8-60	<28	NP-10
	44-65	Weathered bedrock	---	---	---	---	---	---	---	---	---
59C, 59D, 59E---- Myersville	0-7	Very stony silt loam.	ML, CL, CL-ML	A-4	5-25	95-100	90-100	80-95	55-85	18-28	2-10
	7-28	Silty clay loam, clay loam, channery clay loam.	CL	A-6	3-20	75-95	70-95	55-90	50-85	28-38	12-20
	28-44	Silty clay loam, channery silt loam, very channery clay loam.	CL, CL-ML, GM, GC	A-1, A-2, A-3, A-4	3-20	30-85	20-75	12-70	8-65	<28	NP-10
	44-65	Weathered bedrock	---	---	---	---	---	---	---	---	---
60C*, 60D*, 60E*: Myersville-------	0-7	Very stony silt loam.	ML, CL, CL-ML	A-4	5-25	95-100	90-100	80-95	55-85	18-28	2-10
	7-28	Silty clay loam, clay loam, channery clay loam.	CL	A-6	3-20	75-95	70-95	55-90	50-85	28-38	12-20
	28-44	Silty clay loam, channery silt loam, very channery clay loam.	CL, CL-ML, GM, GC	A-1, A-2, A-3, A-4	3-20	30-85	20-75	12-70	8-65	<28	NP-10
	44-65	Weathered bedrock	---	---	---	---	---	---	---	---	---

TABLE 3.9

ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
60C*, 60D*, 60E*: Catoctin--------	0-5	Very stony silt loam.	ML, CL, CL-ML	A-4	5-20	80-90	75-85	70-80	60-70	<30	NP-8
	5-18	Channery silt loam, channery silty clay loam, cobbly silt loam.	SM, SC, CL, GM	A-2, A-4, A-6	0-25	50-80	35-75	30-60	25-60	20-34	2-12
	18-28	Very channery silt loam, channery silt loam.	SM, SC, GC, GM	A-2, A-4, A-1, A-3	10-40	30-75	10-60	9-55	7-50	<28	NP-8
	28	Weathered bedrock	---	---	---	---	---	---	---	---	---
61D*, 61E*: Myersville-------	0-7	Very stony silt loam.	ML, CL, CL-ML	A-4	5-25	95-100	90-100	80-95	55-85	18-28	2-10
	7-28	Silty clay loam, clay loam, channery clay loam.	CL	A-6	3-20	75-95	70-95	55-90	50-85	28-38	12-20
	28-44	Silty clay loam, channery silt loam, very channery clay loam.	CL, CL-ML, GM, GC	A-1, A-2, A-3, A-4	3-20	30-85	20-75	12-70	8-65	<28	NP-10
	44-65	Weathered bedrock	---	---	---	---	---	---	---	---	---
Rock outcrop.											
62B, 62C, 62D---- Nason	0-8	Silt loam---------	ML, CL-ML, SM	A-4	0-5	80-100	75-100	55-95	35-85	<38	NP-10
	8-39	Silty clay loam, silty clay, clay.	CL, CH	A-7	0-5	80-100	75-100	70-95	65-90	40-60	15-30
	39-50	Channery silt loam, silt loam.	CL-ML, SC, GM-GC	A-2, A-4, A-6	0-5	50-80	45-75	40-75	30-70	20-35	4-12
63B--------------- Orange	0-9	Silt loam---------	SM, ML, CL-ML, SM-SC	A-4	0	90-95	85-95	75-95	45-85	<24	NP-6
	9-33	Clay, silty clay, silty clay loam.	CH	A-7	0	90-95	85-95	75-95	65-90	70-99	45-70
	33-60	Silt loam, very channery silt loam, sandy clay loam.	SC, CL	A-6, A-7	0-40	70-100	50-100	45-100	40-90	25-45	10-25
64B--------------- Orange	0-9	Very stony silt loam.	SM, ML, CL-ML, SM-SC	A-4	5-25	90-95	85-95	75-95	45-85	<24	NP-6
	9-33	Clay, silty clay, silty clay loam.	CH	A-7	0-15	90-95	85-95	75-95	65-90	70-99	45-70
	33-60	Silt loam, very channery silt loam, sandy clay loam.	CL, SC	A-6, A-7	0-15	70-100	50-100	45-100	40-90	25-45	10-25
65B, 65C---------- Pacolet	0-6	Sandy loam--------	SM, SM-SC	A-2, A-1	0-2	85-100	80-100	42-80	16-35	<28	NP-7
	6-32	Sandy clay, clay loam, clay.	ML, MH, CL	A-6, A-7	0-1	80-100	80-100	60-95	51-75	38-65	11-30
	32-60	Clay loam, sandy clay loam, sandy loam.	CL, CL-ML, SM-SC, SC	A-2, A-4, A-6	0-2	80-100	70-100	60-80	30-60	20-35	5-15

TABLE 3.9

ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
66C, 66D, 66E---- Parker	0-14	Very stony sandy loam.	GM, GP-GM	A-1, A-2	5-10	40-60	25-50	15-45	10-30	10-20	2-7
	14-38	Very gravelly loam, cobbly sandy loam, very gravelly sandy loam.	GM, GP-GM, GC	A-1, A-2	5-10	40-60	30-55	20-50	10-35	15-25	2-10
	38-67	Very gravelly sandy loam, very gravelly loam.	GM, GP, GC	A-1, A-2	5-15	20-40	5-30	3-25	2-20	15-25	2-10
67D, 67E--------- Parker	0-14	Extremely stony sandy loam.	GM, GP-GM	A-1, A-2	10-15	40-60	25-50	15-45	10-30	10-20	2-7
	14-38	Very gravelly loam, cobbly sandy loam, very gravelly sandy loam.	GM, GP-GM, GC	A-1, A-2	5-10	40-60	30-55	20-50	10-35	15-25	2-10
	38-67	Very gravelly sandy loam, very gravelly loam.	GM, GP, GC	A-1, A-2	5-15	20-40	5-30	3-25	2-20	15-25	2-10
68B, 68C, 68D---- Penn	0-7	Silt loam---------	ML	A-4	0-5	95-100	90-100	85-95	60-85	---	---
	7-21	Shaly silt loam, shaly loam, shaly silty clay loam.	ML, SM, GM	A-4, A-2	0-10	55-100	50-100	45-95	30-75	20-37	1-10
	21-29	Very shaly silt loam, very shaly loam.	ML, CL, SM, GM	A-4, A-2, A-1	0-15	35-100	20-100	15-95	15-70	20-35	3-10
	29	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
69*. Pits											
70C, 70D, 70E---- Porters	0-8	Very stony loam	ML, SM, SM-SC, CL-ML	A-2, A-4	5-35	75-95	70-85	50-70	30-55	<30	NP-7
	8-26	Loam, clay loam	ML, SM	A-4, A-7, A-5	5-15	80-95	70-85	60-70	36-55	35-50	4-15
	26-32	Loam, sandy loam	SM, SM-SC	A-2, A-4	5-25	75-99	60-99	50-90	30-50	<25	NP-7
	32-59	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
71B, 71C, 71D, 71E------------ Rabun	0-6	Clay loam--------	ML, CL, SM, SC	A-6, A-7, A-4	0-2	90-100	75-100	70-100	45-70	25-45	6-20
	6-48	Clay loam, clay, silty clay.	ML, CL, MH, CH	A-7	0-5	90-100	80-100	65-96	55-90	41-61	12-30
	48-63	Clay, clay loam, silty clay loam.	ML, CL	A-7, A-6	0-13	90-100	70-100	65-95	51-85	36-50	11-23
72B3, 72C3, 72D3, 72E3------------ Rabun	0-4	Clay--------------	ML, CL, MH, CH	A-7	0-5	90-100	70-100	65-96	51-90	41-61	12-30
	4-48	Clay, silty clay, clay loam.	MH, CH, ML, CL	A-7	0-5	90-100	80-100	65-96	55-90	41-61	12-30
	48-63	Clay, clay loam, silty clay loam.	ML, CL	A-7, A-6	0-13	90-100	70-100	65-95	51-85	36-50	12-23
73C, 73D, 73E---- Rabun	0-6	Very stony clay loam	SM-SC, SM, SC	A-4, A-6	15-25	75-95	55-85	50-80	35-50	20-35	4-12
	6-48	Clay loam, clay	ML, CL, MH, CH	A-7	0-5	90-100	80-100	65-96	55-86	41-61	12-30
	48-63	Clay, cobbly loam, gravelly clay loam.	ML, CL, MH, CH	A-6, A-7	5-20	80-95	70-90	55-85	51-80	35-60	11-28

TABLE 3.9

ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
74B, 74C, 74D----Rapidan	0-6	Silt loam--------	ML, CL-ML, CL	A-4	0-5	85-100	80-100	70-95	55-90	20-35	NP-10
	6-54	Silty clay loam, clay, shaly silty clay loam.	CL, CH, MH, SC	A-6, A-7	0-5	75-100	50-100	50-95	45-90	40-70	20-40
	54-70	Very shaly silty clay loam, very shaly clay loam, loam.	GM, GC	A-2, A-4, A-6	35-50	40-60	35-50	35-50	30-45	25-45	7-20
75C3, 75D3-------Rapidan	0-6	Silty clay loam	CL, ML	A-4, A-6	0-5	85-100	80-100	75-95	65-95	30-45	10-20
	6-54	Silty clay loam, clay, shaly silty clay loam.	CL, CH, MH, SC	A-6, A-7	0-5	75-100	50-100	50-95	45-90	40-70	20-40
	54-70	Very shaly silty clay loam, very shaly clay loam, loam.	GM, GC	A-2, A-4, A-6	35-50	40-60	35-50	35-50	30-45	25-45	7-20
76---------------Riverview	0-12	Loam---------------	CL, CL-ML, ML	A-4	0	100	100	90-100	60-80	15-30	5-10
	12-35	Sandy clay loam, silty clay loam, loam.	CL, ML, CL-ML	A-4, A-6	0	100	100	90-100	60-95	20-40	4-20
	35-60	Loamy fine sand, sandy loam, sand.	SM, SC, SM-SC	A-2, A-4, A-6	0	100	100	50-95	15-45	<30	NP-7
77*:											
Riverview-------	0-12	Loam---------------	CL, CL-ML, ML	A-4	0	100	100	90-100	60-80	15-30	5-10
	12-35	Sandy clay loam, silty clay loam, loam.	CL, ML, CL-ML	A-4, A-6	0	100	100	90-100	60-95	20-40	4-20
	35-60	Loamy fine sand, sandy loam, sand.	SM, SC, SM-SC	A-2, A-4, A-6	0	100	100	50-95	15-45	<30	NP-7
Chewacla--------	0-8	Silt loam---------	ML, CL, CL-ML	A-4, A-6, A-7	0	98-100	95-100	70-100	55-90	25-49	4-20
	8-60	Silt loam, silty clay loam, clay loam.	ML, CL	A-4, A-6, A-7	0	96-100	95-100	80-100	51-98	30-49	4-22
78---------------Rowland	0-11	Silt loam---------	ML, SM	A-4	0-5	95-100	95-100	75-100	35-95	---	---
	11-38	Silt loam, loam, sandy clay loam.	ML, SM	A-4, A-7, A-6	0-5	95-100	95-100	75-100	35-95	24-45	NP-15
	38-60	Sandy clay, silt loam, gravelly silty clay loam.	ML, SM	A-4, A-6, A-7	0-10	90-100	70-100	65-100	35-95	25-50	3-17
79B--------------Starr	0-18	Silt loam---------	ML, CL-ML, CL	A-4, A-6, A-7	0	90-100	90-100	70-95	51-85	20-50	3-23
	18-68	Clay loam, sandy clay loam, silty clay loam.	ML, CL-ML, CL	A-4, A-6, A-7	0	95-100	95-100	70-95	51-80	20-50	3-23
80B, 80C---------Tatum	0-6	Silt loam---------	ML, CL, SM	A-4	0	85-100	80-100	65-100	40-90	20-34	NP-10
	6-42	Silty clay loam, silty clay, clay.	MH	A-7	0	75-100	70-100	60-100	55-95	50-80	10-36
	42-51	Silt loam, loam, silty clay loam.	CL	A-6, A-7	0	75-100	70-100	60-90	60-85	30-45	12-20
	51	Weathered bedrock	---	---	---	---	---	---	---	---	---

TABLE 3.9

ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag-ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct					Pct	
81B, 81C, 81D---- Thurmont	0-10	Loam-------------	SM, ML, CL, SM-SC	A-2, A-4	0-3	80-100	75-100	55-70	25-65	<30	NP-10
	10-46	Clay loam, loam, gravelly sandy clay loam.	SC, CL	A-2, A-6, A-7	0-5	80-100	70-90	65-80	30-60	30-45	12-20
	46-56	Sandy loam, sandy clay loam, gravelly sandy clay loam.	SC	A-2, A-6, A-7	0-5	75-90	70-90	45-75	30-45	30-45	12-25
	56-68	Cobbly sandy loam, gravelly sandy clay loam.	SM, SM-SC	A-1, A-2	0-30	70-85	50-75	30-50	15-35	<20	NP-7
82C, 82D--------- Thurmont	0-10	Very stony loam	SM, ML, CL, SM-SC	A-1, A-2, A-4	5-25	75-95	60-80	40-70	20-55	<30	NP-10
	10-46	Clay loam, loam, gravelly sandy clay loam.	SC, CL	A-2, A-6, A-7	2-20	75-90	55-75	45-70	20-55	25-45	7-25
	46-56	Sandy loam, sandy clay loam, gravelly sandy clay loam.	SC, CL	A-2, A-6, A-7	2-20	75-90	55-75	35-60	20-40	25-40	7-20
	56-68	Cobbly sandy loam, gravelly sandy clay loam.	SM, SM-SC	A-1, A-2	15-40	70-85	45-75	30-50	15-35	<20	NP-7
83--------------- Toccoa	0-9	Fine sandy loam	SM, ML	A-2, A-4	0	98-100	95-100	85-100	20-60	<30	NP-4
	9-66	Sandy loam, loam	SM, ML	A-2, A-4	0	95-100	90-100	60-100	30-55	<30	NP-4
84B, 84C--------- Totier	0-8	Silt loam--------	ML, CL	A-4	0	90-100	75-100	70-95	60-90	20-35	NP-15
	8-40	Silty clay, clay, shaly silty clay loam.	ML, MH, CL, CH	A-6, A-7	0	95-100	60-100	60-100	55-95	45-70	25-45
	40-49	Shaly silty clay loam, very shaly silt loam, shaly silty clay.	SC, SM	A-2, A-4, A-6	0-5	60-95	25-70	25-65	20-60	30-45	10-25
	49-63	Weathered bedrock	---	---	---	---	---	---	---	---	---
85C3------------- Totier	0-8	Silty clay loam	ML, CL	A-6, A-7	0	90-100	75-100	70-100	65-95	30-45	10-25
	8-40	Silty clay, clay, shaly silty clay loam.	ML, MH, CL, CH	A-6, A-7	0	95-100	60-100	60-100	55-95	45-70	25-45
	40-49	Shaly silty clay loam, very shaly, silt loam, shaly silty clay.	SC, SM	A-2, A-4, A-6	0-5	60-95	25-70	25-65	20-60	30-45	10-25
	49-63	Weathered bedrock	---	---	---	---	---	---	---	---	---
86B, 86C--------- Turbeville	0-12	Loam--------------	ML, SM, CL-ML	A-2, A-4	0-20	80-100	75-100	50-90	30-75	<28	NP-7
	12-75	Clay, clay loam, sandy clay.	CL, MH, CH	A-7	0-20	70-100	65-100	60-100	55-95	45-65	16-35
87B, 87C, 87D---- Tusquitee	0-9	Stony loam-------	ML, MH, SM	A-5, A-7	2-10	90-100	80-100	65-95	40-75	40-55	5-15
	9-45	Clay loam, sandy clay loam, loam.	ML, CL-ML, SM-SC, SM	A-4, A-6	2-15	90-100	75-100	65-95	36-75	25-40	4-12
	45-63	Gravelly sandy loam, gravelly fine sandy loam.	GM, SM-SC, SM, GM-GC	A-4, A-1, A-2	15-50	45-90	40-85	30-75	13-50	<25	NP-7
88. Udorthents											

TABLE 3.9

ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
89B, 89C---------- Unison	0-6	Silt loam----------	CL, ML CL-ML, SM	A-4, A-6	0-25	75-100	75-100	60-95	50-90	20-38	2-15
	6-58	Clay loam, clay gravelly silty clay.	CL, CH	A-6, A-7	0-25	75-100	65-100	60-100	55-95	35-65	15-35
	58-60	Cobbly clay loam, silty clay loam, very gravelly loam.	CL-ML, CL ML, GM-GC	A-1, A-2, A-6, A-7	10-45	30-90	25-85	20-85	15-80	20-50	5-20
90B, 90C, 90D----- Unison	0-6	Very stony silt loam.	CL, ML, CL-ML, SM	A-4, A-6	5-40	75-100	75-100	60-95	50-90	20-38	2-15
	6-58	Clay loam, clay, gravelly silty clay.	CL, CH	A-6, A-7	0-25	75-100	65-100	60-100	55-95	35-65	
	58-60	Cobbly clay loam, silty clay loam, very gravelly loam.	CL-ML, CL, ML, GM-GC	A-1, A-2, A-6, A-7	10-45	30-90	25-85	20-85	15-80	20-50	5-20
91*. Urban land											
92---------------- Wahee	0-9	Silt loam----------	ML, CL-ML	A-4	0	100	100	90-98	51-75	20-35	2-10
	9-60	Clay, clay loam, silty clay.	CL, CH	A-6, A-7	0	100	100	85-100	51-90	38-70	18-42
93C, 93D, 93E----- Watt	0-10	Channery silt loam.	CL-ML, ML, SM	A-4, A-6	10-20	80-90	50-80	45-75	40-60	15-35	NP-15
	10-18	Channery silt loam, channery silty clay loam.	SM-SC, CL, CL-ML	A-4, A-6	10-20	80-90	50-80	45-80	40-70	20-40	5-20
	18-28	Very channery silt loam, channery silt loam, channery loam.	GM, GM-GC, GC	A-2, A-4, A-6	15-40	60-80	30-55	25-50	20-45	15-35	NP-15
	28-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
94B, 94C---------- Wedowee	0-7	Sandy loam--------	SM, SM-SC	A-4, A-2	0	95-100	90-100	60-99	23-50	<30	NP-6
	7-11	Loam, sandy clay loam.	SM, SC, CL, ML	A-4, A-6	0	90-100	90-100	80-97	40-75	<32	NP-15
	11-30	Sandy clay, clay loam, clay.	SC, ML, CL, SM	A-6, A-7	0	95-100	95-100	65-97	45-71	30-58	10-25
	30-60	Variable----------	---	---	---	---	---	---	---	---	---
95---------------- Wehadkee	0-10	Silt loam----------	CL, MH, ML	A-6, A-7	0	100	98-100	85-100	51-98	30-58	10-24
	10-52	Loam, sandy clay loam, clay loam.	ML, CL, CL-ML	A-6, A-7, A-4	0	100	99-100	85-100	51-85	25-45	7-20
	52-62	Variable----------	---	---	---	---	---	---	---	---	---
96B--------------- Worsham	0-9	Loam--------------	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	70-100	50-90	20-35	4-12
	9-54	Sandy clay loam, sandy clay, clay.	SC, CH, CL	A-2, A-7	0-5	90-100	85-100	70-100	30-95	42-66	22-40
	54-60	Sandy loam, sandy clay loam, clay loam.	SC, CL	A-2, A-4, A-6, A-7	0-10	90-95	80-95	50-90	30-70	20-50	8-30

Source: Soil Survey of Albemarle County, Virginia, 1985.

Table 3.6 summarizes some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils. More specific data on physical and chemical properties of soils is provided in Table 3.8.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In Table 3.8, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field bar moisture tension. Weight is determined after drying the soil at 105 degrees C. The estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root kind penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are low, a change of less than 3 percent; moderate, 3 to 6 percent; and high, more than 6 percent. Very high, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water than can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion and the amount of soil lost. Soils in Albemarle County have not been assigned to these groups.

Organic matter is the plant and animal residue in the soil at various stages of decomposition.

In Table 3.8, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Table 3.9 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet. The depth to the upper and lower boundaries of each layer are indicated for each soil type.

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as 15 percent, an appropriate modifier is added, for example, "channery."

Classification of the soils is determined according to the Unified soil classification system and the system adopted by the American Association of State Highway and Transportation Officials.

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as Pt. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey are and in nearby areas and on estimates made in the field.

Liquid limit and plasticity index (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table .

3.1.1.3 Wildlife

There is a great variety of wildlife species within the project study area. The mountainous areas of the county contain the most dense populations of wildlife, but habitat is provided in most wooded and open areas. Edge areas provide good habitat where woodlands and fields meet. Species hunted or trapped include: 14 mammals, 5 upland birds, a variety of ducks and geese, and 1 reptile. Because of Virginia's location within the Atlantic flyway and the number of lakes, ponds and streams in the area waterfowl hunting is on the rise in Albemarle County. The three most heavily hunted game species within the study area are white-tailed deer, wild turkey and black bear (Table 3.10). Deer and wild turkey are considered indicator species by the Department of Game and Inland Fisheries, and populations are mapped in Figures 3.12 and 3.13. The eastern cottontail rabbit and gray squirrel are also widely hunted. Both the red and gray fox are hunted for the chase. Important furbearers which are trapped for their pelts include beaver, muskrat and raccoon (Table 3.11).

The project area also is host to a multitude of non-game species. A variety of birds nest or migrate throughout the area, 32 species of non-game mammals live in the available habitats, and the herpta fauna of the county is extensive. Tables 3.12 through 3.15 list all birds, mammals, reptiles, and amphibious that may occur within Albemarle County. The bird list (Table 3.12) includes current records of breeding status based on information provided from the Virginia Atlas Project. Other species on this list are migrants within the county, compiled from a number of sources. This list does not include all species that may be found at one time or another, as an effort was made not to include species that would be considered extreme vagrants, occurring only very rarely in the county.

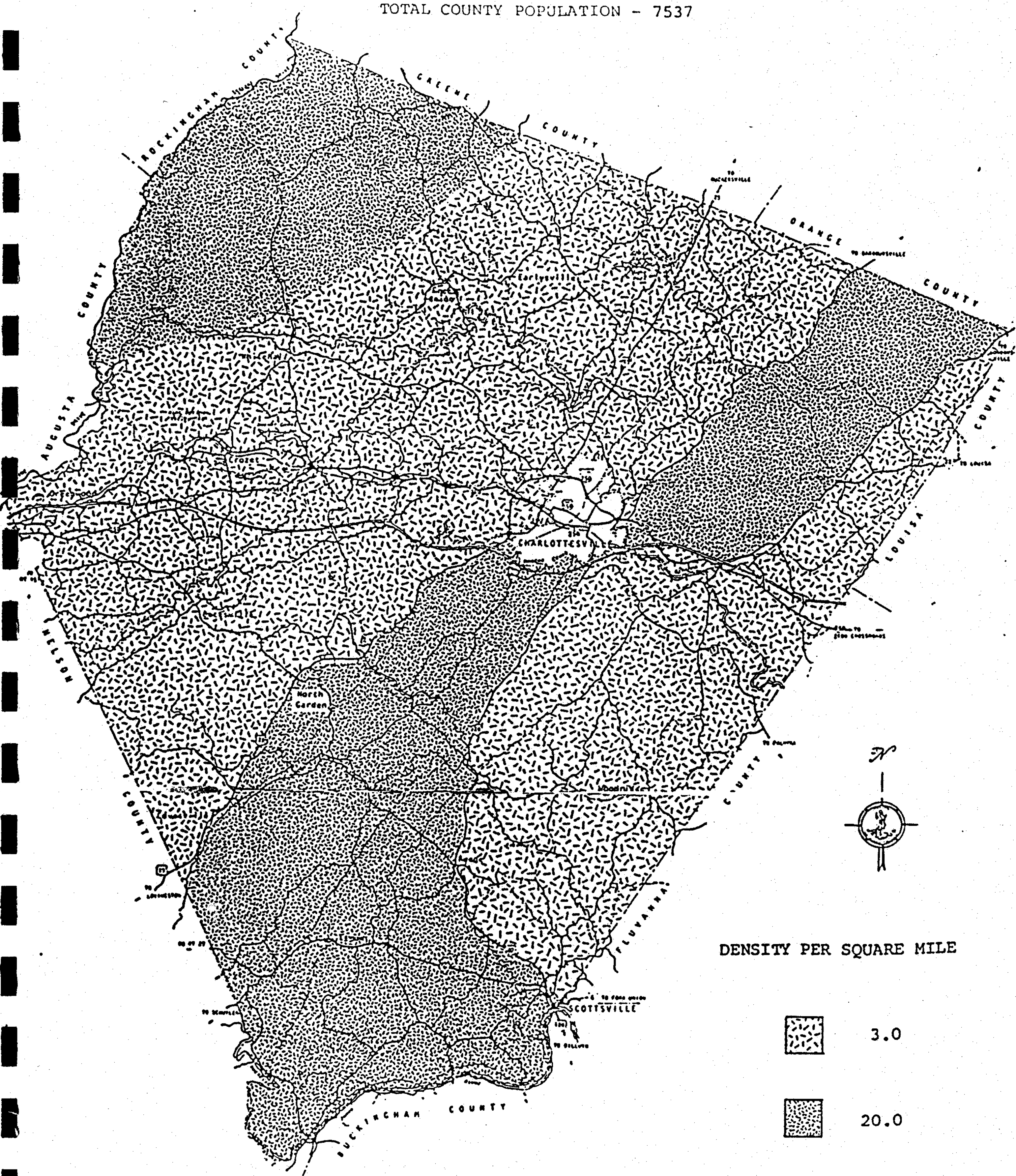
TABLE 3.10
BIG GAME HARVEST SUMMARIES FOR ALBEMARLE COUNTY, VIRGINIA.
1978 THROUGH 1988

SPECIES	TOTAL 1978	TOTAL 1979	TOTAL 1980	TOTAL 1981	TOTAL 1982	TOTAL 1983	TOTAL 1984	TOTAL 1985	TOTAL 1986	TOTAL 1987	TOTAL 1988
White-tailed Deer (Total)	1384	1178	1298	1453	1523	1458	1212	1703	1808	2059	1598
Antlered Bucks	969	853	896	1016	999	876	809	1052	1109	1249	1027
Black Bear	18	12	22	46	37	36	32	15	61	39	47
Wild Turkey											
Fall Harvest	72	214	286	182	282	252	171	214	261	359	172
Spring Harvest	49	99	85	115	105	100	90	102	103	92	110

Source: Commonwealth of Virginia Department of Game and Inland Fisheries "Preliminary" Harvest Comparison data.

FIGURE 3.12 1982 DEER POPULATION

TOTAL COUNTY POPULATION - 7537



1982 TURKEY POPULATION

TOTAL COUNTY POPULATION - 3344

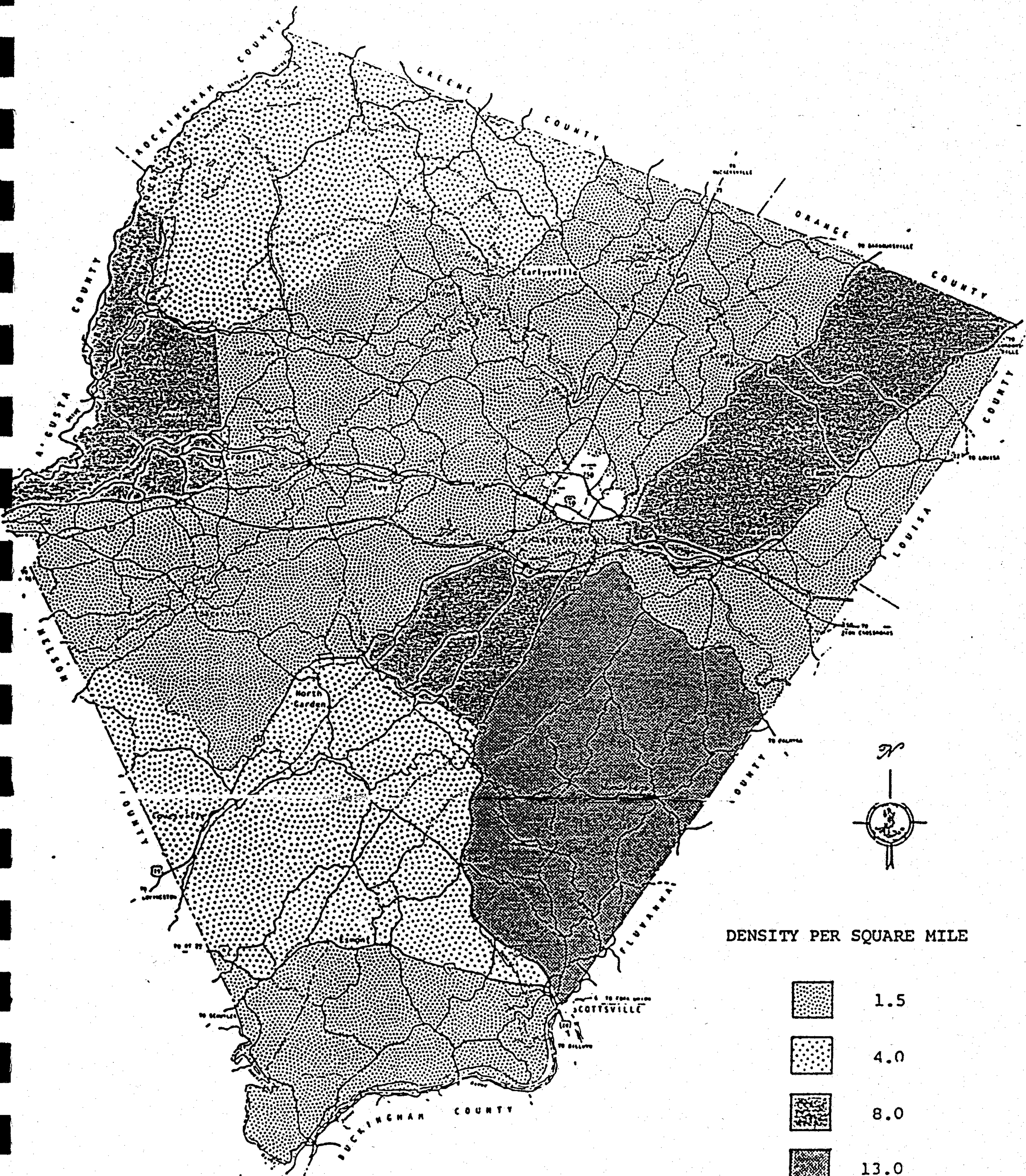


TABLE 3.11
RECENT WILDLIFE HARVEST TRAPPING DATA
IN THE NORTH PIEDMONT

SPECIES	YEAR	DISTRICT[1]	HARVEST
Beaver	1985-1986	10	257 ± 146
		State	6305 ± 630
Bobcat	1985-1986	10	14 ± 12
		State	223 ± 40
Gray Fox	1985-1986	10	284 ± 202
		State	8133 ± 407
Red Fox	1985-1986	10	338 ± 179
		State	7105 ± 639
Mink	1985-1986	10	94 ± 69
		State	2289 ± 320
Muskrat	1985-1986	10	679 ± 278
		State	50304 ± 4527
Opossum	1985-1986	10	4 ± 3
		State	8877 ± 799
Otter	1985-1986	10	34 ± 15
		State	641 ± 51
Racoon	1985-1986	10	1291 ± 710
		State	16445 ± 658
Skunk	1985-1986	10	14 ± 10
		State	2370 ± 379

[1] District 10 includes the North Piedmont Counties of Albemarle, Louisa, Greene, Fluvanna and Nelson.

Source: Virginia Game Survey (Project W-74-R-5)

TABLE 3.12
BIRDS OF THE STUDY AREA - ALBEMARLE COUNTY

		BREEDING STATUS[1]
ORDER PODICIPITIFORMES		
Family Podicipedidae		
Podilymbus podiceps	Pied-billed Grebe	Possible
ORDER CICONIIFORMES		
Family Ardeidae		
Ardea herodias	Great Blue Heron	Observed
Bubulcus ibis	Cattle Egret	
Butorides striatus	Green-backed Heron	Confirmed
Casmerodius albus	Great Egret	
Egretta caerulea	Little Blue Heron	
Nycticorax nyticorax	Black-crowned Night Heron	
Nycticorax violaceus	Yellow-crowned Night Heron	
ORDER ANSERIFORMES		
Family Anatidae		
Aix sponsa	Wood Duck	Confirmed
Anas crecca	Green-winged Teal	
Anas discors	Blue-winged Teal	
Anas platyrhynchos	Mallard	Confirmed
Anas rubripes	American Black Duck	Probable
Aythya affinis	Lesser Scaup	
Aythya americana	Redhead	
Aythya collaris	Ring-necked Duck	
Aythya valisineria	Canvasback	
Branta canadensis	Canada Goose	Confirmed
Bucephala albeola	Bufflehead	
Lophodytes cucullatus	Hooded Merganser	
Mergus merganser	Common Merganser	
ORDER FALCONIFORMES		
Family Cathartidae		
Cathartes aura	Turkey Vulture	Confirmed
Coragyps atratus	Black Vulture	Confirmed
Family Accpitridae		
Subfamily Pandioninae		
Pandion haliaetus	Osprey	Observed

TABLE 3.12
BIRDS OF THE STUDY AREA - ALBEMARLE COUNTY
(continued)

		BREEDING STATUS[1]
ORDER FALCONIFORMES (continued)		
Subfamily Accipitrinae		
Accipiter cooperii	Cooper's Hawk	Observed
Accipiter striatus	Sharp-shinned Hawk	Observed
Buteo jamaicensis	Red-tailed Hawk	Confirmed
Buteo lineatus	Red-shouldered Hawk	Confirmed
Buteo platypterous	Broad-winged Hawk	Confirmed
Family Falconidae		
Falco sparverius	American Kestrel	Observed
ORDER GALLIFORMES		
Family Phasianidae		
Bonasa umbellus	Ruffed Grouse	Possible
Colinus virginianus	Northern Bobwhite	Confirmed
Meleagris gallopavo	Wild Turkey	Confirmed
Phasianus calchicus	Ring-necked Pheasant	Probable
ORDER GRUIFORMES		
Family Rallidae		
Fulica americana	American Coot	
ORDER CHARADRIIFORMES		
Family Charadriidae		
Charadrius vociferus	Killdeer	Confirmed
Family Scolopacidae		
Actitis macularia	Spotted Sandpiper	Possible
Bartramia longicauda	Upland Sandpiper	
Calidris fuscicollis	White-rumped Sandpiper	
Calidris melanotos	Pectoral Sandpiper	
Calidris pusilla	Semipalmated Sandpiper	
Gallinago gallinago	Common Snipe	
Scolopax minor	American Woodcock	Probable
Tringa flavipes	Lesser Yellowlegs	
Tringa solitaria	Solitary Sandpiper	
Family Laridae		
Chlidonias niger	Black Tern	
Larus argentatus	Herring Gull	
Larus delawarensis	Ring-billed Gull	

TABLE 3.12
BIRDS OF THE STUDY AREA - ALBEMARLE COUNTY
(continued)

		BREEDING STATUS[a]
ORDER COLUMBIFORMES		
Family Columbidae		
Columba livia	Rock Dove	Confirmed
Zenaida macroura	Mourning Dove	Confirmed
ORDER CUCULIFORMES		
Family Cuculidae		
Coccyzus americanus	Yellow-billed Cuckoo	Confirmed
Coccyzus erythropthalmus	Black-billed Cuckoo	Confirmed
ORDER STRIGIFORMES		
Family Tytonidae		
Tyto alba	Common Barn-owl	Possible
Family Strigidae		
Aegolius acadicus	Northern Saw-Whet Owl	Observed
Asio falmmeus	Short-eared Owl	
Asio otus	Long-eared Owl	
Bubo virginianus	Great Horned Owl	Probable
Otus asio	Eastern Screech-owl	Probable
Strix varia	Barred Owl	Probable
ORDER CAPRIMULGIFORMES		
Family Caprimuligidae		
Caprimulgus carolinensis	Chuck-will's-widow	Possible
Caprimulgus vociferus	Whip-poor-will	Confirmed
Chordeiles minor	Common Nighthawk	Possible
ORDER APODIDIFORMES		
Family Apodidae		
Chaetura pelagica	Chimney Swift	Confirmed
Family Trochilidae		
Archilochus colubris	Ruby-throated Hummingbird	Probable
ORDER CORACIIFORMES		
Family Alcedinidae		
Ceryle alcyon	Belted Kingfisher	Probable

TABLE 3.12
BIRDS OF THE STUDY AREA - ALBEMARLE COUNTY
(continued)

		BREEDING STATUS[1]
ORDER PICIFORMES		
Family Picidae		
Colaptes auratus	Northern Flicker	Confirmed
Dryocopus pileatus	Pileated Woodpecker	Confirmed
Melanerpes carolinus	Red-bellied Woodpecker	Confirmed
Melanerpes erythrocephalus	Red-headed Woodpecker	Possible
Picoides pubescens	Downy Woodpecker	Confirmed
Picoides villosus	Hairy Woodpecker	Confirmed
Sphyrapicas varius	Yellow-bellied Sapsucker	
ORDER PASSERIFORMES		
Family Tyrannidae		
Contopus virens	Eastern Wood Peewee	Confirmed
Empidonax traillii	Willow Flycatcher	Possible
Empidonax virescens	Acadian Flycatcher	Probable
Myiarchus crinitus	Great Crested Flycatcher	Confirmed
Sayornis phoebe	Eastern Phoebe	Confirmed
Tyrannus tyrannus	Eastern Kingbird	Confirmed
Family Alaudidae		
Eremophila alpestris	Horned Lark	
Family Hirundinidae		
Hirundo rustica	Barn Swallow	Confirmed
Hirundo pyrrhonota	Cliff Swallow	Confirmed
Progne subis	Purple Martin	Confirmed
Riparia riparia	Bank Swallow	Possible
Stelgidopteryx serripennis	Northern Rough-winged Swallow	Confirmed
Tachycineta bicolor	Tree Swallow	Confirmed
Family Corvidae		
Corvus brachyrhynchos	American Crow	Confirmed
Corvus corax	Common Raven	Confirmed
Corvus ossifragus	Fish Crow	Confirmed
Cyanocitta cristata	Blue Jay	Confirmed
Family Paridae		
Parus bicolor	Tufted Titmouse	Confirmed
Parus carolinensis	Carolina Chickadee	Confirmed
Family Sittidae		
Sitta canadensis	Red-breasted Nuthatch	
Sitta carolinensis	White-breasted Nuthatch	Confirmed
Family Certhiidae		
Certhia americana	Brown Creeper	

TABLE 3.12
BIRDS OF THE STUDY AREA - ALBEMARLE COUNTY
(continued)

ORDER PASSERIFORMES (continued)		BREEDING STATUS[1]
Family Troglodytidae		
Thryomanes bewickii	Bewick's Wren	
Thryothorus ludovicianus	Carolina Wren	Confirmed
Troglodytes aedon	House Wren	Confirmed
Troglodytes troglodytes	Winter Wren	
Family Muscicapidae		
Subfamily Sylviinae		
Polioptila caerulea	Blue-gray Gnatcatcher	Confirmed
Regulus calendula	Ruby-crowned Kinglet	
Regulus satrapa	Golden-crowned Kinglet	Observed
Subfamily Turdinae		
Catharus fuscescens	Veery	Observed
Catharus guttatus	Hermit Thrush	
Catharus minimus	Gray-cheeked Thrush	
Catharus ustulatus	Swanson's Thrush	
Hylocichla mustelina	Wood Thrush	Confirmed
Sialia sialis	Eastern Bluebird	Confirmed
Turdus migratorius	American Robin	Confirmed
Family Mimidae		
Dumetella carolinensis	Gray Catbird	Confirmed
Mimus polyglottos	Northern Mockingbird	Confirmed
Toxostoma rufum	Brown Thrasher	Confirmed
Family Motacillidae		
Anthus spinoletta	Water Pipit	
Family Bombycillidae		
Bombycilla cedrorum	Cedar Waxwing	Confirmed
Family Laniidae		
Lanius ludovicianus	Loggerhead Shrike	Confirmed
Family Sturnidae		
Sturnus vulgaris	European Starling	Confirmed
Family Vireonidae		
Vireo flavifrons	Yellow-throated Vireo	Probable
Vireo gilvus	Warbling Vireo	Possible
Vireo griseus	White-eyed Vireo	Probable
Vireo olivaceous	Red-eyed Vireo	Confirmed
Vireo solitarius	Solitary Vireo	Possible

TABLE 3.12
BIRDS OF THE STUDY AREA - ALBEMARLE COUNTY
(continued)

ORDER PASSERIFORMES (continued)

Family Emberizidae

Subfamily Parulinae		BREEDING STATUS[1]
Dendroica caerulescens	Black-throated Blue Warbler	Probable
Dendroica castanea	Bay-breasted Warbler	
Dendroica cerulea	Cerulean Warbler	Probable
Dendroica coronata	Yellow-rumped Warbler	
Dendroica discolor	Prairie Warbler	Confirmed
Dendroica dominica	Yellow-throated Warbler	Probable
Dendroica fusca	Blackburnian Warbler	
Dendroica magnolia	Magnolia Warbler	
Dendroica palmarum	Palm Warbler	
Dendroica pensylvanica	Chestnut-sided Warbler	Confirmed
Dendroica petechia	Yellow Warbler	Probable
Dendroica pinus	Pine Warbler	Probable
Dendroica striata	Blackpoll Warbler	
Dendroica tigrina	Cape May Warbler	
Dendroica virens	Black-throated Green Warbler	Possible
Geothlypis trichas	Common Yellowthroat	Confirmed
Helmitheros vermivorus	Worm-eating Warbler	Confirmed
Icteria virens	Yellow-breasted Chat	Confirmed
Limnothlypis swainsonii	Swainson's Warbler	
Mniotilta varia	Black-and-white Warbler	Probable
Oporornis formosus	Kentucky Warbler	Confirmed
Parula americana	Northern Parula	Probable
Protonotaria citrea	Prothonotary Warbler	
Seiurus aurocapillus	Ovenbird	Confirmed
Seiurus motacilla	Louisiana Waterthrush	Probable
Setophaga ruticilla	American Redstart	Confirmed
Vermivora chrysoptera	Golden-winged Warbler	Probable
Vermivora peregrina	Tennessee Warbler	
Vermivora pinus	Blue-winged Warbler	Possible
Vermivora ruficapilla	Nashville Warbler	
Wilsonia canadensis	Canada Warbler	
Wilsonia citrina	Hooded Warbler	Probable
Wilsonia pusilla	Wilson's Warbler	
Subfamily Thraupinae		
Piranga olivacea	Scarlet Tanager	Confirmed
Piranga rubra	Summer Tanager	Confirmed
Subfamily Cardinalinae		
Cardinalis cardinalis	Northern Cardinal	Confirmed
Guiraca caerula	Blue Grosbeak	Confirmed
Passerina cyanea	Indigo Bunting	Confirmed
Pheucticus ludovicianus	Rose-breasted Grosbeak	Probable
Spiza americana	Dickcissel	

TABLE 3.12
BIRDS OF THE STUDY AREA - ALBEMARLE COUNTY
(continued)

ORDER PASSERIFORMES (continued)		BREEDING STATUS[1]
Subfamily Emberizinae		
Ammodramus savannarum	Grasshopper Sparrow	Probable
Junco hyemalis	Dark-eyed Junco	Confirmed
Melospiza melodia	Song Sparrow	Confirmed
Passerculus sandwichensis	Savannah Sparrow	
Passerella iliaca	Fox Sparrow	
Pipilo erythropthalmus	Rufous-sided Towhee	Confirmed
Pooecetes gramineus	Vesper Sparrow	Possible
Spizella arborea	American Tree Sparrow	
Spizella passerina	Chipping Sparrow	Confirmed
Spizella pusilla	Field Sparrow	Confirmed
Zonotrichia albicollis	White-throated Sparrow	
Zonotrichia leucophyrs	White-crowned Sparrow	
Subfamily Icterinae		
Agelaius phoeniceus	Red-winged Blackbird	Confirmed
Dolichonyx oryzivorus	Bobolink	
Icterus galbula	Northern Oriole	Confirmed
Icterus spurius	Orchard Oriole	Confirmed
Molothrus ater	Brown-headed Cowbird	Confirmed
Quiscalas quiscula	Common Grackle	Confirmed
Sturnella magna	Eastern Meadowlark	Confirmed
Family Fringillidae		
Carduelis flammea	Common Redpoll	
Carduelis pinus	Pine Siskin	
Carduelis tristis	American Goldfinch	Confirmed
Carpodacus mexicanus	House Finch	Confirmed
Carpodacus purpureus	Purple Finch	
Coccothraustes vespertinus	Evening Grosbeack	
Family Passeridae		
Passer domesticus	House Sparrow	Confirmed

[1] Virginia Society of Ornithology. 1989. Virginia's Breeding Birds: An Atlas Workbook William Byrd Press, Richmond, VA.

Observed = Species observed during the breeding season
Possible = Species observed or a singing male observed in suitable nesting habitat during the breeding season
Probable = Evidence of breeding observed without confirmation
Confirmed = Evidence of breeding confirmed

TABLE 3.13
MAMMALS OF THE STUDY AREA - ALBEMARLE COUNTY

ORDER MARSUPIALIA	
Family Didelphidae	
Didelphis virginiana	Virginia Opossum
ORDER INSECTIVORA	
Family Soricidae	
Blarina brevicauda	Northern Short-tailed Shrew
Cryptotis parva	Least Shrew
Sorex hoyi	Pygmy Shrew
Sorex longirostris	Southeastern Shrew
Family Talpidae	
Scalopus aquaticus	Eastern Mole
ORDER CHIROPTERA	
Family Vespertilionidae	
Eptesicus fuscus	Big Brown Bat
Lasiurus borealis	Red Bat
Lasiurus cinereus	Hoary Bat
Lasionycteris noctivagans	Silver-haired Bat
Myotis keenii	Keen's Myotis
Myotis lucifugus	Little Brown Myotis
Nycticeius humeralis	Evening Bat
Pipistrellus subflavus	Eastern Pipistrel
ORDER LAGOMORPHA	
Family Leporidae	
Sylvilagus floridanus	Eastern Cottontail Rabbit
ORDER RODENTIA	
Family Sciuridae	
Glaucomys volans	Southern Flying Squirrel
Marmota monax	Woodchuck
Sciurus carolinensis	Eastern Gray Squirrel
Sciurus niger	Fox Squirrel
Tamias striatus	Eastern Chipmunk
Tamiasciurus hudsonicus	Red Squirrel
Family Castoridae	
Castor canadensis	Beaver

TABLE 3.13
MAMMALS OF THE STUDY AREA - ALBEMARLE COUNTY
(continued)

ORDER RODENTIA	
Family Cricetidae	
Microtus pennsylvanicus	Meadow Vole
Microtus pinetorum	Woodland Vole
Ochrotomys nuttalli	Golden Mouse
Ondatra zibethicus	Muskrat
Peromyscus leucopus	White-footed Mouse
Reithrodontomys humulis	Eastern Harvest Mouse
Synaptomys cooperi	Southern Bog Lemming
Family Muridae	
Mus musculus	House Mouse
Rattus norvegicus	Norway Rat
Family Zapodidae	
Zapus hudsonius	Meadow Jumping Mouse
ORDER CARNIVORA	
Family Canidae	
Urocyon cinereoargenteus	Gray Fox
Vulpes vulpes	Red Fox
Family Ursidae	
Ursus americanus	Black Bear
Family Procyonidae	
Procyon lotor	Raccoon
Family Mustelidae	
Lutra canadensis	River Otter
Mephitis mephitis	Striped Skunk
Mustela frenata	Long-tailed Weasel
Mustela vison	Mink
Family Felidae	
Felis rufus	Bobcat
ORDER ARTIODACTYLA	
Family Cervidae	
Odocoileus virginianus	White-tailed Deer

TABLE 3.14
REPTILES OF THE STUDY AREA - ALBEMARLE COUNTY

ORDER CHELONIA	
Family Chelydridae	
Chelydra serpentina	Snapping Turtle
Family Kinosternidae	
Sternotherus odoratus	Common Musk Turtle
Family Emydinae	
Chrysemys picta	Painted Turtle
Terrapene carolina	Eastern Box Turtle
ORDER SQUAMATA	
Family Iguanidae	
Sceloporus undulatus	Eastern Fence Lizard
Family Scincidae	
Eumeces anthracinus	Coal Skink
Eumeces fasciatus	Five-lined Skink
Eumeces inexpectatus	Southeastern Five-lined Skink
Eumeces laticeps	Broad-headed Skink
Family Teiidae	
Cnemidophorus sexlineatus	Six-lined Racerunner
Family Colubridae	
Carphophis amoenus	Worm Snake
Coluber constrictor	Black Racer
Diadophis punctatus	Ringneck Snake
Elaphe guttata	Corn Snake
Elaphe obsoleta	Rat Snake
Heterodon platyrhinos	Eastern Hognose Snake
Lampropeltis calligaster	Mole Kingsnake
Lampropeltis getulus	Eastern Kingsnake
Lampropeltis triangulum	Eastern Milk Snake
Nerodia sipedon	Northern Water Snake
Opheodrys aestivus	Rough Green Snake
Opheodrys vernalis	Smooth Green Snake
Regina septemvitta	Queen Snake
Storeria dekayi	Brown Snake
Storeria occipitomaculata	Redbelly Snake
Thamnophis sauritus	Eastern Ribbon Snake
Thamnophis sirtalis	Eastern Garter Snake
Virginia valeriae	Smooth Earth Snake
ORDER SQUAMATA	
Family Crotalidae	
Agkistrodon contortrix	Copperhead
Crotalus horridus	Timber Rattlesnake

TABLE 3.15
AMPHIBIANS OF THE STUDY AREA - ALBEMARLE COUNTY

ORDER URODELA	
Family Salamandridae	
Notophthalmus viridescens	Common Newt
Family Ambystomidae	
Ambystoma jeffersonianum	Jefferson Salamander
Ambystoma maculatum	Spotted Salamander
Ambystoma opacum	Marbled Salamander
Family Plethodontidae	
Desmognathus fuscus	Northern Dusky Salamander
Desmognathus monticola	Seal Salamander
Eurycea bislineata	Two-lined Salamander
Eurycea guttolineatta	Three-lined Salamander
Gyrinophilus porphyriticus	Spring Salamander
Hemidactylium scutatum	Four-toed Salamander
Plethodon cinereus	Red-backed Salamander
Plethodon glutinosus	Slimy Salamander
Pseudotriton ruber	Red Salamander
ORDER ANURA	
Family Bufonidae	
Bufo americanus	American Toad
Bufo woodhousei	Fowler's Toad
Scaphiopus holbrooki	Eastern Spadefoot Toad
Family Hylidae	
Acris crepitans	Northern Cricket Frog
Hyla chrysocelis	Gray Treefrog
Hyla crucifer	Spring Peeper
Pseudacris triseriata	Upland Chorus Frog
Family Ranidae	
Rana catesbeiana	Bullfrog
Rana clamitans	Green Frog
Rana palustris	Pickerel Frog
Rana sylvatica	Wood Frog

3.1.1.4 Endangered, Threatened, and Special Concern (ETS) Species

The Virginia Department of Game and Inland Fisheries data base lists six wildlife species that may be found in Albemarle County which are endangered, threatened, or candidate species. These are the Loggerhead Shrike (State endangered), Indiana bat (State and Federal endangered), the eastern woodrat (Federal candidate), the eastern cougar (State and Federal endangered), and the James River Spiny Mussel (State endangered). The Bewicks Wren (State endangered) has also been known to nest in Albemarle County.

There are two known loggerhead shrike nests in Albemarle County, both of which are near the western border. The only known Indiana bat cave hibernacula are in the Southwest corner of the State and this species is not known from Virginia during the Spring and Summer months. The eastern woodrat is likely to occur in areas of rocky terrain within forested areas within the Blue Ridge Province in western Albemarle County, although no specific locational data exists at the present time. Locational information for the eastern cougar lists two unverified sightings of the animal in Albemarle County since 1970. Populations of the James River Spiny Mussel have been located in Mechum's River and Rocky Run in Albemarle County. Since both locations lie upstream of all of the proposed alignments, the mussel is not adversely affected by the project unless its known ranges are extended downstream.

There are no habitats within the study area considered critical to threatened or endangered species of wildlife within Albemarle County. The Virginia Natural Heritage Program reviewed its files for any rare, threatened, or endangered species within the proposed alternates. This database revealed no populations of rare, threatened or endangered plants, animals or natural communities in the project area (Appendix A).

3.1.1.5. Wild and Scenic Rivers and Natural Areas

Evaluation of streams in the project area according to National Park Service criteria for inclusion of a river in the National Wild and Scenic River System, as well as aspects of Virginia's Scenic Rivers Act, revealed that the following rivers meet both criteria: The North Fork of the Rivanna River east of U.S. Route 29; the South Fork of the Rivanna River west of the reservoir; Moormans River; Mechums River; Doyles River above its juncture with the Moormans River; and the Rivanna River southeast of the City of Charlottesville. Although these streams meet the criteria no action has been taken to include them in the Federal system. Segments of Moormans River and the Rivanna River have however, been included in Virginia's Scenic River System.

There are no wildlife management areas within Albemarle County. Three Natural Areas are in the county, Ivy Creek by the South Fork Rivanna River Reservoir, Fernbrook Preserve along the North Fork Rivanna River east of Route 20 at Proffit, and McIntire Park north of Route 250. Fernbrook is 1 1/3 miles east of Alignment 6B and would not be impacted at all. Ivy Creek Natural Area is in the vicinity of Alignment 10, though not directly impacted by this alignment. McIntire Municipal Park, located along Shenks Brook north of the Route 250 bypass, is also classified as a natural area, though the primary use of this area is recreational, Alignment 7 may impact on this site at the south junction with Route 250.

3.1.1.6 Terrestrial Resources by Alignment

The study area provides a variety of habitats for many species. Vertebrate species are well represented within Albemarle County as a result of a mosaic of pastured farms and forested lands. Many farm ponds as well as a myriad of streams and rivers in the county provide aquatic habitat for many species, though the topography yields few wetlands for wetland-dependent species. Potential impacts to wildlife were addressed based on habitat impacts along each alignment. This assessment classifies barren, urban and suburban lands, roadways and open water as low in value for wildlife, agricultural lands as moderate, and forest, old fields, and wetlands as high in value for wildlife use.

Table 3.16 lists existing habitats along each study alignment in terms of total acreage along the 300-foot wide corridors. Table 3.17 shows percentages of each land use type along each alignment. These tables show a pattern of greater percentages of forests and old fields on the east side of the study area, with more land with agricultural uses on the west side. Wetlands consist of a small percentage of the alignment with a small amount of the area in the form of open water. The greater percentage of open water along the western alignments represent the long crossings of the South Fork Rivanna River Reservoir.

TABLE 3.16
LAND COVER ACREAGES ALONG EACH STUDY ALIGNMENT

LAND COVER CLASSIFICATION	ALIGNMENT 6	6B	7	8,9	10	11	12	11N/12S	12N/11S
Barren and Urban/Suburban/ Roadway	71.4	30.6	47.7	116.0	45.2	33.8	44.6	33.5	44.8
Agricultural	14.4	46.9	21.8	0.0	50.3	136.3	226.3	177.8	186.5
Forested	179.6	198.2	153.3	0.0	90.7	125.7	148.8	135.6	169.2
Old Field/Shrub	31.6	18.1	40.4	0.0	0.8	24.7	12.4	7.5	14.5
Wetland	1.5	0.2	0.2	0.2	0.2	0.3	0.6	0.5	0.3
Water	3.1	1.1	1.8	0.1	0.3	5.7	4.4	4.9	4.7
TOTAL	301.6	295.1	265.2	116.3	187.5	326.5	437.1	359.8	420.0

TABLE 3.17
PERCENTAGE OF LAND COVER TYPES ALONG EACH STUDY ALIGNMENT

LAND COVER CLASSIFICATION	ALIGNMENT 6	6B	7	8,9	10	11	12	11N/12S	12N/11S
Barren and Urban/Suburban/ Roadway	23.7%	10.4%	18.0%	99.7%	24.1%	10.4%	10.2%	9.3%	10.7%
Agricultural	4.8%	15.9%	8.2%	0.0%	26.8%	41.7%	51.8%	49.4%	44.4%
Forested	59.5%	67.2%	57.8%	0.0%	48.4%	38.5%	34.0%	37.7%	40.3%
Old Field/Shrub	10.5%	6.1%	15.2%	0.0%	0.4%	7.6%	2.8%	2.1%	3.5%
Wetland	0.5%	0.1%	0.1%	0.2%	0.1%	0.1%	0.1%	0.1%	0.1%
Water	1.0%	0.4%	0.7%	0.1%	0.2%	1.7%	1.0%	1.4%	1.1%
TOTAL ACRES	301.6	295.1	265.2	116.3	187.5	326.5	437.1	359.8	420.0

4.0 IMPACTS

4.1 TERRESTRIAL RESOURCES

4.1.1 General Impacts

4.1.1.1 Geology

The only potential geologic impact of the proposed alignments would be the loss of potential mineral resources. The resources would be in the form of economically valuable pockets of sand and gravel. However, because the locations of sand and gravel pockets are unpredictable, it is not possible to pinpoint their occurrence along the proposed alignments. All other mining of valuable minerals occurs outside the boundaries of the proposed roadways (see section 3.1.1.1).

4.1.1.2 Soils

During the construction of a roadway, compaction of soils and denudation of vegetation can result in increased erosion and sedimentation. Slope, soil texture, the amount of precipitation, and the degree of compliance with the erosion control ordinance will affect the soil loss potential. Increased erosion results in increased sedimentation, as evidenced in several of the feeder streams to the South Fork Rivanna River Reservoir. One of the more obvious potential erosion problems exists one tributary 4.4 miles (river miles) upstream from the South Fork Rivanna River water treatment plant. The bulldozing and tree cutting activities occurring on the tributary's north slope could create increased siltation of the reservoir. The improper use of soils may also result in ground or surface water pollution, landslides, flooding, drainage problems, failed septic systems, construction problems, and unproductive agricultural and forestal lands.

To prevent these adverse situations, development should be avoided on soils with severe limitations. Table 3.6, Composite List of Soils Along Project Alternatives, provides several limiting factors that affect highway location. Existing regulations which address the proper use of soils includes the Soil Erosion and Sedimentation Ordinance, and Critical Slopes and Site Plan regulations in the Zoning Ordinance which requires that the soils be reviewed as to suitability for the intended development.

4.1.1.3 Land Use Patterns and Wildlife

The relative significance of new roadway habitat is proportional to the quality and quantity of other habitats converted to this type. Barren land and open water are not exceptional wildlife habitat but their conversion would likely change the areas species composition. These two types of habitat are scarce in the project's corridors.

Small patches of agricultural land interspersed with escape and shelter habitats can be of exceptional value for wildlife. The agricultural land provides food while other nearby habitats provide protection. Deer and turkey are two species for which this arrangement is ideal. However, large uninterrupted tracts of agricultural land are of limited value except to a select few species. Even then, the large tracts frequently are only of seasonal importance. For example, large open cornfields are desirable winter feeding habitat for Canada geese.

Forests, old fields/shrub lands, and wetlands provide quality wildlife habitat. Woodlands, both riparian and upland, provide nesting, escape, and feeding habitat for a large variety of animals. Single-age or monotypic woodlands provide poorer quality habitat, as do grazed woodlots. Because most of Albemarle County was historically woodland, large tracts of woodlands were the norm for the County. A variety of studies (Janzen 1983, Diamond and May 1976, Robbins 1979) show that large tracts of woodlands are superior to small ones for maintenance of species diversity. Some alternatives may eliminate or fragment the remaining sizable woodlands in this part of the State. Therefore, the placement of a roadway through these habitats could replace high quality habitat with poor.

A new road built where none existed previously may eliminate or displace some animals. The magnitude of this impact is dependent upon the type and quality of habitat lost. Loss of a special or rare habitat type or the distance to appropriate habitat may result directly in the elimination of a few individuals. Some species are not capable of emigration at a speed commensurate with the elimination of habitat during construction. For those species of individuals who can emigrate, the result is an increase in the population in the area to which they moved. Frequently, as a result of overcrowding in an area with a limited carrying capacity, a population reduction may occur. Therefore, in the long run, a new road may result in the reduction of some types of animals. This is generally a temporary decline in numbers as species will always regenerate themselves.

A new roadway can fragment habitats. It may result in a disproportionate decrease in numbers of individuals or numbers of species in the remaining fragments. For some species, a new road may result in near isolation of the fragmented populations (Swihart and Slade 1984, Wilkins 1982). For others it will undoubted result in increased road kills as individuals try to move between two pieces of habitat. For deer, accidents are most common in the rutting season and tend to vary proportionally with deer numbers but increase geometrically with traffic volume; it also appears that higher speeds kill more deer (Arnold 1978). For many mammals mortality is greatest when the traffic volume is intermediate, but for other taxa, mortality varies little with traffic volume and does not appear correlated to mating seasons (Wilkins and Schmidly 1980). Removal of riparian corridors may be destructive since they serve as dispersal and dispersion routes for many species, including turkeys (Miller 1983).

A variety of road related factors may cause stress in individual animals or to whole populations. Increased noise levels can cause loss of hearing in animals just as it does for humans, and it may interfere with auditory signals used by animals for conspecific communication. Physiological stress can result in some species (USEPA 1971). Air pollution in general (Catcott 1961), and auto exhausts in specific (Murphy et al. 1963) have detrimental effects on wildlife, specially the pulmonary system, just as they do in humans. Both shrews and bats are insectivorous and as such are very susceptible to biological concentration of pollutants. In animals collected near the Baltimore-Washington parkway, both shrews and bats contained lead contaminants of a level sufficient to cause reproductive impairment, and if comparable to other species, even death (Clark 1979). Pollutants can cause death of young through concentration in the female's milk fat and subsequent ingestion by offspring (Clark et al. 1978).

The impact on game species will be mediated via the same mechanism as impacts on wildlife in general, predominantly through habitat destruction. Deer in Albemarle County are wide-spread and can be found in all appropriate habitat. It is not possible to use past deer harvest as an indicator of the preferability of the various alternatives. Harvest data on other game species is insufficient for any analysis of the alternatives. Even if data were available, the harvest of many species frequently reflects hunting effort rather than game abundance.

With few exceptions, a new road will have greater detrimental impacts on wildlife than the upgrading of an existing route. The "No-Action" alternative, as a rule, will have the least impacts of all alternatives. The No Action alternative may concentrate roadway pollutants and contaminants, such as lead, as a result of increased use of the existing route. A new route would more widely disperse the pollutants, but not reduce the total quantity released into the environment.

There are no animals considered endangered by the U.S. Fish and Wildlife Service found within the project corridors, nor is there critical habitat provided for any endangered species. Similarly, no rare, threatened, or endangered plant communities lie within the project study area, and no wildlife management areas or natural areas will be impacted by any alignment. Also, no existing or potential scenic streams or rivers will be directly impacted by any project alignment.

4.1.2 Specific Impacts

Discussion of impacts along each alignment centers largely on habitat impacts as they relate to wildlife resources. Lands that are barren, urban, suburban, or consist of roadways and open water are considered of low value for wildlife. Agricultural fields are of moderate wildlife value, ranging from small fields with adjacent forests and hedge rows that provide better wildlife habitat, to large, unbroken fields that are of poorer value. Lands that are of highest value to wildlife are forested, old field/shrub areas and wetlands. A summary of geologic, soils and terrestrial impacts by alignment is shown in Tables 4.1 and 4.2.

TABLE 4.1
SUMMARY OF SOIL AND GEOLOGIC IMPACTS
ALONG PROPOSED ALIGNMENTS

ALIGNMENT	FLOODPLAINS CROSSED	MAJOR FAULTS CROSSED	ACRES OF SEVERELY ERODIBLE SOILS	ACRES OF PRIME FARM-LAND SOILS
6	7	0	3.95	89.5
6B	5	0	8.32	78.1
7	9	0	3.43	78.2
8,9	0	0	1.04	0.0
10	0	0	2.70	48.7
11	4	2	0.0	101.7
12	8	1	5.86	157.6
11N/12S	5	2	1.27	110.7
12N/11S	7	1	4.50	147.1

TABLE 4.2
ACRES OF HIGH, MODERATE, AND LOW VALUE WILDLIFE
HABITAT FOR EACH ALIGNMENT

ALIGNMENT	HABITAT ACRES						TOTAL ACRES
	HIGH VALUE		MODERATE VALUE		LOW VALUE		
	ACRES	%	ACRES	%	ACRES	%	
6	212.7	70.5	14.4	4.8	74.5	24.7	301.6
6B	216.5	73.4	46.9	15.9	31.7	10.7	295.1
7	193.9	73.1	21.8	8.2	49.5	18.7	265.2
8,9	0.2	0.2	0.0	0.0	116.1	99.8	116.3
10	91.7	48.9	50.3	26.8	45.5	24.3	187.5
11	150.7	46.2	136.3	41.7	39.5	12.1	326.5
12	161.8	37.0	226.3	51.8	49.0	11.2	437.1
11N/12S	143.6	39.9	177.8	49.4	38.4	10.7	359.8
12N/11S	184.0	43.8	186.5	44.4	49.5	11.8	420.0

No lands considered vital to rare, threatened or endangered species are impacted by any study alternative. There are no lands designated as wildlife areas that would be impacted as a result of this project. No state or county designated scenic rivers are crossed by the alignments, and no State and county scenic highways are impacted. No impacts on vital mineral resources were identified during this study.

4.1.2.1 Alignment 6

Alignment 6 impacts on a total of 301.6 acres of lands east of existing Route 29. No geologic hazards occur along this route, though seven floodplains are crossed. Soils considered a severe erosion hazard comprise a total of 3.95 acres along this alignment, and 89.5 acres of soils designated as prime farmland soils would be impacted. Land cover along Alignment 6 is mostly forested (59.5%) and urban (23.7%), with only 4.8% of lands consisting of agricultural fields. Over two-thirds of the land along Alignment 6 are of high wildlife value, while one quarter of the alignment crosses low-value urban and open water areas.

4.1.2.2 Alignment 6B

Alignment 6B, the far eastern alignment impacts on a total of 295.1 acres of land. There are no geologic hazards along this alignment, though 5 floodplains are crossed. Impacts on severely erodible soils are greatest of all alternatives along Alignment 6B, yet still only comprise 8.32 acres of the total. There are 78.1 acres of prime farmland soils along this alignment. Alignment 6B crosses the North Fork Rivanna River east of Route 29. Though this river is not currently designated as a Wild and Scenic River, and is not under study as a candidate for this designation, it does meet the criteria for inclusion in the National Wild and Scenic River System.

As with all eastern alignments, land cover along this alignment is predominately forested (67.2%), with more land used for agricultural purposes (15.9%) and subsequently less urban lands (10.4%). Overall, wildlife habitat along this alignment would be rated as good, with 73% considered of high value, 16% of moderate value, and 11% low in value. This is slightly better than habitat values along Alignment 6, resulting from the more rural nature of this far eastern route.

4.1.2.3 Alignment 7

This alignment impacts on a total of 265.2 acres. Only 3.43 acres of severely erodible soils are impacted, and 78.2 acres are considered prime farmland soils. Nine floodplains are crossed by this alignment, more than any other of the study options. Also, a portion of McIntire Park north of the Route 250 bypass along Shenks Brook would be impacted on the southern end of the alignment. This impact would involve approximately 11 acres. Though classified as a natural area, this park is predominately open field that is of low to moderate value to wildlife. Land cover along Alignment 7 is similar to Alignment 6, as expected since most of the areas are common to both. Over half of the alignment is forested (57.8%), and little is agricultural (8.2%), with more land classified as old field, high in wildlife value. Overall, 73% of lands along this alignment were determined to be of high value, 8% of moderate value, and 19% of low value.

4.1.2.4 Alignments 8 and 9

The expressway options have the fewest impacts on terrestrial resources. A total of 116.3 acres of land would be impacted, one acre of which crosses severely erodible soils. No prime farmland soils or floodplains would be impacted by this option. This area along Route 29 is already highly developed, and wildlife value of the land is low along the majority of these options.

4.1.2.5 Alignment 10

Alignment 10, the near western option is the shortest of the alternatives (other than the expressway options), and impacts on only 187.5 acres. Of this total, 2.7 acres of soils that are a severe erosion hazard would be impacted along with 48.7 acres of prime farmland soils. No floodplains are crossed by this alignment. As the near western route with respect to the City of Charlottesville, nearly on quarter of the land along Alignment 10 would be considered urban or suburban habitat, low in terms of wildlife value. About one quarter of the land cover is agricultural (moderate value) and the remaining half forested (high wildlife value).

4.1.2.6 Alignment 11

Alignment 11 impacts on 326.5 acres, and contains no soils considered a severe erosion hazard. Prime farmland soils cover 101.7 acres of the total along this option, and four floodplains are crossed. In addition, this alignment crosses two fault lines along the northern segments. Land cover along Alignment 11 reflects the more agricultural nature of the lands west of existing Route 29, with 42% of the total as cultivated or pastoral fields. There is less forested land along this alignment (38%), as well as less urban and suburban lands (10%). Overall, land cover along Alignment 11 is split between high quality wildlife habitat (46%) and moderate habitat (42%), with the remaining areas low in wildlife value.

4.1.2.7 Alignment 12

This alignment is the longest of all study options and subsequently impacts on the greatest amount of terrestrial resources (437.1 acres). A total of 5.86 acres involve severely erodible soils, and 157.6 acres cross prime farmland soils. The northern portion of Alignment 12 crosses a fault line just west of Route 606, and a total of 8 floodplains are crossed. Over half (51.8%) of this alignment is over agricultural fields, and only 34.0% is forested. Overall, alignment 12 is similar to Alignment 11 in terms of habitat value, with slightly less of high wildlife value (37%), and more of moderate value (52%).

4.1.2.8 Alignment 11N/12S

This crossover option impacts on 359.8 acres of land, and crosses only 1.27 acres of severely erodible soils and 110.7 acres of prime farmland soils. Five floodplains are crossed, along with the two fault lines crossed by Alignment 11. Agricultural land predominates along this alignment (49%), followed by forested lands (38%). A total of 40% of lands are rated high in wildlife value, 49% of moderate value, and the remaining 11% as low in value.

4.1.2.9 Alignment 12N/11S

This northern crossover option impacts on 420.0 acres of land, including 4.50 acres of severely erodible soils, 147.1 acres of prime farmland soils, seven floodplains, and the one fault line described under Alignment 12. As with the other western alignments, land cover is predominately agricultural (44%) and forested (40%). Wildlife habitat values for this option are equal between lands of high and moderate value (44% each) with the remaining 12% of land impacted low in value.

5.0 MITIGATION

5.1 GEOLOGY AND SOILS

Where soils subject to severe erosion will be impacted, measures for reducing on-site erosion will be utilized. These measures will include the use of diversion ditches, dikes, sediment dams, minimizing the removal of vegetation, scheduling earthwork during dry periods of the year, and replanting vegetation as soon as possible after disturbance.

To prevent adverse situations, development should be avoided on soils with severe limitations. Existing regulations which address the proper use of soils includes the Soil Erosion and Sedimentation Ordinance, and Critical Slopes and Site Plan regulations in the Zoning Ordinance which requires that the soils be reviewed as to suitability for an intended development.

5.2 TERRESTRIAL RESOURCES

Highway construction and maintenance will utilize habitat management techniques. Replanting of rights-of-way with native plant species will commence promptly after construction to provide new habitat and reduce erosion. Long term impacts from highway operation and maintenance will be minimized through selection of pesticides and herbicides which will have the least effect upon terrestrial organisms.

6.0 COORDINATION

Methods to gather comments in the preparation of this report included publication of a Notice of Intent to prepare an Environmental Impact Statement in the Federal Register; preparation of an early coordination letter and Plan of Study; development and distribution of study newsletters; establishment of mail and telephone communications between the Study Team and interested agencies, public officials and individuals; verbal and written communication with various agencies, groups and individuals; and a series of meetings and exhibits with key agencies, local officials and the general public.

These coordination and comments gathering efforts have been an integral part of the planning and environmental studies prepared for the U.S. Route 29 Corridor Study. As a result, the alternatives under consideration reflect numerous changes, major and minor, which were made in response to ideas and concerns raised by people outside of the Study Team. This process has led to the development of alternatives which sensitively reflect these ideas and concerns while achieving the desired transportation objectives.

6.1 Agency Scoping

An Interagency Coordination Meeting for the U.S. Route 29 Corridor Study was held by the Virginia Department of Transportation on September 22, 1988. The purpose of this meeting was to solicit comments regarding the selection of the Candidate Build Alternatives, and to allow concerned agencies the opportunity to make recommendations for inclusion in the Draft Environmental Impact Statement (DEIS). An information packet was provided to all agencies outlining the study methodologies and references for the Natural Environmental Analysis task, and the considerations that were being given to the environment during the selection process for the build alternatives. The following agencies and or organizations were coordinated with, or provided information on the U.S. Route 29 Corridor Study during its conduct (partial list):

* U.S. Department of Agriculture
  - Soil Conservation Service

* U.S. Department of the Army
  - Army Corps of Engineers, Regulatory Branch

* U.S. Environmental Protection Agency (Region III)

* U.S. Geological Service

* U.S. Department of Interior
  - National Park Service, Mid-Atlantic Region
  - Fish and Wildlife Service

* Virginia Council on the Environment

* Virginia Department of Agriculture and Consumer Services
* Virginia Department of Conservation and Historic Resources
* Virginia Department of Forestry
* Virginia Department of Game and Inland Fisheries
* Virginia Department of Transportation
* Virginia Natural Heritage Program
* Virginia Water Control Board
* The Nature Conservancy
* Piedmont Environmental Council
* Virginia Native Plant Society
* Virginia Society of Ornithology
* Virginia Wildlife Federation
* County of Albemarle, Department of Engineering
* County of Albemarle, Department of Planning and Community Development
* County of Albemarle, Office of Watershed Management
* Rivanna Water and Sewer Authority

The following agencies/organizations were represented at the Interagency Coordination Meeting (partial list):

* U.S. Department of the Army
  - Army Corps of Engineers
* U.S. Department of the Interior
  - Fish and Wildlife Service
* U.S. Environmental Protection Agency (Region III)
* U.S. Federal Highway Administration
* Virginia Council on the Environment

* Virginia Department of Game and Inland Fish

* Virginia Department of Transportation

* Virginia Marine Resources Commission

6.2 Public Coordination

An exceedingly large number of community meetings have been held during the course of this study. These meetings include one on one sessions between study team members and public officials as well as private citizens, talks to residents associations and civic groups, monthly meetings of the City of Charlottesville and Albemarle County Route 29 Joint Task Force, a series of Public Information Meetings, and a Route 29 Project Open House. Attendance at the public meetings have varied from several hundred to in excess of 1,500 persons with varying degrees of interests in the project.

Ideas and comments received at these meetings and exhibit sessions were instrumental in the location and details of preliminary alternates selection, and in refining the process of selecting the study alternates evaluated in this report. These meetings were often general in nature but by and large they usually dealt with specific issues of importance to a particular individual or group.

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APPENDIX A

RARE, THREATENED, AND ENDANGERED SPECIES:

VIRGINIA NATURAL HERITAGE PROGRAM LETTER

B. C. LEYNES, JR.
Director

DIVISIONS
ADMINISTRATION
NATURAL AREAS
PARKS AND RECREATION
SOIL AND WATER CONSERVATION

COMMONWEALTH of VIRGINIA

DEPARTMENT OF CONSERVATION AND RECREATION
VIRGINIA NATURAL HERITAGE PROGRAM
203 GOVERNOR STREET, SUITE 402
RICHMOND, VIRGINIA 23219
(804) 786-7951 (V/TDD)

RECEIVED
AUG - 4 1989

August 1, 1989

Bob A. Neely, Environmental Division Manager
James R. Reed & Associates, Inc.
813 Forrest Drive
Newport News, Virginia 23606

Dear Bob:

In response to your recent request for information, the Virginia Natural Heritage Program has reviewed the alignments indicated on the map we recently received. We submit the following comment:

According to the information presently in our files, there are no populations of rare, threatened or endangered plants, animals or natural communities in the project area. The absence of data does not necessarily mean that rare, threatened or endangered species or other significant habitats do not exist on or adjacent to the proposed project site, but rather that our files currently do not contain information documenting the presence of them.

I have enclosed a listing of rarities with their respective state and global Heritage ranks and state and federal legal status reported from Albemarle County, as you requested.

Bob, I noticed that the easternmost June 1988 alternate alignment runs directly adjacent to, and according to te map, partially through, Fernbrook Natural Area. The Natural Area contains a fine example of mature southern Piedmont forestland bordering the North Fork of the Rivanna River. It is owned by the Virginia Chapter of The Nature Conservancy. George Fenwick should be contacted if this alternative is still being considered. His address is listed below.

Thank you for the opportunity to comment on this project. Please contact us if we can be of further assistance.

Sincerely,

Katie Perry

Katie Perry
Environmental Review Coordinator

cc: George Fenwick
The Nature Conservancy
1110 Rosehill Drive
Charlottesville, Virginia 22901

Definition of Abbreviations used on element lists
of the
Virginia Natural Heritage Program
Department of Conservation and Historic Resources

The following ranks are used by the Virginia Natural Heritage Program to set protection priorities. The primary criterion for ranking species is the number of occurrences, i.e. the number of known distinct localities. Also of great importance is the number of individuals in existence at each locality or, if a highly mobile organism (e.g., sea turtles, many birds, and butterflies), the total number of individuals. Other considerations may include the condition of the occurrences, the number of protected occurrences, and threats. However, the emphasis remains on the number of occurrences such that ranks will be an index of known biological rarity.

S1 Extremely rare; usually 5 or fewer occurrences in the state; or may be a few remaining individuals; often especially vulnerable to extirpation.

S2 Very rare; usually between 5 and 20 occurrences; or with many individuals in fewer occurrences; often susceptible to becoming endangered.

S3 Rare to uncommon; usually between 20 and 100 occurrences; may have fewer occurrences, but with a large number of individuals in some populations; may be susceptible to large- scale disturbances.

S4 Common; usually >100 occurrences, but may be fewer with many large populations; may be restricted to only a portion of the state; usually not susceptible to immediate threats.

S5 Very common; demonstrably secure under present conditions.

SA Accidental in the state.

SH Historically known from the state, but not verified for an extended period, usually >15 years; this rank is used primarily when inventory has been attempted recently.

SN Regularly occurring migrants; transients; seasonal, nonbreeding residents. Usually no specific site can be identified with its range in the state. (Note that congregation and staging areas are monitored separately).

SU Status uncertain, often because of low search effort or cryptic nature of the element.

SX Apparently extirpated from the state.

Global ranks are similar, but refer to a species' rarity throughout its total range. Global ranks are denoted with a "G" followed by a character. Note that GA and GN are not used and GX means apparently extinct. A "Q" in a rank indicates that a taxonomic question concerning that species exists. Ranks for subspecies are denoted with a "T". The global and state ranks combined (e.g. G2/S1) give an instant grasp of a species'known rarity.

These ranks should not be interpreted as legal designations.

Federal Status

The Virginia Natural Heritage Program uses the standard abbreviations for Federal endangerment developed by the U.S. Fish and Wildlife Service, Division of Endangered Species and Habitat Conservation.

LE - Listed Endangered
LT - Listed Threatened
PE - Proposed Endangered
PT - Proposed Threatened
C1 - Candidate, category 1
C2 - Candidate, category 2

3A - Former candidate - presumed extinct
3B - Former candidate - not a valid species under current taxonomic understanding
3C - Former candidate - common or well protected

State Status

The Virginia Natural Heritage Program uses similar abbreviations for State endangerment.

LE - Listed Endangered
LT - Listed Threatened
C - Candidate

PE - Proposed Endangered
PT - Proposed Threatened

For information on the laws pertaining to threatened or endangered species, contact:

U.S. Fish and Wildlife Service for all FEDERALLY listed species
Department of Agriculture and Consumer Services Plant Protection Bureau for STATE listed plants and insects
Department of Game and Inland Fisheries for all other STATE listed animals

VIRGINIA NATURAL HERITAGE PROGRAM
DEPARTMENT OF CONSERVATION & RECREATION
RARE, THREATENED, ENDANGERED PLANTS KNOWN
FROM ALBEMARLE COUNTY

SCIENTIFIC NAME	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS
PITUOPHIS MELANOLEUCUS	PINE SNAKE	G5	SU		
PYRGUS WYANDOT	SOUTHERN GRIZZLED SKIPPER	G3	S3		
STYGOBROMUS SPINOSUS	BLUE RIDGE MOUNTAIN AMPHIPOD	G2G3	S1		
CHAMPION TREE	WILD CRABAPPLE				
BETULA PAPYRIFERA	PAPER BIRCH	G5	S2S3		
CORALLORHIZA TRIFIDA	EARLY CORALROOT	G5	S1		
CORNUS CANADENSIS	BUNCHBERRY	G5	S1		
SIDA HERMAPHRODITA	VIRGINIA MALLOW	G3	S1	3C	
SOLIDAGO RANDII	RAND'S GOLDENROD	G?	S?		