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SOIL SURVEY REPORT FOR NORFOLK NAVAL SHIPYARD AND ST. JULIENS CREEK ANNEX

PORTSMOUTH, VIRGINIA

Prepared By

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In Cooperation with
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Norfolk Naval Shipyard and St. Juliens Creek Annex

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TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

SUMMARY OF TABLES

FOREWORD AND ACKNOWLEDGEMENTS

Effective land management programs for Defense Department installations are important to insure wise and proper land use. The basis for such programs is found in an investigation and appraisal of the soils on the installation, and interpretation of their properties for a wide variety of uses. For this reason a soil survey (the second one) was made on installation lands at the Norfolk Naval Shipyard and St. Juliens Creek Annex, Portsmouth, Virginia. The first soil survey of St. Juliens Creek Annex was arranged by the Navy in 1959. The Norfolk Naval Shipyard land was surveyed in 1961. Field work and report preparation were done by Soil Scientists of the United States Department of Agriculture, Soil Conservation Service.

The soil survey work for this report was done to revise these earlier reports. A new system of soil classification and improved methods of surveys and techniques have been adopted since earlier reports were made. Field work was done by Soil Scientist, Ian Rodihan and the report was prepared by Dallas Adams, SCS District Conservationist, Chesapeake, Virginia. The work was done during 1981 and 1982 in cooperation with the installation and the Atlantic Division, Naval Facilities Engineering Command, which arranged for the survey.

Soil conservation and erosion control effort are needed to protect and care for Navy facility lands, and is a requirement for all installations by the Naval Facilities Engineering Command, which is responsible for natural resource management. Soil sediment is probably the most common and one of the worst water pollutants. Soil erosion is a major problem on all lands in the United States, and its control is a matter of major national concern.

This report contains information which can be useful in future construction and maintenance work, in the management of installation natural resources, in land planning programs on installation lands, and to predict soil suitability and behavior for selected land uses. It also highlights limitations and hazards inherent in the soil, improvements needed to overcome limitations, and the effect of selected land uses on the environment. A copy of it should be kept in all offices having responsibilities for these programs.

This soil survey is designed for many different users. Station planners, officials, engineers and builders can use the survey to plan land use, select sites for construction, and identify special practices needed to insure proper performance. Farmers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them select sites, understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to hard pans. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. The location of each kind of soil is shown on detailed soil maps. Each kind of soil in the survey area is described and much information is given about each soil for specific uses. This soil survey can be useful in the conservation, development and productive use of soil, water and other resources. Additional information or assistance in using this report can be obtained from the local office of the Soil Conservation Service.

HOW TO USE THIS REPORT

1. Use the Aerial Photo Soil Survey Maps

   Locate the specific map which you want to study from the map index sheet. Soil boundaries are outlined by black lines, with a symbol for each soil mapping unit. The symbol is inside the soil boundary if there is enough room, otherwise, it is outside the area and a pointer shows the area where the symbol belongs. Make a note of the soil mapping unit symbol occurring in the specific area which you have selected.

2. Use Table 1 to Find Soil Name

   Look up the map symbol along the left-hand column. The symbols are listed numerically. When you have located the mapping symbol, read across for the soil name.

3. Use the Interpretive Tables 4-15 for Limitation Ratings for Various Uses of the Soils

   Soil interpretive tables are filed in numerical order. Slopes and textures are needed to arrive at the limitations for some soils and proposed uses. The explanation sheets precede the interpretive tables.

INTRODUCTION

The Norfolk Naval Shipyard is located in the City of Portsmouth, Virginia, on the southern branch of the Elizabeth River. The St. Juliens Creek Annex is located in the City of Chesapeake, Virginia, at the confluence of the South Fork of the Elizabeth River and St. Juliens Creek. These installations are very near each other and are in the lower Atlantic Coastal Plain. The topography is nearly level with some gently sloping areas along low ridges. The elevation ranges from sea level along the river and creek to approximately ten feet above sea level. The drainage from this area goes into the Southern Branch of the Elizabeth River.

Geology

The Princess Anne marine terrace extends across both installations. The entire area was developed from marine deposited sediments consisting of sands, silts and clays. Some gravel may be present in the lower portion of the soil profiles. The soil material was deposited by sea water in recent geologic time.

NORFOLK NAVAL SHIPYARD

TABLE 1

SOIL INDEX AND ACREAGE

SOIL INDEX SYMBOL	TENTATIVE SOIL NAME	APPROXIMATE ACRES	PERCENT OF TOTAL
2	Urban Land	443.8	64.4
12	Udorthents, loamy	1.4	0.2
14	Udorthents, clayey	83.8	12.2
34	Munden fine sandy loam	32.8	4.8
36	Tetotum fine sandy loam	19.2	2.8
42	Dragston fine sandy loam	10.8	1.6
45	Augusta fine sandy loam	8.0	1.2
52	Nimmo fine sandy loam	5.7	0.8
55	Tomotley fine sandy loam	25.2	3.6
65	Portsmouth fine sandy loam	36.0	5.2
79	Bohicket silt clay	22.3	3.2
	TOTAL LAND SURVEYED	689.0 Acres	100%
	HIGHLY CLASSIFIED AREAS NOT SURVEYED	97.0	
	TOTAL IN FACILITY	786.0 Acres	

ST. JULIENS CREEK ANNEX

TABLE 1

SOIL INDEX AND ACREAGE

SOIL INDEX SYMBOL	TENTATIVE SOIL NAME	APPROXIMATE ACRES	PERCENT OF TOTAL
2	Urban Land	48.2	9.9
10	Urban Land-Udorthents Complex	91.6	18.7
12	Udorthents, loamy	5.0	1.0
14	Udorthents, clayey	61.2	12.5
34	Munden fine sandy loam	28.2	5.8
36	Tetotum fine sandy loam	71.9	14.7
45	Augusta fine sandy loam	70.5	14.4
55	Tomotley loam	70.6	14.4
79	Bohicket silt clay	41.8	8.6
	TOTAL	489.0 Acres	100%

CLIMATE OF NORFOLK NAVAL SHIPYARD AND ST. JULIENS CREEK ANNEX PORTSMOUTH, VIRGINIA

The winters are mild while the autumn and spring seasons usually are delightful. Summers, though warm and long, frequently are tempered by cool periods often associated with northeasterly winds off the Atlantic. Temperatures of 100° or higher are of very infrequent occurrence. Cold waves seldom penetrate to this area and during the period of continuous official record now available, a temperature of zero has never been recorded. Occasional winters pass without a measurable amount of snowfall. Most of the snow generally occurs in light falls, which usually melt and disappear within 24 hours. Average seasonal snowfall is 8.5 inches.

From an agricultural standpoint, this area, with its long frost-free period and prolonged growing season, averaging 244 days is exceptionally well favored. The average date of the last freezing temperature in the spring is March 22, while the average date of the first in autumn is November 21. The average annual amount of rainfall is about 45 inches and considerable more than one-half of it falls in well distributed amounts during the crop growing season, April to October, inclusive, a fact of great importance to agricultural interests.

The average relative humidity in midafternoon is about 62 percent, humidity is higher at night, and the average at dawn is about 78 percent. During the course of a year there is an average of 110 clear days, 103 partly cloudy days and 152 cloudy days. The prevailing wind is from the southwest. The average wind speed for a year is 10.5 mph. The highest 12.3 mph recorded in March and the lowest 8.8 mph recorded in July and August.

Table 2 gives information on temperature and precipitation for the survey area as recorded at Norfolk International Airport for the period 1941-1980.

Table 3 shows probable dates of the first freeze in the fall and the last freeze in the spring along with the length of the growing season.

TABLE 2

AVERAGE TEMPERATURE, PRECIPITATION & SNOWFALL RECORDED IN THE PERIOD 1941-1980

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.
Temp.	41.4	42.1	48.9	57.5	66.7	74.6	78.6	77.6	72.5	62.1
Precip.	3.32	3.33	3.78	3.20	3.73	4.01	5.70	5.33	3.89	3.13

	Nov.	Dec.
Temp.	52.1	43.6
Precip.	2.62	3.19

Average Annual Temp.	59.8
Total Annual Precip.	45.23

SNOWFALL

Record	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
Mean	0.0	0.0	0.0	0.0	T	1.1	3.2	2.9	1.3	T

Record	May	June	Total
Mean	0.0	0.0	8.5

TABLE 3

FREEZE DATA

PROBABILITY	LAST FROST IN SPRING Temp. 32°	FIRST FROST IN FALL Temp. 32°	GROWING SEASON
9 yrs. in 10	April 8	November 2	208 days
5 yrs. in 10	March 22	November 21	244 days
1 yr. in 10	March 5	December 9	279 days

AVERAGE GROWING SEASON IS 244 DAYS

HOW THE SURVEY WAS MADE

The soils on the Norfolk Naval Shipyard and St. Juliens Creek Annex were studied, classified, and mapped by Soil Scientists of the USDA-Soil Conservation Service with assistance from Virginia Polytechnic Institute and State University Research Division personnel. They made this survey to learn what kind of soils are in the area; where they are located; and how they can be used.

As the Soil Scientists traveled over the land, they observed steepness, length, and shape of slopes; kinds of native plants or crops; and many other facts about the soils. They studied soils along roadbanks, pipelines and other excavated areas where the soil layers were undisturbed. They dug many holes to expose the sequence of soil layers that make up the soil profile. The soils were classified by first examining the soil and comparing the thickness and arrangement of soil layers with soils already mapped and classified in other counties and other states. Scientific classification of the soils was then completed by use of the National Comprehensive System of Soil Classification.

Soils having similar features make up a soil series. All major layers of the soils of each series are similar in thickness, arrangement and other identifying features. All soils in the United States having the same series name are essentially alike in these features. Each soil series is named for a town or other geographic feature near the place where the series was first identified.

After the soils of the survey area were identified and classified, the soil scientist made the soil map by walking over the land and examining features of the soils in many different places. Lines were drawn on aerial photographs to show the boundaries between different mapping units. Each mapping unit consists of one or more dominant kinds of soil, but includes small areas of different soils that were not practical to map separately at the scale used.

DESCRIPTIONS OF THE SOILS

A brief description of each soil series on the Norfolk Naval Shipyard and St. Juliens Creek Annex is given following the prime farmland report. These descriptions point out general features that are most likely to affect the use and management of the individual soils. The important characteristics of the major layers of a typical soil are described. This is the same profile for which estimates of engineering properties are given in the columns listing the physical and chemical properties. The names of the units in each series are listed at the top of the sheet.

S O I L   M A P   U N I T   D E S C R I P T I O N S

2 - URBAN LAND

This map unit consists of areas where more than 70 percent of the land surface is covered by asphalt, concrete, buildings, or other impervious materials. Examples are parking lots, military installations, shopping centers, industrial parks, and high-density residential areas. Areas of this unit commonly are irregular shaped and range from about 2 to over 100 acres. Slope ranges from 0 to 10 percent.

Included with this unit in mapping are small areas, generally less than 2 acres in size, of undisturbed soils and Udorthents. The undisturbed soils are usually between streets and sidewalks, in yards, and in traffic islands and circles. The Udorthents are areas where the natural soils have been disturbed by grading, excavating, or filling. Included soils make up about 30 percent of the unit.

An on-site investigation is needed to determine the suitability and limitations of this unit for any given use.

A capability subclass is not assigned to this unit.

10 - URBAN LAND-UDORTHENTS COMPLEX, 0 TO 6 PERCENT SLOPES

This complex consists of nearly level to gently sloping areas of urban land, together with areas of moderately well drained and somewhat poorly drained Udorthents soils. The Udorthents soils of this complex have been graded, cut, filled, or otherwise disturbed by construction and earthmoving activities. Areas are generally about 5 to over 100 acres in size. Urban land and Udorthents soils occur together in such an intricate pattern that it was not practical to map them separately.

A typical area of this complex is about 45 percent urban land, where the soils are largely covered by concrete, asphalt, buildings, or other impervious surfaces. Udorthents soils make up about 35 percent of the area. Some of the Udorthents soils have scrap metal, concrete, boards, and other rubble buried in the soil profile. The remaining 20 percent of the area consists of relatively undisturbed soils such as Munden, Tetotum, and Augusta. Also included are small areas having somewhat steeper slopes.

Permeability and internal drainage are generally moderately slow or slow throughout this complex. Runoff is medium and the erosion hazard is moderate. In most areas the surface drainage patterns are controlled by roads and streets. The available water capacity is low to moderate. A seasonal high water table occurs at a depth of about 1 to 3 feet throughout most of this complex. Most unlimed areas are very strongly acid.

Areas of this complex that have not been urbanized vary widely in their potentials and limitations for different land uses. Generally, seasonal wetness limits their use for building sites and recreation areas. In the summer these areas are somewhat droughty and have only fair potential for lawns and landscaping. The fill areas of this complex generally are subject to subsidence and, therefore, have poor potential for use as building sites. This complex is so variable that the potentials and limitations for any proposed use must be determined by careful on-site investigation.

12 - UDORTHENTS, LOAMY

This unit consists of deep, well and moderately well drained loamy and sandy soil material in areas where the soils have been altered during excavation or covered by earthy fill material. Udorthents are mostly around urban areas, major highways, canals, and mining operations. Areas of this unit are irregular and range from about 2 to over 200 acres. Slope ranges from 0 to 25 percent.

Included with this unit in mapping are small areas of undisturbed soils. Also included are small bodies of water and areas of more poorly drained disturbed soils. Many areas have inclusions of non-soil material such as asphalt, concrete, wood, and glass. Inclusions make up about 25 percent of the unit.

The permeability and available water capacity of these Udorthents is quite variable. Surface runoff is rapid and the erosion hazard is severe on unvegetated steep slopes.

These Udorthents are generally not suited to most agricultural uses. Udorthents have limitations for most types of community development and recreation, but some areas are used for community development where the soil material is suitable. An on-site investigation is needed to determine the suitability and limitations of the unit for any given use.

A capability subclass is not assigned to this unit.

14 - UDORTHENTS, CLAYEY

This mapping unit consists mostly of clayey fill material that has been placed on soils of various drainage classes on low-lying terraces, flood plains, and tidal marshes. Some areas were created by filling in open water. Areas range from 5 to over 100 acres in size and they are nearly level.

Most of the soil material is unconsolidated, poorly drained hydraulic fill, deposited during channel dredging operations. Soil textures are predominantly clay and silty clay, although buried lenses of sandy loam, sandy clay loam, clay loam, and silt loam are present. The thickness of the fill ranges from 20 inches to more than 5 feet. Some areas have been used for disposing of refuse, and contain scrap metal, concrete, boards and other rubble.

Included with this soil in mapping are small areas of Rappahannock soils, Urban land and Udorthents, loamy. Also included are small areas having somewhat steeper slopes, such as along drainageways and earth berms which were constructed to contain the fill. Included areas make up about 15 percent of this mapping unit.

The permeability of this soil material is slow or very slow. Runoff is slow and the erosion hazard is slight. Water ponds on the soil surface during extended wet periods. The seasonal high water table rises to within one foot of the surface during winter and spring. The available water capacity is moderate. Some of the soil material is saline.

This mapping unit has severe limitations for most uses. Wetness, low strength and slow permeability are the main limitations for construction sites, roads, sanitary facilities, lawns and landscaping.

A capability subclass is not assigned to this unit.

34 - MUNDEN FINE SANDY LOAM

This soil is deep, nearly level and moderately well drained. It is on low inland ridges and subtle side slopes. Areas of this soil commonly are long and irregular and range from 2 to 200 acres. Slope ranges from 0 to 2 percent.

Typically, the surface layer of this Munden soil is dark grayish brown fine sandy loam about 20 centimeters thick. The subsoil extends to a depth of 81 centimeters. It is yellowish brown sandy loam in the upper 18 centimeters and mottled yellowish brown and brown loam and sandy loam below this. The substratum is mottled brown, gray and red sand to a depth of at least 158 centimeters.

Included with this soil in mapping are small areas of well drained Bojac and State soils, moderately well drained Tetotum soils and somewhat poorly drained Augusta and Dragston soils. The Bojac and State soils are on areas at slightly higher elevations and the State soils have more clay in the subsoil. The Augusta and Dragston soils are in slight depressions and the Augusta soils have more clay in the subsoil. Tetotum soils have more clay in the subsoil. Also included are areas adjacent to drainageways which have slopes of 3 to 10 percent and range from 20 to 100 feet long. Also included are soils which contain less silt and clay than is typical for the unit. Included soils make up about 20 percent of the unit.

The permeability of this Munden soil is moderately rapid in the subsoil and rapid in the substratum. Available water capacity is moderate. Surface runoff is slow. The erosion hazard is slight. The surface layer is friable and easily tilled through a wide range of moisture conditions. The subsoil has a low shrink-swell potential. The root zone extends to a depth of 150 centimeters or more. The soil is low in organic matter content and natural fertility. It is very strongly acid through moderately acid, but reaction of the surface layer varies because of local liming practices. A seasonal high water table is at a depth of 1½ to 2½ feet during winter and early spring.

Most areas of this soil are used for cultivated crops. The remaining areas are in woodland or community development.

This soil is well suited to cultivated crops. Crops respond well to lime and fertilizer. Minimum tillage, using cover crops and grasses and legumes in the cropping system, and returning crop residue to the soil help to maintain organic matter content and tilth, reduce crusting, and increase water infiltration. Tilling within the proper range of moisture content helps to reduce soil compaction and clodding.

The potential productivity for trees on this soil is high, especially for loblolly pine, yellow poplar, sweetgum, and oaks. Seed and seedlings survive and grow well if competing vegetation is controlled. The soil is soft when wet, thus limiting the use of heavy timber equipment.

The seasonal high water table of this soil is the main limitation for community development. The seasonal high water table limits use of the soil as a site for septic tank absorption fields, but with proper design and installation of drainfields this limitation can be overcome.

The capability subclass is IIw.

36 - TETOTUM FINE SANDY LOAM

This soil is deep, nearly level, and moderately well drained. It is on low ridges and subtle side slopes on inland areas of the lower Coastal Plain. Areas of this soil commonly are long and irregular and range from 2 to 300 acres. Slope ranges from 0 to 2 percent.

Typically, the surface layer of this soil is dark grayish brown fine sandy loam about 23 centimeters thick. The subsoil extends to a depth of 122 centimeters. It is mostly yellowish brown sandy clay loam and clay loam with gray and brown mottles in the lower part. The substratum is mottled brown, yellow, and gray, stratified loamy fine sand and fine sandy loam to a depth of at least 183 centimeters.

Included with this soil in mapping are small areas of well drained Bojac and State soils, moderately well drained Munden soils, and somewhat poorly drained Augusta and Dragston soils. The Bojac and State soils are on areas at slightly higher elevations. The Augusta and Dragston soils are in slight depressions. The Munden soils have less clay in the subsoil. Also included are areas adjacent to large drainageways which have short, steep slopes of 2 to 10 percent and range from 20 to 100 feet long. The soils on the steeper slopes usually have more sand and less clay in the subsoil than is typical for Tetotum soils. Included soils make up about 15 percent of the unit.

The permeability of this Tetotum soil is moderate in the subsoil and moderately rapid to rapid in the substratum. Available water capacity is moderate. Surface runoff is slow. The erosion hazard is slight. The surface layer is friable and easily tilled through a wide range of moisture conditions. The subsoil has a low shrink-swell potential. The root zone extends to a depth of greater than 150 centimeters. The soil is low in organic matter content and natural fertility. It commonly ranges from extremely acid through strongly acid, but reaction of the surface layer varies because of local liming practices. A seasonal high water table is at a depth of 1½ to 2½ feet during winter and early spring.

Most areas of this soil are used for cultivated crops or are in community development. The remaining areas are in woodland.

This soil is well suited to cultivated crops. Crops respond well to lime and fertilizer. The soil is wet and cold in the early spring, and planting and tillage may be delayed because of wetness. Tilling within the proper range of moisture content reduces soil compaction and clodding. Minimum tillage, using cover crops and grasses and legumes in the cropping system, and returning crop residue to the soil help to maintain organic matter content and tilth, reduce crusting, and increase water infiltration.

The potential productivity for trees on this soil is high, especially for loblolly pine, yellow-poplar, sweetgum and oaks. Seed and seedlings survive and grow well if competing vegetation is controlled. The soil is soft when wet, thus limiting the use of heavy timber equipment.

The seasonal high water table of this soil is the main limitation for community development. The seasonal high water table limits use of the soil as a site for septic tank absorption fields, but with proper design and installation of drainfields this limitation can be overcome.

The capability subclass is IIw.

42 - DRAGSTON FINE SANDY LOAM

This soil is deep, nearly level, and somewhat poorly drained. It is on low ridges and subtle side slopes. Areas of this soil commonly are long and irregular and range from 2 to 200 acres. Slope ranges from 0 to 2 percent.

Typically, the surface layer of this soil is dark grayish brown fine sandy loam about 23 centimeters thick. The subsoil extends to a depth of 71 centimeters. It is mostly light olive brown and grayish brown fine sandy loam with mottles in shades of gray and brown. The substratum is mottled yellow fine sand to a depth of at least 168 centimeters.

Included with this soil in mapping are small areas of moderately well drained Munden and Tetotum soils, somewhat poorly drained Augusta soils and poorly drained Nimmo and Tomotley soils. The Munden and Tetotum soils are on areas at slightly higher elevations. The Nimmo and Tomotley soils are in slight depressions. The Augusta soils have more clay in the subsoil. Included soils make up about 20 percent of the unit.

The permeability of this Dragston soil is moderately rapid in the subsoil and rapid in the substratum. Available water capacity is moderate. Surface runoff is low. The erosion hazard is slight. The surface layer is friable and easily tilled through a wide range of moisture conditions. The subsoil has a low shrink-swell potential. The root zone extends to a depth of 150 centimeters or more. The soil is low in organic matter content and natural fertility. It commonly is very strongly acid or strongly acid, but reaction of the surface layer varies because of local liming practices. A seasonal high water table is at a depth of 1 foot to 1½ feet during winter and spring.

Most areas of this soil are used for cultivated crops. The remaining areas are in community development or in woodland.

This soil is well suited to cultivated crops if drained. Drainage systems are difficult to install, however, because of the wet, sandy substratum. The soil may be droughty during the growing season and crop response to lime and fertilizer may be limited by the available water capacity. Tilling within the proper range of moisture content reduces soil compaction and clodding. Minimum tillage, using cover crops and grasses and legumes in the cropping system, and returning crop residue to the soil help to maintain organic matter content and tilth, hold moisture in the soil, and reduce crusting.

The potential productivity for trees on the soil is high, especially for loblolly pine, sweetgum, and oaks. Seeds and seedlings survive and grow well if competing vegetation is controlled. The soil is soft when wet, thus limiting the use of heavy timber equipment.

The seasonal high water table and the rapid permeability of the substratum are the main limitations of this soil for community development. The seasonal high water table limits use of the soil as a site for septic tank absorption fields, but this limitation may be overcome with adequate artificial drainage and with proper design and installation of drainfields. The rapid permeability of the substratum may cause a contamination hazard to ground water and nearby open waters in areas used for septic tanks. The seasonal high water table also limits use of the soil as a building site and for many types of recreation, but proper landscaping and artificial drainage can help to overcome this limitation.

The capability subclass is IIw if drained and IIIw if undrained.

45 - AUGUSTA FINE SANDY LOAM

This soil is deep, nearly level, and somewhat poorly drained. It is on low inland ridges and very subtle side slopes. Areas of this soil commonly are long and irregular and range from 2 to 200 acres. Slope ranges from 0 to 2 percent.

Typically, the surface layer of this soil is brown fine sandy loam about 22 centimeters thick. The subsoil extends to a depth of 150 centimeters. The upper 25 centimeters is pale brown sandy clay loam with mottles in shades of gray and brown. The lower 103 centimeters is mostly gray clay loam with brown mottles. The substratum is mottled brown and gray sandy loam to a depth of at least 175 centimeters.

Included with this soil in mapping are small areas of moderately well drained Tetotum soils, somewhat poorly drained Dragston soils, and poorly drained Acredale and Tomotley soils. The Tetotum soils are on areas at slightly higher elevations. The Acredale and Tomotley soils are in slight depressions. Dragston soils have less clay in the subsoil. Included soils make up about 20 percent of the unit.

The permeability of this Augusta soil is moderate in the subsoil and moderately rapid in the substratum. Available water capacity is moderate. Surface runoff is slow. The erosion hazard is slight except for included areas of short, steep slopes. The surface layer is friable and easily tilled. The subsoil has a low shrink-swell potential. The root zone extends to a depth of 150 centimeters or more. The soil is low in organic matter content and natural fertility. It ranges from very strongly acid through moderately acid but reaction of the surface layer varies because of local liming practices. A seasonal high water table is at a depth of 1 foot to 1½ feet during winter and spring.

Most areas of this soil are used for cultivated crops or are in community development. The remaining areas are in woodland.

This soil is well suited to cultivated crops if drained. Crops respond well to lime and fertilizer but are sometimes damaged in undrained areas after heavy or prolonged rains. The soil is wet and cold in spring, and wetness often interferes with tillage. Tilling within the proper range of moisture content reduces soil compacting and clodding. Minimum tillage, using cover crops and grasses and legumes in the cropping system, and returning crop residue to the soil help to maintain organic matter content and tilth, reduce crusting, and increase water infiltration.

The potential productivity for trees on this soil is high, especially for loblolly pine, sweetgum, yellow poplar, and oaks. Seeds and seedlings survive and grow well if competing vegetation is controlled. The soil is soft when wet, thus limiting the use of heavy timber equipment.

The seasonal high water table is the main limitation of the soil for community development. The seasonal high water table limits the use of the soil as a site for septic tank absorption fields, but this limitation may be overcome by adequate artificial drainage and by proper design and installation of drainfields. Also, the seasonal high water table limits the use of the soil as a building site, for roads and streets, and for most types of recreation. The wetness limitation may be overcome with proper landscaping and artificial drainage.

The capability subclass is IIIw.

52 - NIMMO FINE SANDY LOAM

This soil is deep, nearly level, and poorly drained. It is on broad inland flats. Areas of this soil commonly are oval to irregular and range from 2 to 500 acres. Slope ranges from 0 to 2 percent.

Typically, the surface layer of this soil is dark gray fine sandy loam about 18 centimeters thick. The subsoil extends to a depth of 84 centimeters. It is mostly light gray and gray fine sandy loam and loam with yellowish brown mottles. The substratum is light gray fine sand to a depth of at least 150 centimeters.

Included with this soil in mapping are small areas of somewhat poorly drained Augusta and Dragston soils, poorly drained Acredale and Tomotley soils and very poorly drained Portsmouth soils. The Dragston and Augusta soils are on areas at slightly higher elevations and the Augusta soils have more clay in the subsoil. Portsmouth soils have thicker, dark-colored surface layers that are rich in organic matter. The Acredale and Tomotley soils have more clay in the subsoil. Also included are soils that have water on the surface after heavy rains or during prolonged wet periods. Included soils make up about 20 percent of the unit.

The permeability of this Nimmo soil is moderate in the subsoil and rapid in the substratum. Available water capacity is moderate. Surface runoff is slow. The erosion hazard is slight. The surface layer is friable and easily tilled. The subsoil has a low shrink-swell potential. The root zone extends to a depth of 150 centimeters or more. The soil is low in organic matter content and natural fertility. It ranges from extremely acid through strongly acid, but reaction of the surface layer varies because of local liming practices. A seasonal high water table is between the surface and a depth of 1 foot during winter and spring.

Most areas of this soil have been drained by ditching and are used for cultivated crops. The remaining areas are in woodland or community development.

This soil is well suited to cultivated crops if drained. Drainage systems may be difficult to install because of the wet sandy substratum. Crops respond well to lime and fertilizer but are sometimes damaged in undrained areas after heavy or prolonged rains. The soil is wet and cold in spring, and wetness often interferes with tillage. Tilling within the proper range of moisture content reduces soil compaction and clodding. Minimum tillage, using cover crops and grasses and legumes in the cropping system, and returning crop residue to the soil help to maintain organic matter content and tilth, reduce crusting, and increase water infiltration.

The potential productivity for trees on this soil is high, especially for loblolly pine, sycamore, sweetgum, and oaks. Seeds and seedlings survive and grow well if competing vegetation is controlled. Productivity and seedling survival are enhanced by drainage. The soil is soft when wet thus, limiting the use of heavy timber equipment.

The seasonal high water table and the sandy texture of the substratum are the main limitations of the soil for community development. The seasonal high water table limits use of the soil as a site for septic tank absorption fields; however, this limitation may be overcome with adequate artificial drainage and proper design and installation of drainfields. The seasonal high water table also limits use of the soil as a building site and for many types of recreation, but this limitation can also be overcome for these uses with proper landscaping and artificial drainage.

The capability subclass is IIIw if drained and IVw if undrained.

55 - TOMOTLEY LOAM

This soil is deep, nearly level, and poorly drained. It is on broad inland flats or in poorly defined drainageways. Areas of this soil commonly are irregular or oval and range from 2 to 500 acres. Slope ranges from 0 to 2 percent.

Typically, the surface layer of this soil is dark gray loam about 20 centimeters thick. The subsoil extends to a depth of 147 centimeters. It is mainly gray and light gray sandy clay loam, sandy clay and fine sandy loam with mottles in shades of brown and red. The substratum is mottled gray loamy sand to a depth of at least 200 centimeters.

Included with this soil in mapping are small areas of somewhat poorly drained Augusta and Dragston soils, poorly drained Acredale and Nimmo soils and very poorly drained Portsmouth and Hyde soils. The Augusta and Dragston soils are on areas at slightly higher elevations. The Nimmo soils have less clay in the subsoil. The Acredale soils have more silt in the subsoil. The Portsmouth and Hyde soils have thicker, dark-colored surface layers that are rich in organic matter. Also included are areas that have water on the surface after heavy rains or during prolonged wet periods. Included soils make up about 30 percent of the unit.

The permeability of this Tomotley soil is moderate in the subsoil and moderately rapid in the substratum. Available water capacity is moderate. Surface runoff is slow. The erosion hazard is slight. The subsoil has a low shrink-swell potential. The root zone extends to a depth of 150 centimeters or more. The soil is moderate in organic matter content and low in natural fertility. It commonly ranges from extremely acid through strongly acid, but reaction of the surface layer varies because of local liming practices. A seasonal high water table is between the surface and a depth of 1 foot during winter and spring.

Most areas of this soil have been drained by ditching and are used for cultivated crops. The remaining areas are in community development or woodland.

This soil is well suited to cultivated crops if drained. Crops respond well to lime and fertilizer but are sometimes damaged in undrained areas after heavy or prolonged rains. The soil is wet and cold in spring, and wetness often interferes with tillage. Tilling within the proper range of moisture content reduces soil compaction and clodding. Minimum tillage, using cover crops and grasses and legumes in the cropping system, and returning crop residue to the soil help to maintain organic matter content and tilth, reduce crusting, and increase water infiltration.

The potential productivity for trees on this soil is high, especially for loblolly pine, sweetgum, and oaks. Seeds and seedlings survive and grow well if competing vegetation is controlled. Productivity and seedling survival are enhanced by drainage. The soil is soft when wet, thus limiting use of heavy timber equipment.

The seasonal high water table is the main limitation of the soil for community development. The seasonal high water table limits use of the soil as a site for septic tank absorption fields; however, this limitation may be overcome with adequate artificial drainage and with proper design and installation of drainfields. The seasonal high water table also limits use of the soil as a building site and for many types of recreation, but with proper landscaping and artificial drainage this limitation may also be overcome for these uses.

The capability subclass is IVw if undrained and IIIw if drained.

65 - PORTSMOUTH LOAM

This soil is deep, nearly level, and very poorly drained. It is mostly on broad inland flats and slight depressions. Areas of this soil commonly are irregular shaped and range from 2 to 400 acres. Slope ranges from 0 to 2 percent.

Typically, the surface layer of this soil is black loam about 30 centimeters thick, underlain by gray loam to a depth of 47 centimeters. The subsoil extends to a depth of 95 centimeters. It is mostly gray fine sandy loam and sandy clay loam in the upper part and mottled gray, brown and yellow sandy loam in the lower part. The substratum is gray stratified sand, fine sandy loam and sandy clay loam to a depth of at least 180 centimeters.

Included with this soil in mapping are small areas of poorly drained Acredale, Nimmo, and Tomotley soils, somewhat poorly drained Dragston soils and very poorly drained Hyde soils. The Acredale, Nimmo and Tomotley soils are on areas at slightly higher elevations. The Dragston soils are on low-lying ridges. The Hyde soils have more silt in the subsoil than Portsmouth soils. Also included are areas that have water on the surface after heavy rains or during prolonged wet periods. Included soils make up about 20 percent of the unit.

The permeability of this Portsmouth soil is moderate in the subsoil and moderately rapid to rapid in the substratum. Available water capacity is high. Surface runoff is very slow. The erosion hazard is slight. Tilth is good. The subsoil has a low shrink-swell potential. The root zone extends to a depth of 150 centimeters or more. The soil is low in natural fertility and the surface layer is high in organic matter content. The soil commonly ranges from extremely acid through strongly acid, but reaction of the surface layer varies because of local liming practices. A seasonal high water table is between the surface and a depth of 1/2 foot, mostly during winter and spring.

Most areas of this soil have been drained by ditching and are used for cultivated crops. Most remaining areas are in woodland.

This soil is well suited to cultivated crops if drained. Drainage systems may be difficult to install because of the wet, sandy substratum. Draining areas of this soil in Carolina Bays may be hindered by the lack of suitable outlets. Crops respond well to lime and fertilizer but are sometimes damaged in undrained areas after heavy or prolonged rains. The soil is wet and cold in spring and wetness often interferes with tillage. Tilling within the proper range of moisture content reduces soil compaction and clodding. Minimum tillage, using cover crops and grasses and legumes in the cropping system, and returning crop residue to the soil help to maintain organic matter content and tilth, reduce crusting, and increase water infiltration.

The potential productivity for trees on this soil is very high, especially for loblolly pine, sweetgum and oaks. Productivity and seedling survival are enhanced by drainage. Seeds and seedlings survive and grow well if competing vegetation is controlled. The soil is soft when wet, thus limiting the use of heavy timber equipment.

The seasonal high water table and the sandy substratum are the main limitations of the soil for community development. The seasonal high water table limits use of the soil as a site for septic tank absorption fields; however, this limitation may be overcome with adequate artificial drainage and with proper design and installation of drainfields. The seasonal high water table and the instability of the sandy substratum limit excavation. The seasonal high water table also limits use of the soil as a building site and for many types of recreation. This wetness limitation may be overcome for these uses with proper landscaping and artificial drainage.

The capability subclass is IIIw, if drained and VIw if undrained.

79 - BOHICKET SILTY CLAY LOAM

This soil is deep, nearly level, and very poorly drained. It is on tidal marshes along the Nansemond River, Hampton Roads, and small streams. Areas of this soil are commonly long and winding, but some are very broad. The areas range from about 3 to 100 acres. Slopes range from 0 to 1 percent.

Typically, the surface layer of this soil is dark grayish brown silty clay loam about 13 inches thick. The substratum is silty clay to a depth of at least 60 inches.

Included with this soil in mapping are small areas of moderately well drained Pactolus and Munden soils around the edges of the tidal marsh. These soils are not flooded by tidal action. Also included are a few small areas of coastal beach. Included soils make up about 10 percent of the unit.

The permeability of this Bohicket soil is very slow, and available water capacity is high. Surface runoff is very slow. The soil is high in organic matter content and high in natural fertility. The substratum has a high shrink-swell potential. The soil is neutral through moderately alkaline, but becomes extremely acid when dry. It is flooded daily by tidal water and is continuously saturated.

Most areas of this soil are in saltwater-tolerant grasses and forbs.

Tidal flooding, low strength, wetness, the high shrink-swell potential, and a high sulfur content make this soil unsuitable for most uses other than as wetland wildlife habitat.

The capability subclass is VIIIw.

SOIL SERIES DESCRIPTIONS

MUNDEN SERIES

The Munden series consists of deep, moderately well drained soils. They formed in loamy and sandy marine or fluvial sediments on the Pamlico surface of the lower Coastal Plain and on stream terraces throughout the Coastal Plain. Permeability is moderate in the solum and moderately rapid in the underlying material. Slopes range from 0 to 6 percent.

Taxonomic Class: Coarse-loamy, mixed, thermic Aquic Hapludults.

Typical Pedon: Munden fine sandy loam (Colors are for moist soil)

Ap--0 to 20 cm.; dark grayish brown (10 YR 4/2) fine sandy loam; weak fine granular structure; very friable; common fine roots; slightly acid; abrupt smooth boundary. (13 to 30 cm. thick)

B21t--20 to 38 cm.; yellowish brown (10 YR 5/6) sandy loam; weak medium subangular blocky structure; friable; slightly sticky, slightly plastic; few fine roots; few thin discontinuous clay films on faces on peds; many sand grains coated and bridged with clay; strongly acid; clear smooth boundary. (15 to 36 cm. thick)

B22t--38 to 63 cm.; yellowish brown (10 YR 5/6) loam; common medium faint light brown (7.5 YR 6/4) mottles; moderate medium subangular blocky structure; friable slightly sticky, slightly plastic; few fine roots; common thin discontinuous clay films on faces of peds; many sand grains coated and bridged with clay; very strongly acid; clear smooth boundary. (15 to 40 cm. thick)

B23t--63 to 81 cm.; brown (10 YR 5/3) and yellowish brown (10 YR 5/8) sandy loam; common fine distinct light brownish gray (10 YR 6/2) mottles; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; few thin discontinuous clay films on faces of peds; many sand grains coated and bridged with clay; few small pockets of sand up to 4 cm. in diameter; very strongly acid; clear smooth boundary. (10 to 25 cm. thick)

C--81 to 158 cm.; mottled yellowish brown (10 YR 5/8), light brownish gray (10 YR 6/2) and yellowish red (5 YR 5/6) sand; single grain; loose; many sand grains stained; strongly acid.

Solum thickness ranges from 60 to 120 centimeters. Reaction ranges from very strongly acid through medium acid unless limed.

The A horizon has hue of 10 YR or 2.5 Y, value of 3 through 5, and chroma of 1 through 4. It is loamy fine sand, sandy loam, fine sandy loam, or loam.

The B horizons have hue of 7.5 YR through 2.5 Y, value of 4 through 6, and chroma of 4 through 8. In some pedons the lower B horizons have high and low chroma mottles. The B horizons are sandy loam, fine sandy loam, or loam. Subhorizons of some pedons range to sandy clay loam.

The C horizon has hue of 7.5 YR through 2.5 Y, value of 5 through 7, and chroma of 2 through 8, or it is mottled with high and low chroma mottles. It is sand, loamy fine sand, sandy loam, or fine sandy loam.

TETOTUM SERIES

The Tetotum series consists of deep, moderately well drained soils that have moderate permeability in the B horizon and moderate to rapid permeability in the C horizon. They formed in moderately fine textured fluvial stream terrace or lower Coastal Plain sediments. Slopes range from 0 to 50 percent.

Taxonomic Class: Fine-loamy, mixed, thermic Aquic Hapludults.

Typical Pedon: Tetotum fine sandy loam (Colors are for moist soil)

Ap--0 to 23 cm.; dark grayish brown (10 YR 4/2) fine sandy loam; moderate fine granular structure; very friable; many fine roots; few fine pebbles; medium acid, clear smooth boundary. (20 to 30 cm. thick)

B21t--23 to 36 cm.; dark yellowish brown (10 YR 4/4) sandy clay loam; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; many fine roots; common fine pores; few thin patchy clay films; few fine pebbles; strongly acid; clear smooth boundary.

B22t--36 to 58 cm.; yellowish brown (10 YR 5/4) clay loam; moderate medium subangular blocky structure; firm, sticky, slightly plastic; common fine roots; common fine pores; thin patchy clay films; few fine pebbles; strongly acid; clear smooth boundary.

B23t--58 to 76 cm.; yellowish brown (10 YR 5/8) clay loam, few fine distinct gray (10 YR 6/1) and strong brown (7.5 YR 5/8) mottles; moderate fine subangular blocky structure; firm, sticky, slightly plastic; common fine roots; common fine pores; thin patchy clay films; few fine pebbles; strongly acid; clear smooth boundary.

B24t--76 to 96 cm.; mottled yellowish brown (10 YR 5/8), gray (10 YR 6/1), and red (2.5 YR 4/8) clay loam; moderate fine angular blocky structure; firm, sticky, plastic; few fine roots; few fine pores; thin continuous clay films; common fine pebbles; very strongly acid; clear smooth boundary. (Combined thickness of the B2t horizon is 45 to 130 cm.)

B3tg--96 to 122 cm.; gray (10 YR 6/1) sandy clay loam; many fine distinct strong brown (7.5 YR 5/6) and yellowish brown (10 YR 5/6) mottles; weak medium subangular blocky structure; firm slightly sticky, slightly plastic; few fine roots; few fine pores; thin patchy clay films; common fine pebbles; very strongly acid; gradual smooth boundary. (0 to 35 cm. thick)

II Cg--122 to 183 cm.; gray (10 YR 6/1) stratified fine sandy loam and loamy fine sand; common distinct yellowish brown (10 YR 5/4) and strong brown (7.5 YR 5/6) mottles; massive; friable; few fine pebbles; very strongly acid.

Solum thickness ranges from 100 to 150 centimeters or more. Coarse fragments make up 0 to 10 percent of the soil. Reaction ranges from strongly acid through extremely acid, unless limed.

The upper 50 centimeters of the Bt horizon has more than 30 percent silt or more than 40 percent silt plus very fine sand.

The A horizon has hue of 10 YR or 2.5 Y, value of 3 through 5, and chroma of 2 through 4. It is sandy loam, fine sandy loam, loam or silt loam.

The B horizons have hue of 7.5 YR through 2.5 Y, value of 4 through 7, and chroma of 1 through 8. The lower B horizons have high and low chroma mottles. The B horizons are loam or clay loam, but some pedons have sub-horizons of sandy clay loam, silt loam, or silty clay loam.

The C horizon is gray with high chroma mottles or it is mottled with no dominant matrix color. It is stratified and ranges from sand to sandy clay loam.

DRAGSTON SERIES

The Dragston series consists of deep, somewhat poorly drained soils that formed in loamy fluvial or marine sediments on stream terraces and on the Pamlico surface of the lower Coastal Plain. Permeability is moderately rapid. Slopes range from 0 to 2 percent.

Taxonomic Class: Coarse-loamy, mixed, thermic Aeric Ochraquults.

Typical Pedon: Dragston fine sandy loam-cultivated (Colors are for moist soil).

Ap--0 to 23 cm.; dark grayish brown (10 YR 4/2) fine sandy loam; weak medium granular structure; very friable; many fine roots; many fine pores; strongly acid; abrupt smooth boundary. (15 to 30 cm. thick)

B21t--23 to 43 cm.; light olive brown (2.5 Y 5/4) fine sandy loam; common medium distinct yellowish brown (10 YR 5/8) mottles and few fine faint grayish brown (2.5 Y 5/2) mottles; weak medium subangular blocky structure; friable; slightly sticky, slightly plastic; few fine pores; thin very patchy clay films on faces of peds and clay bridging between sand grains; very strongly acid; clear wavy boundary. (15 to 35 cm. thick)

B22tg--43 to 71 cm.; grayish brown (2.5 Y 5/2) fine sandy loam; common medium distinct yellowish brown (10 YR 5/8) mottles; weak medium subangular blocky structure; friable; slightly sticky, slightly plastic; thin very patchy clay films on faces of peds and clay bridging between sand grains; very strongly acid; gradual wavy boundary. (15 to 50 cm. thick)

B3g--71 to 94 cm.; grayish brown (10 YR 5/2) fine sandy loam; common medium distinct yellowish brown (10 YR 5/6) mottles; weak very coarse subangular blocky structure; very friable, non-sticky, non-plastic; very strongly acid; gradual wavy boundary. (0 to 20 cm. thick)

C--94 to 168 cm.; brownish yellow (10 YR 6/8) fine sand; few coarse distinct light brownish gray (10 YR 6/2) mottles; single grain; loose; very strongly acid.

Solum thickness ranges from 65 to 125 centimeters. Quartz pebbles make up 0 to 2 percent of the solum and 0 to 10 percent of the C horizon. The soil is strongly acid or very strongly acid unless limed.

The A horizon has hue of 10 YR through 5 Y, value of 2 through 5, and chroma of 1 through 4. High and low chroma mottles are few to common. The A horizon is loamy fine sand, sandy loam, fine sandy loam, or loam.

The B horizons have hue of 10 YR through 5 Y or they are neutral, value of 4 through 6, and chroma of 0 through 8, and they are mottled with high and low chromas. The B horizons are sandy loam, fine sandy loam, or loam, but some pedons have subhorizons of sandy clay loam.

The C horizon is mottled or has hue of 10 YR through 5 Y or it is neutral, value of 4 through 7, and chroma of 0 through 8. It is stratified sand, fine sand, loamy fine sand, sandy loam, or fine sandy loam.

AUGUSTA SERIES

The Augusta series consists of deep, somewhat poorly drained, moderately permeable soils that formed in loamy sediments. These soils are on low terraces in the Southern Coastal Plain. The water table commonly is at a depth of about 1 to 2 feet in winter and spring. Slopes range from 0 to 2 percent.

Taxonomic Class: Fine-loamy, mixed, thermic Aeric Ochraquults.

Typical Pedon: Augusta fine sandy loam--in pasture (Colors are for moist soil unless otherwise stated).

Ap--0 to 22 cm.; brown (10 YR 4/3) fine sandy loam; weak fine granular structure; very friable; many fine roots; few fine pebbles; common fine flakes of mica; strongly acid; abrupt wavy boundary. (12 to 25 cm. thick)

B21t--22 to 47 cm.; pale brown (10 YR 6/3) sandy clay loam; many medium distinct yellowish brown (10 YR 5/6) and common medium faint light brownish gray (10 YR 6/2) mottles; weak medium subangular blocky structure; friable few fine roots; few fine pebbles; few fine flakes of mica; strongly acid; gradual smooth boundary. (15 to 30 cm. thick)

B22t--47 to 60 cm.; mottled light brownish gray (10 YR 6/2) and yellowish brown (10 YR 5/6) clay loam; moderate medium subangular blocky structure; firm; thin continuous clay film on faces of peds; common fine flakes of mica; strongly acid; gradual wavy boundary. (0 to 20 cm. thick)

B23tg--60 to 130 cm.; light brownish gray (10 YR 6/2) clay loam; many medium distinct yellowish brown (10 YR 5/6) mottles; moderate medium subangular blocky structure; firm; thin continuous clay film on faces of peds; common fine flakes of mica; strongly acid; gradual wavy boundary. (30 to 50 cm. thick)

B3g--130 to 150 cm.; gray (5 Y 6/1) sandy clay loam; common medium distinct yellowish brown (10 YR 5/6) mottles; weak coarse subangular blocky structure; friable; common fine flakes of mica; strongly acid; gradual irregular boundary. (0 to 25 cm. thick)

Cg--150 to 175 cm.; gray (5 Y 6/1) coarse sandy loam; many medium distinct yellowish brown (10 YR 4/4) mottles; massive; friable; about 5 percent by volume of fine pebbles; few fine flakes of mica; strongly acid.

Solum thickness ranges from 100 to 200 centimeters. The soil ranges from very strongly acid through medium acid, unless limed.

The A horizon has hue of 2.5 Y or 10 YR, value of 4 through 6, and chroma of 2 through 6. It is sandy loam, fine sandy loam, loam or silt loam.

The B horizons have hue of 10 YR through 5 Y, value of 4 through 7, and chroma of 1 through 6, or they are neutral. The B horizons have mottles with high and low chroma. They are sandy loam, loam, sandy clay loam, or clay loam. Some pedons have a subhorizon of clay.

The C horizon has hue of 10 YR through 5 Y, value of 5 through 7, and chroma of 1 or 2, or it is neutral. It is stratified and ranges from sand to clay loam.

NIMMO SERIES

The Nimmo series consists of deep, poorly drained soils. They formed in loamy and sandy marine or fluvial sediments on the lower Coastal Plain and on stream terraces. Permeability is moderate in the solum and moderately rapid in the underlying material. Slopes range from 0 to 2 percent.

Taxonomic Class: Coarse-loamy, mixed, thermic Typic Ochraquults.

Typical Pedon: Nimmo fine sandy loam (Colors are for moist soil).

Ap--0 to 18 cm.; dark gray (10 YR 4/1) fine sandy loam; weak fine granular structure; friable, non-sticky, slightly plastic; many fine roots; common clean sand grains; strongly acid; abrupt smooth boundary. (10 to 38 cm. thick)

B21tg--18 to 36 cm.; light gray (10 YR 6/1) fine sandy loam; common medium prominent yellowish brown (10 YR 5/6) mottles; weak fine subangular blocky structure; friable; slightly sticky, slightly plastic; common fine medium and coarse roots; many sand grains coated and bridged with clay; few thin discontinuous clay films on faces of peds; very strongly acid; clear smooth boundary. (15 to 51 cm. thick)

B22tg--36 to 63 cm.; (10 YR 5/1) loam; many medium prominent yellowish brown (10 YR 5/6) mottles; moderate medium subangular blocky structure; friable; slightly sticky, slightly plastic; common fine medium and coarse roots; many sand grains coated and bridged with clay; few thin discontinuous clay films on faces of peds; very strongly acid; clear smooth boundary. (15 to 51 cm. thick)

B23tg--63 to 84 cm.; gray (10 YR 5/1) fine sandy loam; many medium prominent yellowish brown (10 YR 5/6) mottles; weak fine subangular blocky structure; friable; slightly sticky, slightly plastic; common fine and medium roots; many sand grains coated and bridged with clay; few thin discontinuous clay films on faces of peds; very strongly acid; clear smooth boundary. (13 to 25 cm. thick)

II Cg--84 to 152 cm.; light gray (10 YR 7/1) fine sand; single grain; loose; common very fine black mineral grains; few medium yellowish brown (10 YR 5/4) sand grains; few coarse sand grains; strongly acid.

Solum thickness ranges from 60 to 120 centimeters. Coarse fragments make up 0 to 3 percent of the soil. The soil ranges from extremely acid through strongly acid unless limed.

The A horizon has hue of 10 YR through 5 Y, value of 2 through 5, and chroma of 1 or 2. It is loamy sand, loamy fine sand, sandy loam, fine sandy loam, or loam.

The Btg horizons have hue of 10 YR through 5 Y, value of 4 through 7, and chroma of 1 or 2. They have mottles of high chroma. They commonly are loam or fine sandy loam but range to sandy loam, and some pedons have thin strata of silt loam or sandy clay loam.

The C horizon has hue of 7.5 YR through 5 Y or is neutral, value of 3 through 8, and chroma of 0 through 8. It is sand, fine sand, loamy sand, or loamy fine sand with strata of finer textures.

TOMOTLEY SERIES

The Tomotley series consists of deep, poorly drained, moderately slowly permeable soils formed in loamy marine or fluvial sediment. These soils are on nearly level flats and slight depressions on terraces of the Coastal Plain. The water table is within one foot of the soil surface for 60 to 120 days each year. Slopes range from 0 to 2 percent.

Taxonomic Class: Fine, loamy mixed, thermic Typic Ochraquults.

Typical Pedon: Tomotley loam (Colors are for moist soil).

Ap--0 to 20 cm.; very dark gray (10 YR 3/1) loam; weak fine granular structure; very friable; many fine and medium roots; very strongly acid; clear smooth boundary. (12 to 25 cm. thick)

A2--20 to 32 cm.; light gray (10 YR 6/1) loam; common medium distinct dark gray (10 YR 4/1) streaks and splotches; weak medium subangular blocky structure; very friable; common fine roots; common fine uncoated sand grains; very strongly acid; clear smooth boundary. (7 to 28 cm. thick)

B21tg--32 to 60 cm.; gray (10 YR 5/1) sandy clay, loam, common fine distinct yellowish brown and strong brown and a few fine prominent red mottles; weak medium subangular blocky structure; friable; thin patchy clay films in old root channels and on faces of some peds; common fine roots; few fine lenses of light gray loamy fine sand; very strongly acid; gradual wavy boundary. (15 to 52 cm. thick)

B22tg--60 to 110 cm.; gray (10 YR 6/1) sandy clay loam; common medium prominent red (10 YR 4/8); common medium distinct yellowish brown (10 YR 5/6), and common fine distinct strong brown mottles; moderate medium subangular blocky structure; friable; thin patchy clay films on faces of peds; few fine lenses of light gray loamy fine sand; very strongly acid; gradual wavy boundary. (20 to 90 cm. thick)

B23tg--110 to 130 cm.; light gray (5 Y 7/1) sandy clay; common medium prominent red (2.5 YR 4/6), common fine distinct strong brown and yellowish brown mottles; weak medium subangular blocky structure; firm; thin patchy clay films on faces of some peds; few fine lenses of light gray; loamy fine sand; few fine flakes of mica; very strongly acid; gradual wavy boundary. (17 to 40 cm. thick)

B3g--130 to 147 cm.; light gray (5 Y 7/1) fine sandy loam with coarse pockets of sandy clay loam; common medium distinct strong brown (7.5 YR 5/8), common medium faint pale olive (5 Y 6/3), and few fine prominent yellowish red mottles; massive; friable; few fine flakes of mica; very strongly acid; gradual wavy boundary. (15 to 75 cm. thick)

Cg--147 to 200 cm.; light gray (2.5 Y 7/2) loamy fine sand; common medium distinct strong brown (7.5 YR 5/8), and common medium faint light yellowish brown (2.5 Y 6/4) mottles, massive friable; few fine flakes of mica; very strongly acid.

Solum thickness ranges from 100 to more than 150 centimeters. The soil ranges from extremely acid to strongly acid unless limed.

The Ap horizon has hue of 10 YR to 5 Y, or it is neutral, value of 2 to 4, and chroma of 0 to 2. Some pedons have an A2 horizon with hue of 10 YR or 2.5 Y, value of 4 to 7, and chroma of 1 or 2. The A2 horizon commonly has high chroma mottles. The A horizons are loamy fine sand, fine sandy loam, sandy loam, or loam.

The B horizons have hue of 10 YR to 5 Y, or they are neutral, value of 5 to 7, and chroma of 0 to 2. Mottles in shades of gray, olive, yellow, brown, or red range from few to many. The B horizons are sandy clay loam, clay loam, loam, or fine sandy loam, but some pedons contain thin subhorizons of silt loam.

The C horizon has hue of 10 YR to 5 Y, or it is neutral, value of 6 or 7, and chroma of 1 to 2. Most pedons contain mottles of contrasting shades. The C horizon is commonly stratified and ranges from sand to clay.

PORTSMOUTH SERIES

The Portsmouth series consists of very poorly drained, moderately permeable soils formed in loamy textured marine and fluvial sediments. These soils are moderately thick over contrasting sandy textural material. Slopes range from 0 to 2 percent.

Taxonomic Class: Fine-loamy over sandy or sandy-skeletal, mixed, thermic Typic Umbraquults.

Typical Pedon: Portsmouth loam-cultivated. (Colors are for moist soil unless otherwise stated)

Ap--0 to 30 cm.; black (10 YR 2/1) loam; weak medium granular structure; very friable; many fine roots; medium acid; gradual wavy boundary. (20 to 32 cm. thick)

A2--30 to 47 cm.; gray (10 YR 5/1) loam; weak medium granular structure; very friable; few fine and medium roots; medium acid; gradual wavy boundary. (0 to 20 cm. thick)

B1g--47 to 57 cm.; gray (10 YR 5/1) and dark gray (10 YR 4/1) fine sandy loam; common medium distinct brownish yellow (10 YR 6/8) and yellow (10 YR 7/8) mottles; weak medium subangular blocky structure; friable; slightly sticky, slightly plastic; common fine pores and old root channels; common medium flakes of mica; strongly acid; gradual wavy boundary. (0 to 15 cm. thick)

B2tg--57 to 87 cm.; gray (10 YR 5/1) and dark gray (10 YR 4/1) sandy clay loam with pockets and lenses of sandy clay and sandy loam; common prominent yellowish brown (10 YR 5/8) mottles; weak medium subangular blocky structure; friable; sticky; plastic; common fine pores and old root channels; common thin patchy clay films on faces of peds; common medium flakes of mica; few medium grains of feldspar minerals; very strongly acid; clay; wavy boundary. (25 to 50 cm. thick)

B3g--87 to 95 cm.; mottled gray (10 YR 5/1), yellowish brown (10 YR 6/8) and reddish yellow (5 YR 6/8) sandy loam; weak medium subangular blocky structure; very friable; common medium flakes of mica; few medium grains of feldspar minerals; very strongly acid; clear smooth boundary. (0 to 7 cm. thick)

IIC1g--95 to 120 cm.; gray (10 YR 6/1) sand with few small bodies of sandy clay loam; single grained; loose; common medium flakes of mica; few medium grains of feldspar minerals; very strongly acid; abrupt smooth boundary. (7 to 37 cm. thick)

IIC2g--120 to 180 cm.; gray (10 YR 6/1) and light gray (10 YR 7/1) coarse sand; single grained; loose; common medium flakes of mica; few small to large pebbles; strongly acid.

The loamy textural horizons are 60 to 100 centimeters thick over contrasting sandy textural horizons. Reaction of the A and B horizons ranges from extremely acid to medium acid.

The A1 or Ap horizon typically has hue of 10 YR, value of 2 or 3, and chroma of 0 to 3. Colors range to black (N2/0), very dark gray (N3/0), and very dark grayish brown (2.5 Y 3/2). The A2 horizon, where present, has hue of 10 YR or 5 Y, value of 5 to 7, and chroma of 1 or 2. Texture is sandy loam, fine sandy loam, or loam, or their mucky analogues.

The B1 horizon, where present, has hue of 10 YR or 5 Y or it is neutral, value of 4 to 6, and chroma of 1 or 2. It has mottles in shades of yellow and brown. It is sandy loam, fine sandy loam, or loam.

The B2t horizon has hue of 10 YR, 5 Y, or it is neutral, value of 4 to 7, and chroma of 1 or 2. Mottles are in shades of brown, yellow, and red. It is sandy clay loam, loam, or clay loam. Some pedons have strata or pockets of sandy clay and sandy loam.

The B3 horizon, where present, has colors similar to the B2t horizon. It is loamy sand or sandy loam and is less than 5 inches thick.

The IIC horizon has hue of 10 YR, 5 Y, or it is neutral, value of 5 to 7, and chroma of 1 or 2. Mottles are in shades of brown and yellow. It is sand or loamy sand. Some pedons contain strata or pockets of sandy loam, clay loam, or sandy clay loam.

BOHICKET SERIES

The Bohicket series consists of very poorly drained, very slowly permeable soils that formed in marine sediments in tidal marshes. These soils are flooded twice daily by sea water. Slopes are less than one percent.

Taxonomic Class: Fine, mixed, non acid, thermic Typic Sulfaquents.

Typical Pedon: Bohicket silty clay loam - saltwater marsh wildlife habitat. (Colors are for wet soil)

Ag--0 to 25 cm.; dark gray (5 Y 4/1) silty clay loam; massive; very sticky; strong fine angular blocky structure when dry; many medium and coarse pithy fibrous roots constituting 35 percent of mass by volume; soil flows easily between fingers when squeezed and leaves small residue in hand; neutral; gradual wavy boundary. (20 to 60 cm. thick)

C1g--25 to 123 cm.; dark gray (5 Y 4/1) silty clay; massive; very sticky; many fine and medium roots; soil flows easily between fingers when squeezed and leaves hand empty; clear wavy boundary. (50 to 125 cm. thick)

C2g--123 to 138 cm.; dark gray (5 Y 4/1) silty clay and very dark grayish brown (10 YR 3/2) fine sandy loam; massive; sticky; few fine roots; soil flows easily between fingers when squeezed and leaves small residue in hand; neutral; clear wavy boundary. (0 to 20 cm. thick)

C3g--138 to 170 cm.; greenish gray (5 GY 5/1) clay; common coarse faint gray (5 Y 4/1) mottles; massive; sticky; few fine roots; soil flows between fingers with some difficulty when squeezed leaving large residue in hand; moderately alkaline; gradual wavy boundary. (0 to 63 cm. thick)

C4g--170 to 200 cm.; dark greenish gray (5 GY 4/1) clay; common medium faint greenish gray (5 G 5/1) mottles; massive; slightly sticky; few lenses and pockets of dark grayish brown fine sandy loam material; soil flows between fingers with some difficulty when squeezed leaving large residue in hand; moderately alkaline.

Range in Characteristics: These soils are continuously saturated with sea water. Soil salinity is high or very high. N values of all horizons within the 25 to 100 centimeters control section are 1 or more. Pale yellow sulfer compounds are common on surface of peds after air drying for 30 days. The soil ranges from slightly acid through moderately alkaline throughout. After air drying for 30 days it is extremely acid.

The A horizon has hue of 10 YR, 2.5 Y, 5 Y, or 5 G, or it is neutral, value of 2 to 5 and chroma of 2 or less. H is silty clay loam, silty clay or clay.

The C horizon has hue of 10 YR, 2.5 Y, 5 Y, 5 GY or 5 BG, or it is neutral, value of 2 to 7, and chroma of 2 or less. The upper part of the Cg horizon is clay, silty clay, clay loam, sandy loam, or the mucky analogues of these textures. Some pedons have pockets or thin strata of clay loam, sandy clay loam, silt loam, sandy loam, loamy sand, or sand. Organic layers totaling less than 40 centimeters thick are in the control sections of some pedons. The lower part of the C horizon below about 100 centimeters is variable, ranging from sand to clay.

EXPLANATION OF INTERPRETATIVE TABLES

With the knowledge of soil features, it is possible to rate the limitations of a soil for specific uses for broad land-use planning. Soil Survey maps show the location of different soils, each having distinct individual properties that determine the behavior of these soils. The limitations of these soils for each use are rated in terms of degree-slight, moderate, or severe --

> SLIGHT ratings mean little or no limitation or limitations easily corrected by the use of normal equipment.
>
> MODERATE ratings mean presence of some limitation which normally can be overcome by careful design and management at somewhat greater costs.
>
> SEVERE limitations are those which normally cannot be overcome without exceptional, complex, or costly measures.
>
> It is not intended that a severe rating makes that use unsuitable except for marsh soils.

Soil features and their behavior should not be used as the sole basis for judgment nor can it replace detailed, on-site investigations and testing for design purposes. Other things to consider include location, accessibility, availability of utilities, current use of adjacent areas, and many others. Soil mapping and interpretations apply to the upper 5 to 6 feet.

Interpretations for NNSY and St. Juliens Annex Soils

A. What they are

Soil interpretations are expressions of anticipated behavior of soils under various uses. They are based on detailed soil surveys, and related field and laboratory studies and tests. Because interpretations are valuable tools for broad planning, planners will want to read "Soil Surveys and Land-use Planning"(2).

B. How prepared

Soils in the United States are classified by properties which can be measured or inferred either in the field or the laboratory. Following a rather complex system, soils are named by the National Cooperative Soil Survey. Each named soil is described in detail and then mapped by soil scientists walking over the fields and through woodlands while making countless auger borings. Representative profiles of major soils are selected, pits are excavated and all major horizons are sampled to determine the texture, acidity, available water capacity, cation exchange capacity, organic matter content, estimated permeability, liquid limit, plasticity index, and any other properties which are of importance locally. In addition, forest site index studies and wildlife observations are made to assist with the interpretations for those uses.

C. Assumptions and Rationale for Interpretations

Many soil properties affect the use of a soil for a specific purpose. Usually they are inter-related and may be overlapping. A total of 11 principal soil properties have been chosen as most important. Their importance varies with the specific use. In many cases one property may be enough to affect the rating for a given use.

D. Dominant soil properties or features used in interpretations ---

1. Flood hazard (stream overflow).
2. Wetness (natural drainage classes or water table height and duration).
3. Slope.
4. Coarse fragments (gravel, cobbles, ironstone, shell fossils).
5. Texture (sand, silt, clay proportions).
6. Permeability, percolation.
7. Shrink-swell potential.
8. Natural fertility.
9. Available water capacity.
10. Erosion hazard.
11. Prior erosion.

Note: Depth to bedrock, rockiness and stoniness are not considered in this report (depth to bedrock is estimated at approximately 1,000 feet). Frost action potential is also not considered for the winters are relatively mild and freezing below 6 inches is rare in cultivated areas, almost nil in wooded areas.

E. Explanation of Properties or Factors

1. <u>Flood hazard (stream overflow)</u> - This refers to the overflow intended to include shallow ponding associated with normal rainfall runoff. Damage normally diminishes upstream.

   Flood hazard is a critical soil factor for such land uses as sites for residential buildings, schools, hospitals, nursing homes, and camp sites where loss of life is likely if rapid evacuation is not possible. For health reasons, it is also critical for use of flooded areas as sites for septic disposal fields and sanitary landfills. Extremely high potential for property damage normally prohibits the use of flood plains for sites of industrial or commercial structures unless the flood hazard can be reduced.

Flood hazards at sites can change from time to time. Construction of flood control structures upstream may reduce the flood hazard considerably. On the other hand stream encroachments and upstream urban development may increase the flood hazard.

2. Wetness (natural drainage classes or water table height and duration) - This is an indication of the portion of the year that a soil is saturated or contains excess water. In some cases the soil is saturated by a water table that rises and falls seasonally; in others, water is perched over slowly permeable layers (clay or fragipans). Six natural drainage classes (before man's improvement efforts) are normally used: excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained, and very poorly drained. Natural drainage classes are: excessive - no excess water in soil in any season; well drained - excess water for only short periods after abnormally heavy rainfall; moderately well drained - seasonally high water at 1½ to 4 feet from surface from January to April; somewhat poorly drained - seasonally high water at 1/2 to 1½ feet from surface from December to May; poorly drained - seasonally high water at 0 to 1 foot from surface from November to June; very poorly drained - seasonally high water at surface from October to June. Each class successively is wet for longer periods. There is not an absolute relation of wetness for permeability because wetness is an expression of whether the water remains for definite periods of time. Records of water table fluctuations are used for seasonal water table predictions.

   Some important uses which are affected by soil wetness are building foundations, septic effluent disposal, roads, parking lots, playgrounds, farming, and sanitary landfills.

3. Slope - Slope is shown on the maps in letters following the soil symbol as follows (if there is enough slope to justify it):

Slope Letter, Description		Percent Slope
A	nearly level	0 to 2 percent
B	gently sloping	2 to 6 percent
C	sloping	6 to 10 percent
D	moderately steep	10 to 15 percent
E	steep	15 to 25 percent
F	very steep	25 to 70 percent or greater

   Percent slope means the number of feet vertical rise or fall per 100 feet horizontal distance. Slope as a soil factor affects such uses as military maneuvering, septic tank effluent disposal, playgrounds, farming, wildlife food plots, parking lots, roads, campsites, and forest management.

4. Coarse fragments - This refers to fragments of quartz, ironstone, or fossiliferous shells ranging in sizes larger than coarse sands (2mm). If the fragments are of quartz they are called pebbles or gravel up to 3 inches. If the fragments are greater than 3 inches but less than 10 inches they are called cobbles. The ironstone (ferricrete) and shells (fossiliferous shells) are not designated to size adjectives. Coarse fragments affect uses of soils as athletic fields, source of topsoil, and campsites. A high coarse fragment on the surface content reduces the erosion hazard in a soil.

5. Texture (sand, silt, clay proportions) - This refers to the proportion of each of the named size particles in a soil. Soil texture is an important soil property affecting available water capacity, natural fertility, permeability, erosiveness, frost action hazard, filtering ability, and many others. Sandy textures are generally rapidly permeable, low in available water capacity, low in natural fertility. Clayey soils are slowly permeable and are subject to shrink-swell volume changes. Silty soils have high available water capacity but are subject to high erosion action.

6. Permeability, percolation - Permeability refers to the rate of vertical movement of water through a wet soil; it is generally expressed in inches per hour. Percolation refers to the rate of water movement (vertically and horizontally) in a soil thoroughly wetted; it is reported in minutes per inch.

   Permeability (or percolation) is important as one of the controlling properties of soil that governs its use as a septic effluent disposal field. Suitable permeability (or percolation) must be coupled with well drained conditions; high water table can prevent permeable soils from functioning.

   Permeability also affects the drainage, irrigation, and function of sanitary landfills.

7. Shrink-swell potential - Refers to the volume change that normally occurs with the alternating drying and wetting that occurs in soils. Soils containing large amounts of montmorillonite clay have high shrink-swell potential.

8. Natural fertility - Natural fertility is a general expression of the ability of soil to grow plants and produce crops. Natural fertility is affected by acidity which can be corrected by liming. The application of fertilizers over many years tremendously increases the crop production facility of a soil.

Natural fertility affects the use of soils for farming, lawns, golf fairways and as a source of topsoil.

9. Available water capacity - Available water capacity is the ability of soils to hold water available to plants. It is controlled mostly by silt size soil particles. In some soils there are root-restricting horizons. Water in and below these layers is mostly unavailable to plants. Where the water table enters the soil it can provide additional water if the texture is not too coarse.

10. Erosion hazard - Generally this is a function of slope. It becomes critical when the natural cover of trees, shrubs or grasses are removed.

11. Prior Erosion - Prior erosion on land carelessly managed affects crop yields severely. It may affect other soil properties such as depth to bedrock, organic matter content, available water capacity, and others. It affects such uses as farming, lawns and landscaping, and golf fairways.

F. Limitations of Interpretations ---

Map units of soil surveys contain inclusions of other soils. Soils with similar properties and behavior are intentionally included; distinctly contrasting soils are intentionally included only if they are small. Included in places, are contrasting soils that are not seen by the mapper. Interpretations are made for the dominant soil as mapped and may not fit the contrasting inclusions. Interpretations are most reliable for large areas, and least reliable for very small areas. These need on-site investigations.

G. References and Suggested Reading

1. Interpretations

"Guide for Interpreting Engineering Uses of Soils", USDA - Soil Conservation Service, Superintendent of Documents, Washington, D. C. $2.00

2. Planning Material

"Soil Surveys and Land Use Planning", Soil Science Society of America, 677 South Segoe Road, Madison, Wisconsin

3. Engineering and Soil Terminology

PCA Primer, Portland Cement Association, 33 West Grand Avenue Chicago, Illinois.

H. Explanation of Headings on Soil Interpretive Tables

Soil description is a non-technical description of the soil series. If more detailed information is needed, refer to the official description for the series.

Stream overflow hazard is given in terms of normal occurrence–none, seldom (less than 1 year in 5), occasional (1 overflow in 3 or 4 years), frequent (annually), and very frequent (several times a year).

Depth to seasonal high water is the normal range of minimum depth, in feet, to the water table (real or perched). Duration and height in summer are also given if known. If water is perched, this information is given here.

Horizons shows the layers of a representative profile that are significant.

Typical depth from surface shown in inches.

Classification, USDA texture class, Unified, and AASHTO gives the normal range of textures for each horizon by abbreviations. Key to these are listed in Reference 2. For definitions and comparison with unified and AASHTO, see PCA Soil Primer listed in references.

Coarse fragments refer to material greater than 2 mm in diameter. This material is normally removed from the sample and is therefore over and above the 100% assigned to the material below 2 mm in diameter.

Fractions passing sieve numbers is given in normal ranges for the soil but does not cover inclusions of other soils.

Liquid limit and Plastic index given are ranges. For definition, see a recent soil survey report or PCA Soil Primer.

Permeability is the range of rates for water passing through a wet soil.

Available water capacity given ranges of available water; where groundwater is seasonally close to the surface, this information is given.

Soil reaction, natural shown is the range in pH for the soil before lime treatment. Most farmed soils have higher pH because of treatment. Some treatment has changed the pH to 5 feet or more.

Resistivity is an indication of potential corrosivity of uncoated steel especially where soil and moisture changes occur. Low resistivity indicates high corrosivity.

Organic matter is given in percent ranges.

Shrink-swell potential ratings are relative expressions for results of normal wetting and drying that takes place in soils. High ratings are reserved for soils high in montmorillonite clays.

Consistence, in place, is normally rated for moist soils in this area. Consistences are different for wet and dry soils.

SOURCE OF MATERIALS ---

Topsoil refers to material used for top-dressing an area where vegetation is to be established and maintained.

Sand and gravel indicates probable sources of the material. Normally thickness of material is 3 or more feet thick in the upper part being within 5 feet of depth. No quality is indicated in these ratings.

Roadfill refers to suitability of soils as a source of roadfill. Ratings intended for holding back water. Permeability here refers to compacted permeability and normally is slower than soil materials in place.

AGRICULTURAL INTERPRETATIONS —

Land capability classes show, in a general way, the suitability of soils for most kinds of field crops. Soil groupings are made according to the limitations of the soils when used for field crops, the risk of damage when they are used, and the way they respond to treatment. The grouping does not take into account major and generally expensive land forming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to horticultural crops, or other crops requiring special management. Capability classes are designated by Arabic numerals 1 through 8. The higher numerals indicate progressively greater limitations and narrower choices for practical use. The letters e, s, and w following the numeral indicates the dominant limitation to be erosion, soil droughtiness or wetness. Numbers following these letters indicate soil management groups.

Wildlife Suitability are ratings showing the limitations of soils to produce the habitat considered important for openland, woodland, and wetland wildlife.

Woodland Suitability groups indicate relative woodland production ratings. A rating of 1 is most productive and 5 least productive. Letters d, o, r, s, w, and x indicate dominant limiting factors. Letter d indicates shallow rooting depth, o indicates no limiting factor, r is relief or slope, s is a soil factor such as deep droughty sand, w is wetness, and x is extremely stony or rocky.

Erodibility (K) factors are relative erosion factors indicating sheet erosion that might be expected from bare soil. Ratings are .17, .20, .24, .28, .32, .37, .43, .49. Lowest erosion hazard is .17, the highest is .49. Some soils that are only nearly level are not rated.

Hydrologic Soil Group are ratings of soils to indicate amount of runoff following prolonged wetting. A indicates the least runoff and D the most. Factors considered in rating were natural drainage or water table, permeability rate, depth to fragipan (dense slowly permeable layer) or bedrock. Soil rated A can absorb the greatest rainfall and generally at the most rapid rates. These soils generally have a low available water capacity for plants because the coarse soil particles cannot hold the water.

SOIL LIMITATIONS FOR SELECTED USES

Pond Reservoir area is that area covered by water when an impoundment is filled. Of primary concern are soil properties that affect seepage rates.

Excavated ponds are dugout ponds with groundwater as the source of water. Underlying clay layers may reduce recharge rates sufficiently to make them poorly suited for irrigation. Extreme acidity of underlying clays may make some ponds so acid that fish will not live or will not reproduce.

Land drainage refers to the response of soils to the installation and performance of surface and subsurface drainage systems.

Sprinkler irrigation refers to the application of water to soils for crop production.

Terraces, diversions are berms of soil constructed on a designed grade to carry runoff water to protected outlets.

Land smoothing includes removal of knolls and filling of low areas to facilitate farming operations.

Winter grading refers to grading, generally around new construction planned to be done in winter.

Pipeline construction and maintenance includes the installation and maintenance of the lines to a depth of 5 or 6 feet.

Shallow excavations to a depth of 5 to 6 feet for cables, cemeteries, foundations.

COMMUNITY DEVELOPMENT USES (BUILDING SITE DEVELOPMENT)

Septic filter fields assumes lines at a depth of about 2 1/2 feet. Groundwater pollution hazard is stated where significant but was not used as a criteria in the rating.

Foundations for houses with basements assumes excavations to 5 or 6 feet. Bedrock soft enough to be dug out with light power equipment, such as backhoes, is rated as moderate limitation when depth is less than 40 inches. Soils are assumed to be undisturbed. Use of soils for septic disposal is not considered in this rating.

Foundations for houses without basements assumes excavation deep enough for footings. Use of soils for septic disposal is not considered in this rating.

Local roads refers to the use of the soils for construction and maintenance of improved local roads and streets that have all-weather surfacing. Excluded from rating are highways designed for fastmoving, heavy trucks.

Parking lots assumes that they will be paved. Criteria are similar to roads but slopes are more restricted.

Campsites, trailers and tents assumes that little site preparation will be done other than shaping and leveling for tent and parking areas. Soil suitability for growing and maintaining vegetation is not a part of this rating.

Play areas, Athletic fields assumes the soils are to be used intensively for such organized games as baseball, football, soccer, volley ball, etc. Soil suitability for growing and maintaining vegetation is not a part of this rating. Playing season is full year.

Picnic areas assumes park-type use with most vehicular traffic confined to access roads. Soil suitability for growing vegetation is not a part of this rating.

Paths and trails assumes that the areas will be used as they occur naturally with little excavation or fill. Soil features affecting trafficability, dust, design and maintenance are considered in this rating.

Lawns, landscaping, golf fairways assumes moderate foot and light vehicular traffic and soil materials at the site will be used for any smoothing operations.

Sanitary landfill, trench method rating is based on information to a depth of 5 feet. On-site investigation is needed to determine conditions below 5 feet. Groundwater pollution hazard is used as a criteria for this rating.

GLOSSARY

ABC soil. A soil having an A, a B, and a C horizon.

AC soil. A soil having only an A and a C horizon. Commonly such soil formed in recent alluvium or on steep rocky slopes.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim. An area difficult to reclaim after the removal of soil for construction and other uses.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	More than 12

Chiseling. Tillage with an implement having one or more soil-penetrating points that loosen the subsoil and bring clods to the surface. A form of emergency tillage to control soil blowing.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Climax vegetation. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse grained (light textured) soil. Sand or loamy sand.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are:

Loose. Noncoherent when dry or moist; does not hold together in a mass.

Friable. When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm. When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic. When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky. When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard. When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft. When dry, breaks into powder or individual grains under very slight pressure.

Cemented. Hard; little affected by moistening.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 to 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave. The walls of excavations tend to cave in or slough.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess fines. Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Excess salts. Excess water-soluble salts in the soil that restrict the growth of most plants.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grains are grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fast intake. The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fine grained (heavy textured) soil. Sandy clay, silty clay, and clay.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Forb. Any herbaceous plant not a grass or a sedge.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gleyed soil. A soil having one or more neutral gray horizons as a result of waterlogging and lack of oxygen. The term "gleyed" also designates gray horizons and horizons having yellow and gray mottles as a result of intermittent waterlogging.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hardpan. A hardened or cemented soil horizon, or layer.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. The major horizons of mineral soil are as follows:

O horizon. An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A horizon. The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

A2 horizon. A mineral horizon, mainly a residual concentration of sand and silt high in content of resistant minerals as a result of the loss of silicate clay, iron, aluminum, or a combination of these.

B horizon. The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon. The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Roman numeral II precedes the letter C.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake in inches per hour is expressed as follows:

Less than 0.2	-	Very low
0.2 to 0.4	-	Low
0.4 to 0.75	-	Moderately low
0.75 to 1.25	-	Moderate
1.25 to 1.75	-	Moderately high
1.75 to 2.5	-	High
More than 2.5	-	Very high

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, invader plants follow disturbance of the surface.

Leaching. The removal of soluble material from soil or other material by percolating water.

Light textured soil. Sand and loamy sand.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam or silt.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Moderately coarse textured (moderately light textured) soil. Sandy loam and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage.

Muck. Dark colored, finely divided, well decomposed organic soil material.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Percolation. The downward movement of water through the soil.

Percs slowly. The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality that enables the soil to transmit water or air, measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	Less than 0.06 inch
Slow	0.06 to 0.20 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	More than 20 inches

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping. Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Ponding. Standing water on soils in closed depressions. The water can be removed only by percolation or evapotranspiration.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Productivity (soil). The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity of alkalinity is expressed as:

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Rill. A steep sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Salty water. Water that is too salty for consumption by livestock.

Seepage. The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have about the same profile, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and runoff water.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slow intake. The slow movement of water into the soil.

Slow refill. The slow filling of ponds, resulting from restricted permeability in the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 mm in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	Less than 0.002

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind and water erosion after harvest, during preparation of a seedbed for the next crops, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Summer fallow. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently, designated as the "plow layer", or the "Ap horizon".

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that it can soak into the soil or flow slowly to a prepared outlet without harm. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Thin layer. Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The condition of the soil, especially the soil structure, as related to the growth of plants. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Unstable fill. Risk of caving or sloughing on banks or fill material.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the low lands along streams.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

Soil Survey Area: ____________________

State: ____________________

Date: __________

CULTURAL FEATURES

DESCRIPTION	SYMBOL
BOUNDARIES	
National, state, or province	
County or parish	
Minor civil division	
Reservation (national forest or park, state forest or park, and large airport)	
Land grant	
Limit of soil survey (label)	
Field sheet matchline & neatline	
AD HOC BOUNDARY (label)	
Small airport, airfield, park, oilfield, cemetery, or flood pool	
STATE COORDINATE TICK	1 890 000 FEET
LAND DIVISION CORNERS (sections and land grants)	
ROADS	
Divided (median shown if scale permits)	
County, farm or ranch	
Trail	
ROAD EMBLEMS & DESIGNATIONS	
Interstate	66
Federal	287
State	52
Other	398
RAILROAD	
POWER TRANSMISSION LINE (normally not shown)	
PIPE LINE (normally not shown)	
FENCE (normally not shown)	
LEVEES	
Without road	
With road	
With railroad	
DAMS	
Large (to scale)	
Medium or small	W
PITS	
Gravel pit	
Mine or quarry	

CULTURAL FEATURES (cont.)

DESCRIPTION	SYMBOL
MISCELLANEOUS CULTURAL FEATURES	
Farmstead, house (omit in urban areas)	
Church	
School	
Indian mound (label)	
Located object (label)	
Tank (label)	
Wells, oil or gas	
Windmill	
Kitchen midden	

WATER FEATURES

DESCRIPTION	SYMBOL
DRAINAGE	
Perennial, double line	
Perennial, single line	
Intermittent	
Drainage end	
Canals or ditches	
Double - line (label)	CANAL
Drainage and/or irrigation	
LAKES, PONDS AND RESERVOIRS	
Perennial	water w
Intermittent	intermittent int
MISCELLANEOUS WATER FEATURES	
Marsh or swamp	
Spring	
Well, artesian	
Well, irrigation	
Wet spot	

SPECIAL SYMBOLS FOR SOIL SURVEY

DESCRIPTION	SYMBOL
SOIL DELINEATIONS AND SOIL SYMBOLS	CeA FaB2
ESCARPMENTS	
Bedrock (points down slope)	
Other than bedrock (points down slope)	
SHORT STEEP SLOPE	
GULLY	
DEPRESSION OR SINK	
SOIL SAMPLE SITE (normally not shown)	S
MISCELLANEOUS	
Blowout	
Clay spot	
Gravelly spot	
Gumbo, slick or scabby spot (sodic)	ø
Dumps and other similar non soil areas	
Prominent hill or peak	
Rock outcrop (includes sandstone and shale)	
Saline spot	+
Sandy spot	
Severely eroded spot	
Slide or slip (tips point upslope)	
Stony spot, very stony spot	
RECOMMENDED AD HOC SOIL SYMBOLS	

Rules of Application for Use of Conventional and Special Map Symbols for Soil Surveys

1. All symbols are black. Symbols other than boundaries, roads, streams, drainage ends, and soil delineations (pen sizes listed below) will be placed on type overlays of project surveys with clear stripping film with adhesive backing (stickup). Pen size 00 is to be used for symbols on field sheets and for map compilation of other surveys with the following exceptions:

Pen size	Symbols
0	-- Trail and soil delineation.
1	-- Minor civil division, reservation, land grant and limit of soil survey.
2	-- National, state or province, county or parish boundaries, and center line of dams.
2.5	-- All roads except trails.

2. All the symbols shown on the legend will not be used in a single soil survey. Symbols actually used will be underlined in red during the initial field review. Changes in symbols selected must be approved by the state soil scientist.

3. Ad hoc symbols will be defined in the legend in terms of the specific kind and size of area represented.

4. All mapping unit boundaries are unbroken lines. Enclosed areas of water, double line streams and double line canals are mapping unit boundaries.

5. Single and double line roads, railroads, minor civil division lines, field sheet match lines or neatlines, soil survey area boundaries, single line canals, and levees are not mapping unit boundaries.

6. Areas represented by conventional and special symbols will not be included in the table "Approximate Acreage and Proportionate Extent of the Soils" in soil surveys. Acreage for enclosed areas of water more than 40 acres in size; and streams, sloughs, estuaries and canals more than one-eighth of a statute mile in width is given at the end of the table under "water".

7. The following rules apply to symbols for pits, marsh or swamp, and dumps and other similar nonsoil areas:

    a. Areas less than the minimum size delineation being used in the survey area are indicated only by symbols.

    b. Areas greater than the minimum size delineation being used in the survey area are delineated, classified, and correlated as mapping units.

8. Where a map scale change occurs in a soil survey area a neatline is used as a boundary. The map scale change is made a part of the joins note parallel to the neatline, e.g. Joins sheet 89 - 1:31680.

9. Proposed roads are not shown. Where the photo image shows a road under construction, represent it on the map as if it were constructed. Interchanges and access and egress ramps to limited access roads are not shown. "Other" roads are shown as necessary for proper orientation of the map.

10. Symbols for schools and churches are centered on the photo image and are not inked to scale.

11. Departure from these conventional and special symbols must be approved by the Deputy Administrator for Soil Survey.

PRIME FARMLAND

Prime farmland is one of several kinds of important farmlands defined by the U. S. Department of Agriculture. It is of major importance in providing the nation's short- and long-range needs for food and fiber. The supply of high quality farmland is limited and the U. S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, must encourage and facilitate the use of our nation's prime farmland with wisdom and foresight.

Prime farmland, as defined by the U. S. Department of Agriculture, is the land that is best suited to producing food, feed, forage, fiber, and oilseed crops. It has the soil quality, growing season, and moisture supply needed to economically produce a sustained high yield of crops when it is treated and managed using acceptable farming methods. Prime farmland produces the highest yields with minimal inputs of energy and economic resources, and farming it results in the least damage to the environment.

Prime farmland may now be in crops, pasture, woodland, or other land, but not urban and built-up land or water areas. It must either be used for producing food or fiber or be available for these uses.

Prime farmland usually has an adequate and dependable supply of moisture from precipitation or irrigation. It also has favorable temperature and growing season, acceptable acidity or alkalinity. It has few or no rocks and is permeable to water and air. Prime farmland is not excessively erodible or saturated with water for long periods and is not flooded during the growing season. The slope ranges mainly from 0 to 6 percent. For more detailed information on the criteria for prime farmland consult the local staff of the Soil Conservation Service.

About 379 acres or a little over 32 percent of the land surveyed on NNSY and St. Juliens Annex meets the soil requirement for prime farmland. Areas are mostly in map units I and II of the general soil map.

A recent trend in land use has been the loss of some prime farmlands to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and difficult to cultivate, and usually less productive.

Soil map units that make up prime farmland at NNSY and St. Juliens Annex are listed in this section. This list does not constitute a recommendation for a particular land use. The extent of each listed map unit is shown in table 1. The location is shown on the detailed soil maps in the back of this publication. The soil qualities that affect use and management are described in the mapping unit description.

Soils that have limitations---a high water table, flooding, or inadequate rainfall---may qualify for prime farmland if these limitations are overcome by such measures as drainage, flood control, or irrigation. In the following list, these limitations, if any, are shown in parentheses after the map unit name. On-site evaluation is necessary to see if these limitations have been overcome by corrective measures.

The map units that meet the soil requirement for prime farmland are:

34	Munden
42	Dragston (if artificially drained)
45	Augusta (if artificially drained)
52	Nimmo (if artificially drained)
55	Tomotley (if artificially drained)
65	Portsmouth (if artificially drained)

TABLE 4

LAND CAPABILITY CLASSIFICATION

(Capability Classes are Defined in the Text)

Soil Name and Map Symbol	Class-Determining Phase	Capability Class
34------------------ Munden	0-2% slope 2-6% slope	2w 2e
36------------------ Tetotum	0-2% slope 2-6% slope	2w 2e
42------------------ Dragston	Drained Undrained	2w 3w
45------------------ Augusta	All	3w
52------------------ Nimmo	Drained Undrained	3w 4w
55------------------ Tomotley	Drained Undrained	3w 4w
65------------------ Portsmouth	Drained Undrained	3w 4w
79------------------ Bohicket	All	8w

SOIL INTERPRETATIVE TABLES

USE AND MANAGEMENT OF THE SOILS

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

SOIL PROPERTIES

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distributions and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

TABLE 5

YIELDS PER ACRE OF CROPS AND PASTURE

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Soil maps for detailed planning." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

Yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depend on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green-manure crops; and harvesting that insures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils.

TABLE 6

WOODLAND MANAGEMENT AND PRODUCTIVITY

Table 6 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination (woodland suitability) symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the ordination symbol, a number, indicates the potential productivity of the soils for important trees. The number 1 indicates very high productivity; 2, high; 3, moderately high; 4, moderate; and 5, low. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter w indicates excessive water in or on the soil; d, restricted root depth; c, clay in the upper part of the soil; s, sandy texture; and r, steep slopes. The letter o indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows; w, d, c, s, and r.

In table 6, slight, moderate, and severe indicate the degree of the major soil limitations to be considered in management.

Ratings of the erosion hazard indicate the risk of loss of soil in well managed woodland. The risk is slight if the expected soil loss is small, moderate if measures are needed to control erosion during logging and road construction, and severe if intensive management or special equipment and methods are needed to prevent excessive loss of soil.

Ratings of equipment limitation reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. A rating of slight indicates that use of equipment is not limited to a particular kind of equipment or time of year; moderate indicates a short seasonal limitation or a need for some modification in management or in equipment; and severe indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings indicate the degree to which the soil affects the mortality of tree seedlings. Plant competition is not considered in the ratings. The ratings apply to seedlings from good stock that are properly planted during a period of sufficient rainfall. A rating of slight indicates that the expected mortality is less than 25 percent; moderate, 25 to 50 percent; and severe, more than 50 percent.

Ratings of windthrow hazard are based on soil characteristics that affect the development of tree roots and the ability of the soil to hold trees firmly. A rating of slight indicates that a few trees may be blown down by normal winds; moderate, that some trees will be blown down during periods of excessive soil wetness and strong winds; and severe, that many trees are blown down during periods of excessive soil wetness and moderate or strong winds.

The potential productivity of merchantable or common trees on a soil is expressed as a site index. The index is average height, in feet, that dominant and codominant trees of a given species attain in 50 years; and it applies to fully stocked, even-aged, unmanaged stands. Site index is listed for trees that woodland managers generally favor in intermediate or improvement cuttings. The trees are selected on the basis of growth rate, quality, value, and marketability. Other trees that are common on the soil are also listed regardless of potential value and growth potential.

Trees to plant are those that are suited to the soils and to commercial wood production.

TABLE 7

RECREATIONAL DEVELOPMENT

The soils of the survey area are rated in table 7 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capability of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, on-site assessment of the height, duration, intensity and frequency of flooding is essential.

In table 7 the degree of soil limitation is expressed as slight, moderate, or severe. Slight means that soils properties are generally favorable and that limitations are minor and easily overcome. Moderate means that limitations can be overcome or alleviated by planning, design, or special maintenance. Severe means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 7 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 10 and interpretations for dwellings without basements and for local roads and streets in table 9.

Camp areas require site preparation such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking, horseback riding, and bicycling should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for trees or greens is not considered in rating the soils.

TABLE 8

WILDLIFE HABITAT

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 8, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of good indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of fair indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of poor indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of very poor indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, lovegrass, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, wheatgrass, and grama.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zones, the available water capacity, and wetness. Examples of these plants are oak, poplar, cherry, sweetgum, apple, hawthorn, dogwood, hickory, blackberry, and blueberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated good are Russian-olive, autumn-olive, and crabapple.

Coniferous plants furnish browse, seeds, and cones. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, cedar, and juniper.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, wildrice, saltgrass, cordgrass, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include bobwhite quail, pheasant, meadowlark, field sparrow, cottontail, rabbit, and red fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, deer, and bear.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, and beaver.

TABLE 9

BUILDING SITE DEVELOPMENT

Table 9 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered slight if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; moderate if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and severe if 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. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwelling and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil) shrink-swell potential, and depth to a high water table affect the traffic supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

TABLE 10

SANITARY FACILITIES

Table 10 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered slight if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; moderate if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and severe if 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.

Table 10 also shows the suitability of the soils for use as daily cover for landfills. A rating of good indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; fair indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and poor indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alterations.

Septic tank absorptions fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fracture bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to effectively filter the effluent. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 10 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill--trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thick layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 10 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

TABLE 11

CONSTRUCTION MATERIALS

Table 11 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated good, fair, or poor as a source of these materials. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated good contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated fair are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated poor have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. The ratings in table 11 provide guidance as to where to look for probable sources and are based on the probability that soils in a given area contain sizable quantities of sand or gravel. A soil rated good or fair has a layer of suitable materials at least 3 feet thick, the top of which is within a depth of 6 feet. Coarse fragments of soft bedrock material, such as shale and siltstone, are not considered to be sand and gravel. Fine-grained soils are not suitable sources of sand and gravel.

The ratings to not take into account depth to the water table or other factors that affect excavation of the material. Descriptions of grain size, kinds of minerals, reaction, and stratification are given in the soil series descriptions and in table 11.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated good have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated fair are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated poor are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

TABLE 12

WATER MANAGEMENT

Table 12 gives information on the soil properties and site features that affect water management.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope, susceptibility to flooding; and subsidence of organic layers. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Terrace and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after consideration.

TABLE 13

PHYSICAL AND CHEMICAL PROPERTIES

Table 13 shows estimates of 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.

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 of pH values. The range of 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 on 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 that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

ENGINEERING

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-sized distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock with 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggreation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

TABLE 14

ENGINEERING PROPERTIES

Table 14 gives estimates of the engineering classification and of the range of 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.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil Series and Morphology."

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 a soil contains particles coarser than sand, an appropriate modifier is added, for example, "gravelly". Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (2) and the system adopted by the American Association of State Highway and Transportation Officials (1).

The Unified system classifies soils according to properties that affect their use as construction materials. 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 classified 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.

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 oven-dry weight. The sieves, number 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 area 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.

TABLE 15

SOIL AND WATER FEATURES

Table 15 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundations of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt and water in swamps and marshes is not considered flooding.

Table 15 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional and frequent. None means that flooding is not probable; rare that it is unlikely but possible under unusual weather conditions; common that it is likely under normal conditions; occasional that it occurs on an average of once or less in 2 years; and frequent that it occurs on an average of more than once in two years. Duration is expressed as very brief if less than 2 days, brief if 2 to 7 days, and long if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relations of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 15 are the depth to the seasonal high water table; the kind of water table that is, perched, artesian, or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 15. Only saturated zones within a depth of about 6 feet are indicated.

An apparent water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. An artesian water table is under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole. A perched water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Risk of corrosion pertains to potential soil induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors created a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as _low_, _moderate_, or _high_, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as _low_, _moderate_, or _high_. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

TABLE 5

YIELDS PER ACRE OF CROPS AND PASTURE

(Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil.)

Soil Name and Map Symbol	Corn Bu.	Soybeans Bu.	Wheat Bu.	Grass Hay Ton	Pasture AUM*
34---------------- Munden	145	45	60	5	8.0
36---------------- Tetotum	150	40	45	3	8.5
42---------------- Dragston	125	40	50	3.5	6.0
45---------------- Augusta	100	40	60	6	10.0
52---------------- Nimmo	150	45	50	4	7.0
55---------------- Tomotley	130	40	50	6	10.0
65---------------- Portsmouth	130	45	60	6	10.0
79---------------- Bohicket	–	–	–	–	–

*AUM - Animal-unit-month

TABLE 6

WOODLAND MANAGEMENT AND PRODUCTIVITY

Soil Name and Map Symbol	Ordination Symbol	Management Concerns				Potential Productivity		Trees to Plant
		Erosion Hazard	Equipment Limitation	Seedling Mortality	Windthrow Hazard	Common Trees	Site Index	
34------------ Munden	2w	Slight	Moderate	Slight	Slight	Loblolly Pine	90	Loblolly Pine
						Sweet Gum	90	
						White Oak	75	
36------------ Tetotum	2w	Slight	Moderate	Slight	Slight	Loblolly Pine	88	Loblolly Pine
						Sweet Gum	85	
						Southern Red Oak	76	
42------------ Dragston	2w	Slight	Moderate	Slight	Slight	Southern Red Oak	80	Loblolly Pine
						Loblolly Pine	85	Sweet Gum
						Sweet Gum	90	Yellow Poplar
						Yellow Poplar	90	
45------------ Augusta	2w	Slight	Moderate	Slight		Loblolly Pine	90	Loblolly Pine
						Sweet Gum	90	American Sycamore
						American Sycamore	90	Yellow Poplar
						White Oak	80	
52------------ Nimmo	2w	Slight	Severe	Severe	Slight	Loblolly Pine	95	Loblolly Pine
						Sweet Gum	95	
						White Oak	80	
55------------ Tomotley	2w	Slight	Severe	Severe	Slight	Loblolly Pine	94	Loblolly Pine
						Water Tupelo		
65------------ Portsmouth	1w	Slight	Severe	Severe		Loblolly Pine	96	Loblolly Pine
						Red Maple		
						Water Oak		
79------------ Bohicket	-	-	-	-	-	None	-	-

TABLE 7

RECREATIONAL DEVELOPMENT

(See Text for Definitions of "Slight, "Moderate", and "Severe")

Soil Name and Map Symbol	Camp Areas	Picnic Areas	Playgrounds	Paths & Trails
34--------------- Munden	Moderate: wetness	Moderate: wetness	Moderate: wetness	Moderate: wetness
36--------------- Tetotum	Moderate: wetness	Moderate: wetness	Moderate: wetness	Moderate: wetness
42--------------- Dragston	Severe: wetness	Moderate: wetness	Severe: wetness	Moderate: wetness
45--------------- Augusta	Severe: wetness	Moderate: wetness	Severe: wetness	Moderate: wetness
52--------------- Nimmo	Severe: wetness	Severe: wetness	Severe: wetness	Severe: wetness
55--------------- Tomotley	Severe: wetness	Severe: wetness	Severe: wetness	Severe: wetness
65--------------- Portsmouth	Severe: floods, wetness	Severe: wetness	Severe: wetness	Severe: wetness
79--------------- Bohicket	Severe: floods	Severe: floods	Severe: floods	Severe: floods

TABLE 8

WILDLIFE HABITAT

Soil Name and Map Symbol	Potential for Habitat Elements							Potential as Habitat for-----		
	Grain and seed Crops	Grasses and Legumes	Wild Herba-ceous Plants	Hardwood Trees	Conif-erous Plants	Wetland Plants	shallow Water Areas	Openland Wildlife	Woodland Wildlife	Wetland Wildlife
34------------- Munden	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor
36------------- Tetotum	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor
42------------- Dragston	Fair	Good	Good	Good	Good	Fair	Poor	Good	Good	Fair
45------------- Augusta	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair
52------------- Nimmo	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good
55------------- Tomotley	Fair	Fair	Fair	Good	Good	Good	Good	Fair	Good	Good
65------------- Portsmouth	Fair	Good	Good	Good	Good	Poor	Fair	Good	Good	Poor
79------------- Bohicket	Very poor	Very poor	Very poor	Very poor	Very poor	Good	Good	Very poor	Very poor	Good

TABLE 9

BUILDING SITE DEVELOPMENT

(See Text for Definitions of "Slight, "Moderate", and "Severe")

Soil Name and Map Symbol	Shallow Excavations	Dwellings Without Basements	Dwellings With Basements	Small Commercial Buildings	Local Roads and Streets	Lawns and Landscaping
34---------------- Munden	Severe: cutbanks cave, wetness	Moderate: wetness	Severe: wetness	Moderate: wetness	Moderate: wetness	Moderate: wetness
36---------------- Tetotum	Severe: cutbanks cave, wetness	Moderate: wetness	Severe: wetness	Moderate: wetness	Moderate: wetness	Moderate: wetness
42---------------- Dragston	Severe: cutbanks cave, wetness	Severe: wetness	Severe: wetness	Severe: wetness	Moderate: wetness	Moderate: wetness
45---------------- Augusta	Severe: wetness	Severe: wetness	Severe: wetness	Severe: wetness	Severe: wetness	Severe: wetness
52---------------- Nimmo	Severe: wetness	Severe: wetness	Severe: wetness	Severe: wetness	Severe: wetness	Severe: wetness
55---------------- Tomotley	Severe: wetness	Severe: wetness	Severe: wetness	Severe: wetness	Severe: wetness	Severe: wetness
65---------------- Portsmouth	Severe: cutbanks cave,	Severe: floods, wetness	Severe: floods, wetness	Severe: floods, wetness	Severe: wetness	Severe: wetness
79---------------- Bohicket	Severe: ponding	Severe: flooding, ponding	Severe: flooding, ponding	Severe: flooding, ponding	Severe: low strength, flooding, ponding	Severe: excess salt, sulfur, ponding

TABLE 10

SANITARY FACILITIES

(See Text for Definitions of "Slight", "Moderate", "Good", "Fair", and Other Terms)

Soil Name and Map Symbol	Septic Tank Absorption Fields	Sewage Lagoon Areas	Trench Sanitary Landfill	Area Sanitary Landfill	Daily Cover For Landfill
34---------------- Munden	Severe: wetness	Severe: seepage, wetness	Severe: seepage, wetness	Severe: seepage, wetness	Fair: thin layer
36---------------- Tetotum	Severe: wetness	Severe: seepage, wetness	Severe: seepage, wetness	Severe: wetness	Fair: too clayey
42---------------- Dragston	Severe: wetness, poor filter	Severe: wetness, seepage	Severe: wetness, seepage	Severe: wetness, seepage	Poor: wetness, thin layer
45---------------- Augusta	Severe: floods, wetness	Severe: floods, wetness	Severe: floods, wetness	Severe: floods, wetness	Fair: wetness
52---------------- Nimmo	Severe: wetness	Severe: seepage, wetness	Severe: seepage, wetness	Severe: seepage, wetness	Poor: seepage, too sandy
55---------------- Tomotley	Severe: wetness, percs slowly	Severe: wetness	Severe: wetness	Severe: wetness	Poor: wetness

TABLE 10

SANITARY FACILITIES — Continued

(See Text for Definitions of "Slight", "Moderate", "Good", "Fair", and Other Terms)

Soil Name and Map Symbol	Septic Tank Absorption Fields	Sewage Lagoon Areas	Trench Sanitary Landfill	Area Sanitary Landfill	Daily Cover For Landfill
65---------------- Portsmouth	Severe: wetness, percs slowly	Severe: floods, wetness	Severe: wetness	Severe: wetness	Poor: wetness
79---------------- Bohicket	Severe: flooding, ponding	Severe: flooding, ponding	Severe: flooding, ponding	Severe: flooding, ponding	Poor: too clayey, ponding

TABLE 11

CONSTRUCTION MATERIALS

Soil Name and Map Symbol	Roadfill	Sand	Gravel	Topsoil
34---------------- Munden	Fair: wetness	Probable	Improbable: too sandy	Fair: thin layer
36---------------- Tetotum	Fair: wetness	Improbable: excess fines	Improbable: excess fines	Fair: too clayey
42---------------- Dragston	Fair: wetness	Probable	Improbable: too sandy	Fair: thin layer
45---------------- Augusta	Fair: wetness	Improbable: excess fines	Improbable: excess fines	Fair: small stones
52---------------- Nimmo	Poor: wetness	Probable	Improbable: too sandy	Poor: wetness, thin layer
55---------------- Tomotley	Poor: wetness	Improbable: excess fines	Improbable: excess fines	Poor: wetness
65---------------- Portsmouth	Poor: wetness	Probable	Improbable: too sandy	Poor: wetness
79---------------- Bohicket	Poor: low strength wetness	Improbable: excess fines	Improbable: excess fines	Poor: excess salt

TABLE 12

WATER MANAGEMENT

(See Text for Definitions of "Slight", "Moderate", and "Severe")

Soil Name and Map Symbol	Limitations for----			Features Affecting---		
	Pond Reservoir Areas	Embankments, Dikes, and Levees	Aquifer-fed Excavated Ponds	Drainage	Terraces and Diversions	Grassed Waterways
34---------------- Munden	Severe: seepage	Severe: seepage, wetness	Severe: cutbanks cave	Cutbanks cave	Wetness: too sandy	Favorable
36---------------- Tetotum	Moderate: seepage	Severe: wetness	Severe: cutbanks cave	Favorable	Wetness	Favorable
42---------------- Dragston	Severe: seepage	Severe: piping, wetness	Severe: cutbanks cave	Cutbanks cave	Wetness	Wetness
45---------------- Augusta	Moderate: seepage	Severe: wetness	Moderate: slow refill	Favorable	Soil blowing: wetness	Droughty: wetness
52---------------- Nimmo	Severe: seepage	Severe: seepage, wetness	Severe: cutbanks cave	Cutbanks cave	Wetness: too sandy	Wetness: droughty
55---------------- Tomotley	Moderate: seepage	Severe: piping, wetness	Severe: slow refill	Favorable	Wetness: erodes easily	Wetness: erodes easily
65---------------- Portsmouth	Severe: seepage	Severe: seepage	Severe: cutbanks cave	Cutbanks cave	Wetness: too sandy	Wetness
79---------------- Bohicket	Slight	Severe: hard to pack, excess salt	Severe: slow refill	Ponding: flooding	Ponding	Wetness: excess salt

TABLE 13

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 "Organic Matter" apply only to the surface layer.)

Soil Name and Map Symbol	Depth	Clay $<$ 2mm	Moist Bulk Density	Permeability	Available Water Capacity	Soil Reaction	Shrink-Swell Potential	Erosion Factors K	Erosion Factors T	Organic Matter
	In	Pct	G/cm^3	In/hr	In/in	pH				Pct
34-------------	0-8	3-12	1.20-1.35	2.0-6.0	0.06-0.10	4.5-6.0	Low----------	0.20	4	.5-1
Munden	0-8	4-16	1.20-1.35	2.0-6.0	0.06-0.15	4.5-6.0	Low----------	0.20	4	1-2
	8-32	8-18	1.20-1.35	0.6-2.0	0.08-0.17	4.5-6.0	Low----------	0.17		
	32-62	2-12	1.35-1.55	$>$ 2.0	0.04-0.08	4.5-6.0	Low----------	0.17		
36-------------	0-9	5-15	1.20-1.40	2.0-6.0	0.08-0.15	3.6-5.5	Low----------	0.28	4	.5-2
Tetotum	0-9	10-22	1.20-1.35	0.6-2.0	0.14-0.19	3.6-5.5	Low----------	0.37	4	.5-2
	9-48	18-35	1.25-1.45	0.6-2.0	0.14-0.19	3.6-5.5	Low----------	0.32		
	48-72	5-30	1.25-1.45	0.6-20	0.06-0.15	3.6-5.5	Low----------	0.32		
42-------------	0-9	4-12	1.20-1.50	2.0-6.0	0.08-0.15	4.5-5.5	Low----------	0.24	4	.5-1
Dragston	0-9	2-10	1.20-1.45	$>$ 6.0	0.06-0.11	4.5-5.5	Low----------	0.17	4	.5-1
	9-37	10-18	1.25-1.45	2.0-6.0	0.08-0.16	4.5-5.5	Low----------	0.17		
	37-66	2-12	1.35-1.55	$>$ 6.0	0.04-0.10	4.5-6.5	Low----------	0.17		
45-------------	0-9	5-20		2.0-6.0	0.10-0.15	4.5-6.0	Low----------	0.15	4	.5-1
Augusta	0-9	10-25		0.6-2.0	0.15-0.22	4.5-6.0	Low----------	0.15	4	.5-2
	9-60	20-35		0.6-2.0	0.12-0.18	4.5-6.0	Low----------	0.24		
	60-70	3-10		2.0-6.0	0.06-0.12	4.5-6.0	Low----------	0.24		
52-------------	0-7	4-14	1.20-1.35	2.0-6.0	0.06-0.15	3.6-5.5	Low----------	0.17	4	1-3
Nimmo	0-7	3-12	1.20-1.35	2.0-6.0	0.06-0.10	3.6-5.5	Low----------	0.17	4	1-2
	7-33	8-15	1.20-1.35	0.6-2.0	0.08-0.17	3.6-5.5	Low----------	0.17		
	33-60	1-8	1.35-1.55	$>$ 2.0	0.04-0.08	3.6-5.5	Low----------	0.17		

TABLE 13

PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS - Continued

(The symbol < means less than; > means more than. Entries under "Erosion Factors--T" apply to the entire profile. Entries under "Organic Matter" apply only to the surface layer.)

Soil Name and Map Symbol	Depth	Clay< 2mm	Moist Bulk Density	Permeability	Available Water Capacity	Soil Reaction	Shrink-Swell Potential	Erosion Factors K	Erosion Factors T	Organic Matter
	In	Pct	G/cm^3	In/hr	In/in	pH				Pct
55--------------	0-13	2-10	1.40-1.70	6.0-20	0.06-0.11	3.6-5.5	Low---------	0.17	5	1-6
Tomotley	0-13	5-20	1.30-1.60	2.0-6.0	0.10-0.15	3.6-5.5	Low---------	0.20	5	1-6
	0-13	5-27	1.20-1.40	2.0-6.0	0.12-0.18	3.6-5.5	Low---------	0.20	5	1-6
	13-44	18-35	1.30-1.50	0.6-2.0	0.12-0.18	3.6-5.5	Low---------	0.20		
	44-59	15-45	1.30-1.60	0.2-2.0	0.12-0.18	3.6-6.0	Low---------	0.20		
65--------------	0-19	5-25	1.30-1.40	0.6-6.0	0.12-0.18	3.6-5.5	Low---------	0.24	5	3-15
Portsmouth	19-35	20-35	1.45-1.55	0.6-2.0	0.14-0.20	3.6-5.5	Low---------	0.28		
	35-38	8-18	1.40-1.60	2.0-6.0	0.06-0.10	3.6-5.5	Low---------	0.17		
	38-72	2-10	1.40-1.65	6.0-2.0	0.02-0.05	3.6-6.0	Low---------	0.17		
79--------------	0-10	30-60	1.20-1.40	0.06-0.2	0.02-0.06	6.1-8.4	High--------	0.28	5	5-25
Bohicket	10-49	35-60	1.30-1.60	< 0.06	0.02-0.06	6.1-8.4	High--------	0.24		
	49-80									

TABLE 14

ENGINEERING INDEX PROPERTIES

(The symbol < means less than; > means more than.)

Soil Name and Map Symbol	Depth	USDA Texture	Classification		Fragments > 3 inches	Percentage Passing Sieve Number---				Liquid Limit	Plasticity Index
			Unified	AASHTO		4	10	40	200		
	In				Pct						
34----------- Munden	0-8	ls,lfs	SM,SM-SC	A-2,A-4	0	100	98-100	55-85	15-45	<18	NP-7
	0-8	sl,fsl,l	SM,SC,SM-SC	A-4	0	100	98-100	60-95	35-75	<22	NP-10
	8-32	sl,l,scl	SM,SC,SM-SC	A-2,A-4,A-6	0	100	98-100	60-95	30-75	<30	NP-15
	32-62	ls,fs,s	SM,SP-SM, SM-SC	A-2,A-3	0	100	98-100	50-90	5-35	<18	NP-7
36----------- Tetotum	0-9	fsl,sl	SM,ML	A-2,A-4	0	85-100	80-100	45-85	25-55	<30	NP-7
	0-9	l,sil	SM,SC,ML,CL	A-4,A-6	0	85-100	80-100	65-95	45-85	<30	NP-15
	9-48	scl,cl,sil	SC,CL	A-6,A-7	0-2	85-100	80-100	60-95	35-85	30-45	10-20
	48-72	sr,scl,lfs	SM,SC,ML,CL	A-2,A-4,A-6	0-2	80-100	75-100	50-95	15-75	<30	NP-15
42----------- Dragston	0-9	fsl,sl,l	SM,SC,SM,SC	A-2,A-4	0	100	95-100	60-85	30-60	<20	NP-8
	0-9	lfs,ls	SM,SM-SC	A-2	0	100	95-100	50-90	15-35	<18	NP-7
	9-37	fsl,sl,l	SM,SC,SM-SC	A-2,A-4	0	100	95-100	60-85	30-60	<25	NP-10
	37-66	s,ls,fsl	SM,SP-SM, SM-SC	A-1,A-2,A-3	0	95-100	85-100	35-70	5-30	<18	NP-7
45----------- Augusta	0-9	sl,fsl	SM,SM-SC	A-2,A-4	0	90-100	75-100	50-80	30-50	<25	NP-7
	0-9	sil,l	ML,CL-ML	A-4	0	90-100	75-100	75-100	51-75	<35	NP-10
	9-60	scl,cl,l	CL,CL-ML	A-4,A-6,A-7	0	90-100	75-100	75-95	51-80	20-45	5-25
	60-70	cosl,l,gr-ls	SM,SP-SM,ML, SM-SC	A-2,A-4,A-1	0	75-100	55-100	30-90	10-70	<25	NP-5

TABLE 14

ENGINEERING INDEX PROPERTIES - Continued

(The symbol < means less than; > means more than.)

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						
52----------- Nimmo	0-7	l,fsl,sl	SM,SC,SM-SC, ML	A-4	0	100	95-100	60-85	36-60	<22	NP-10
	0-7	ls,lfs	SM,SM-SC	A-2,A-4	0	100	95-100	55-85	15-45	<18	NP-7
	7-33	l,fsl,sl	SM,SC,ML,CL	A-2,A-4,A-6	0	100	95-100	60-95	30-75	<30	NP-15
	33-60	ls,fs,s	SM,SP-SM, SM-SC	A-2,A-3	0	100	95-100	50-80	5-35	<18	NP-7
55----------- Tomotley	0-13	ls,lfs	SM	A-2	0	98-100	95-100	75-98	15-35	<25	NP-4
	0-13	sl,fsl	SM	A-2,A-4	0	98-100	95-100	75-98	25-50	<30	NP-7
	0-13	sil,l	ML	A-4	0	98-100	95-100	75-100	51-98	<40	NP-10
	13-44	fsl,scl,cl	SM-SC,SC,CL-ML,CL	A-2,A-4,A-6	0	98-100	95-100	75-98	30-70	20-40	6-18
	44-59	fsl,scl,sc	SM-SC,SC,CL-ML,CL	A-4,A-6,A-7	0	98-100	95-100	75-98	30-75	20-45	6-22
	59-80	var									
65----------- Portsmouth	0-19	sl,fsl,l	SM,SM-SC-ML	A-2,A-4	0	98-100	98-100	65-95	30-65	<30	NP-7
	19-35	l,scl,cl	SC,CL-ML,CL	A-4,A-6	0	98-100	98-100	75-95	36-70	18-40	7-18
	35-38	ls,sl	SM	A-2	0	98-100	98-100	50-70	13-35	<18	NP-4
	38-72	sr-cos-ls	SP-SM,SP,SM	A-1,A-2,A-3	0	98-100	98-100	45-65	3-20	--	NP
79----------- Bohicket	0-10	sicl,sic,c	CH,MH	A-7	0	100	99-100	90-100	80-100	60-100	15-60
	10-49	sic,c,sc	CH,MH	A-7	0	100	99-100	80-100	70-95	50-100	15-60
	49-80	var									

TABLE 15

SOIL AND WATER FEATURES

Soil Name & Map Symbol	Hydro-logic Group	Flooding			High Water Table			Bedrock		Risk of Corrosion	
		Fre-quency	Duration	Months	Depth	Kind	Months	Depth	Hard-ness	Uncoated Steel	Concrete
					Ft			In			
34---------- Munden	B	None	----	----	1.5-2.5	Apparent	Dec-Apr	>60	----	Low	High
36---------- Tetotum	C	None	----	----	1.5-2.5	Apparent	Dec-Apr	>60	----	High	High
42---------- Dragston	C	None	----	----	1.0-2.5	Apparent	Nov-Apr	>60	----	Low	High
45---------- Augusta	C	None - Common	Brief	Jan-May	1.0-2.0	Apparent	Jan-May	>60	----	High	Moderate
52---------- Nimmo	D	None	----	----	0-0.5	Apparent	Dec-Apr	>60	----	Low	High
55---------- Tomotley	B/D	None - Rare	----	----	0-1.0	Apparent	Dec-Mar	>60	----	High	High
65---------- Portsmouth	D	Rare	----	----	0-1.0	Apparent	Dec-Apr	>60	----	High	High
79---------- Bohicket	D	Frequent	V.Brief	Jan-Dec	+3-0	Apparent	Jan-Dec	>60	----	High	High

SOIL IDENTIFICATION LEGEND

NORFOLK NAVAL SHIPYARD AND ST. JULIENS ANNEX

PORTSMOUTH, VIRGINIA   CHESAPEAKE, VIRGINIA

I Soils that have been disturbed by construction activities

- 2 Urban Land
- 10 Urban Land-Udorthents Complex
- 12 Udorthents, loamy
- 14 Udorthents, clayey

II Moderately well drained soils

- 34 Munden
- 36 Tetotum

III Somewhat poorly drained

- 42 Dragston
- 45 Augusta

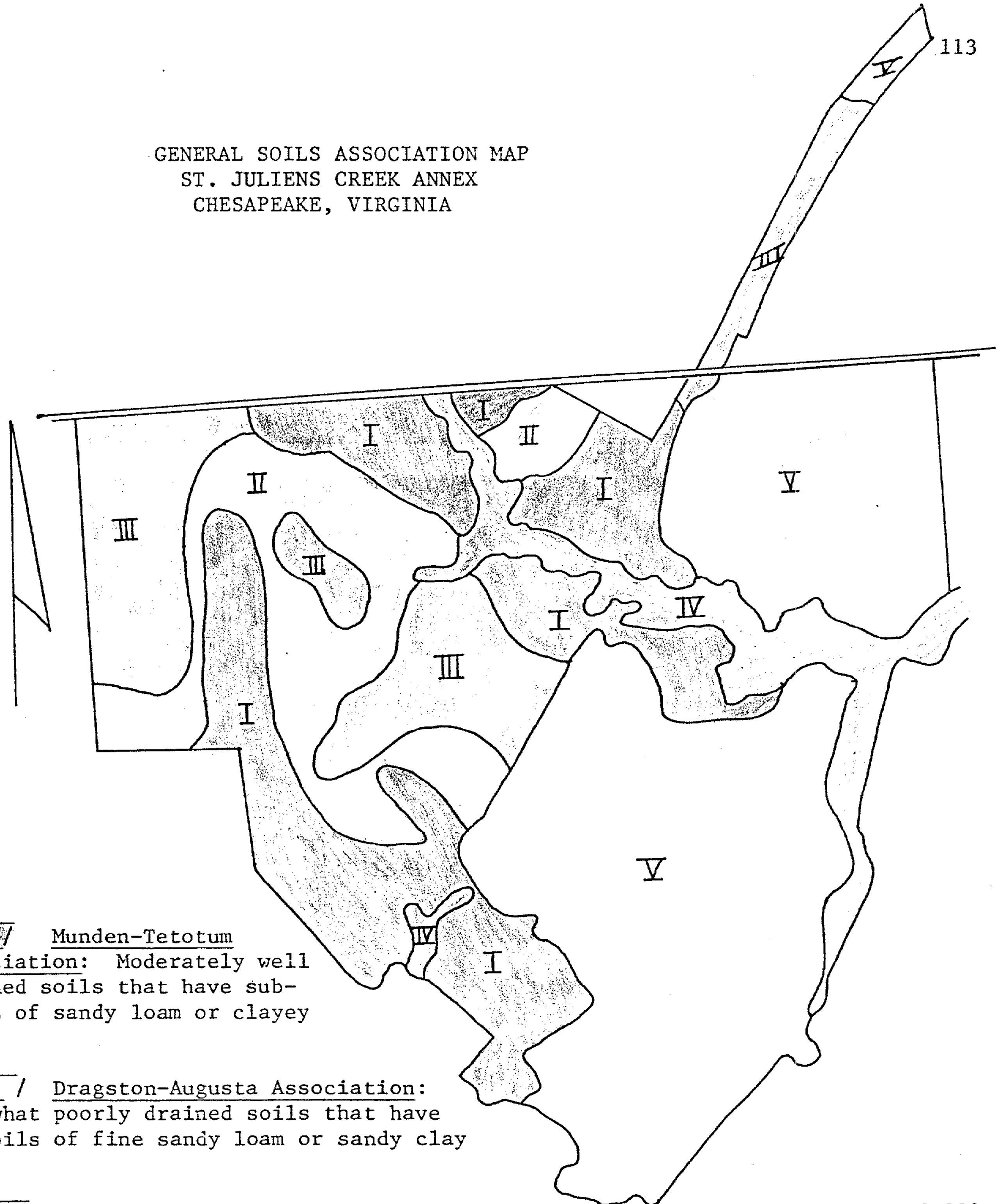
IV Poorly drained

- 52 Nimmo
- 55 Tomotley

V Very poorly drained

- 65 Portsmouth
- 79 Bohicket

GENERAL SOILS ASSOCIATION MAP
ST. JULIENS CREEK ANNEX
CHESAPEAKE, VIRGINIA



/ I / Munden-Tetotum Association: Moderately well drained soils that have subsoils of sandy loam or clayey loam.

/ II / Dragston-Augusta Association: Somewhat poorly drained soils that have subsoils of fine sandy loam or sandy clay loam.

/ III / Nimmo: Poorly drained soil that has subsoil of fine sandy loam.

/ IV / Bohicket: Very poorly drained soil of tidal marshes that has a silty clay substratum.

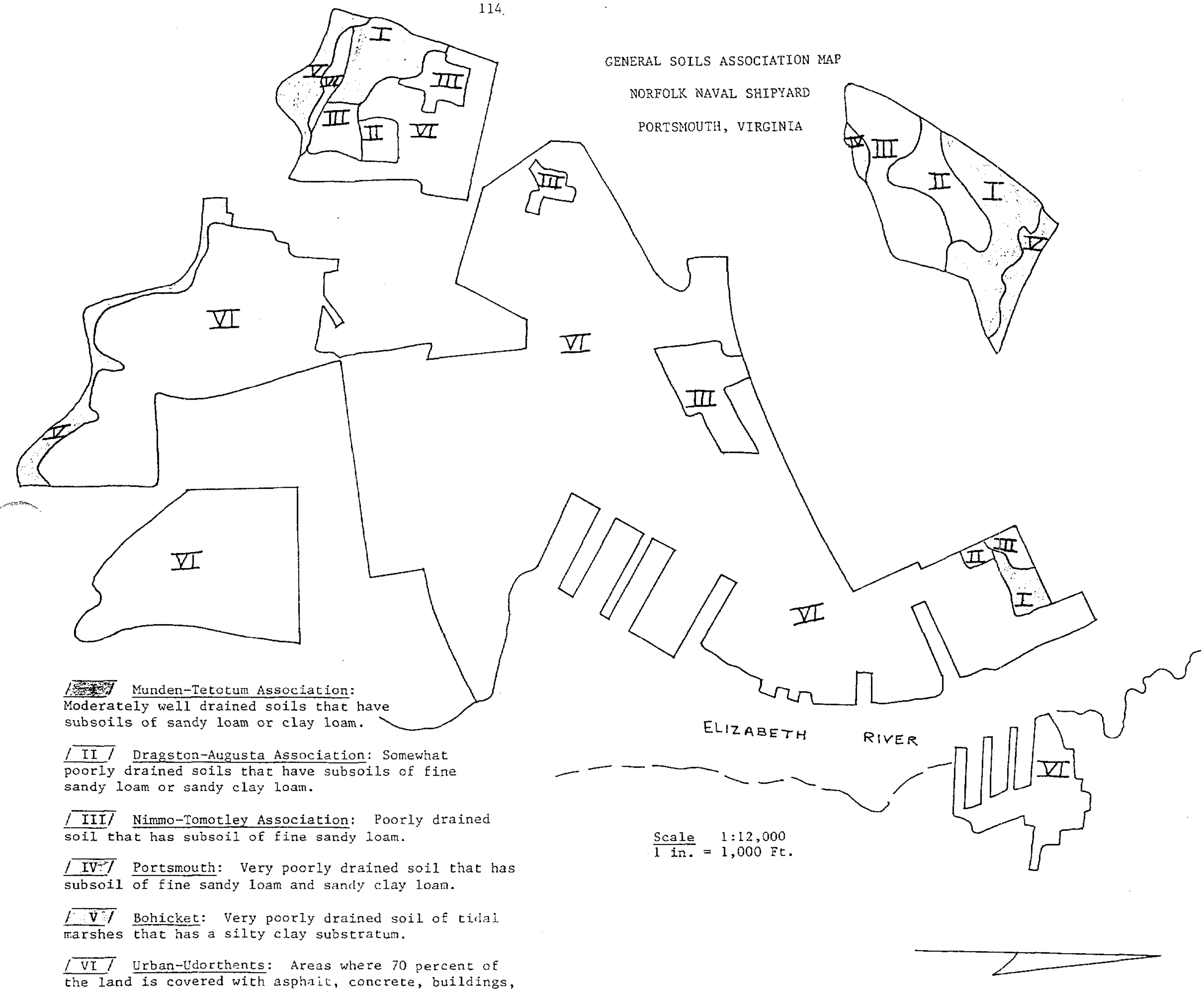
/ V / Urban-Udorthents: Areas where 70 percent of the land is covered with asphalt, concrete, building, etc. or where soils have been altered by excavations.

Scale 1:12,000
1 in. = 1,000 Ft.

GENERAL SOILS ASSOCIATION MAP

NORFOLK NAVAL SHIPYARD

PORTSMOUTH, VIRGINIA



/ I / Munden-Tetotum Association: Moderately well drained soils that have subsoils of sandy loam or clay loam.

/ II / Dragston-Augusta Association: Somewhat poorly drained soils that have subsoils of fine sandy loam or sandy clay loam.

/ III / Nimmo-Tomotley Association: Poorly drained soil that has subsoil of fine sandy loam.

/ IV / Portsmouth: Very poorly drained soil that has subsoil of fine sandy loam and sandy clay loam.

/ V / Bohicket: Very poorly drained soil of tidal marshes that has a silty clay substratum.

/ VI / Urban-Udorthents: Areas where 70 percent of the land is covered with asphalt, concrete, buildings, etc. or where soils have been altered by excavations.

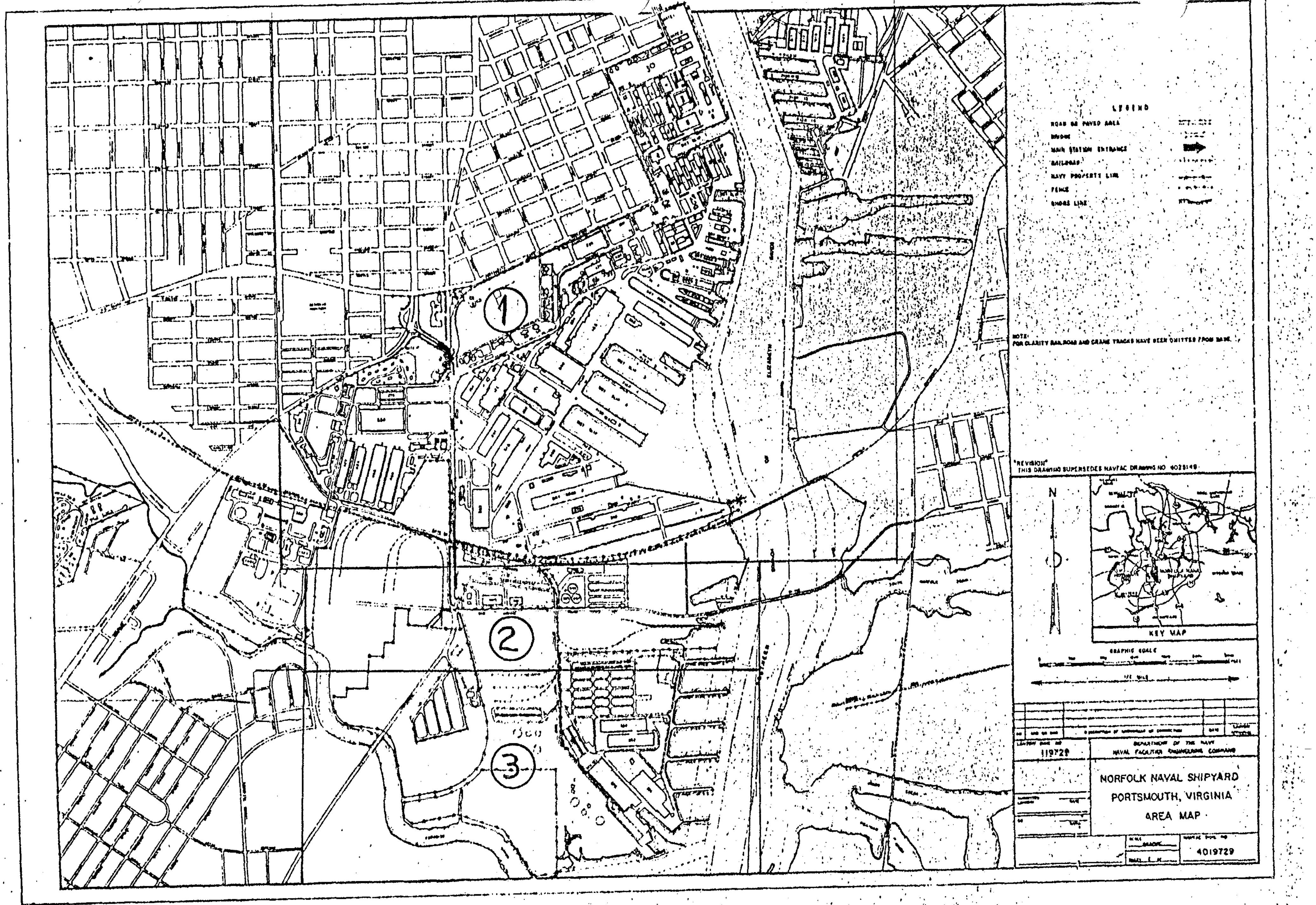
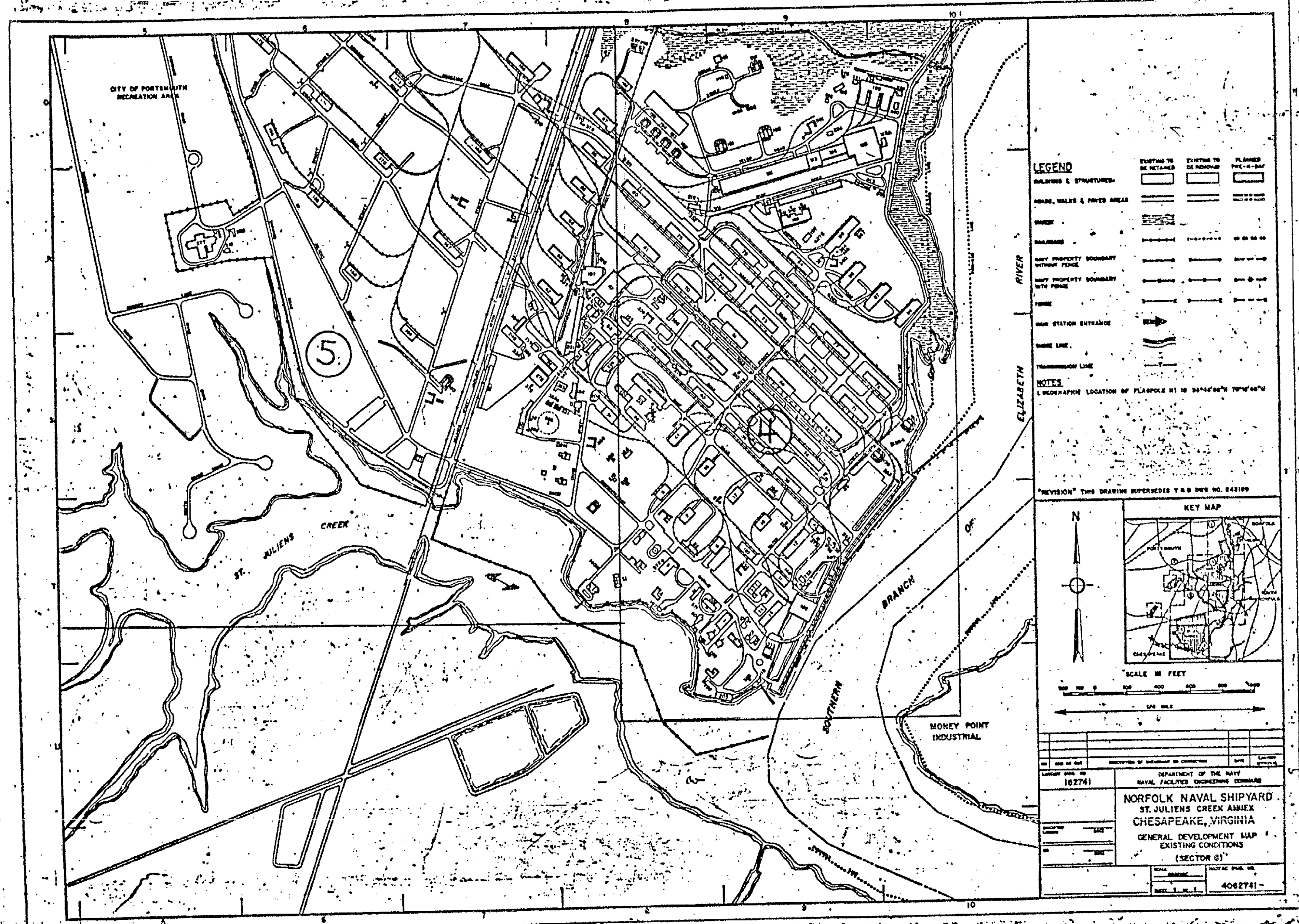


PHOTO INDEX MAP

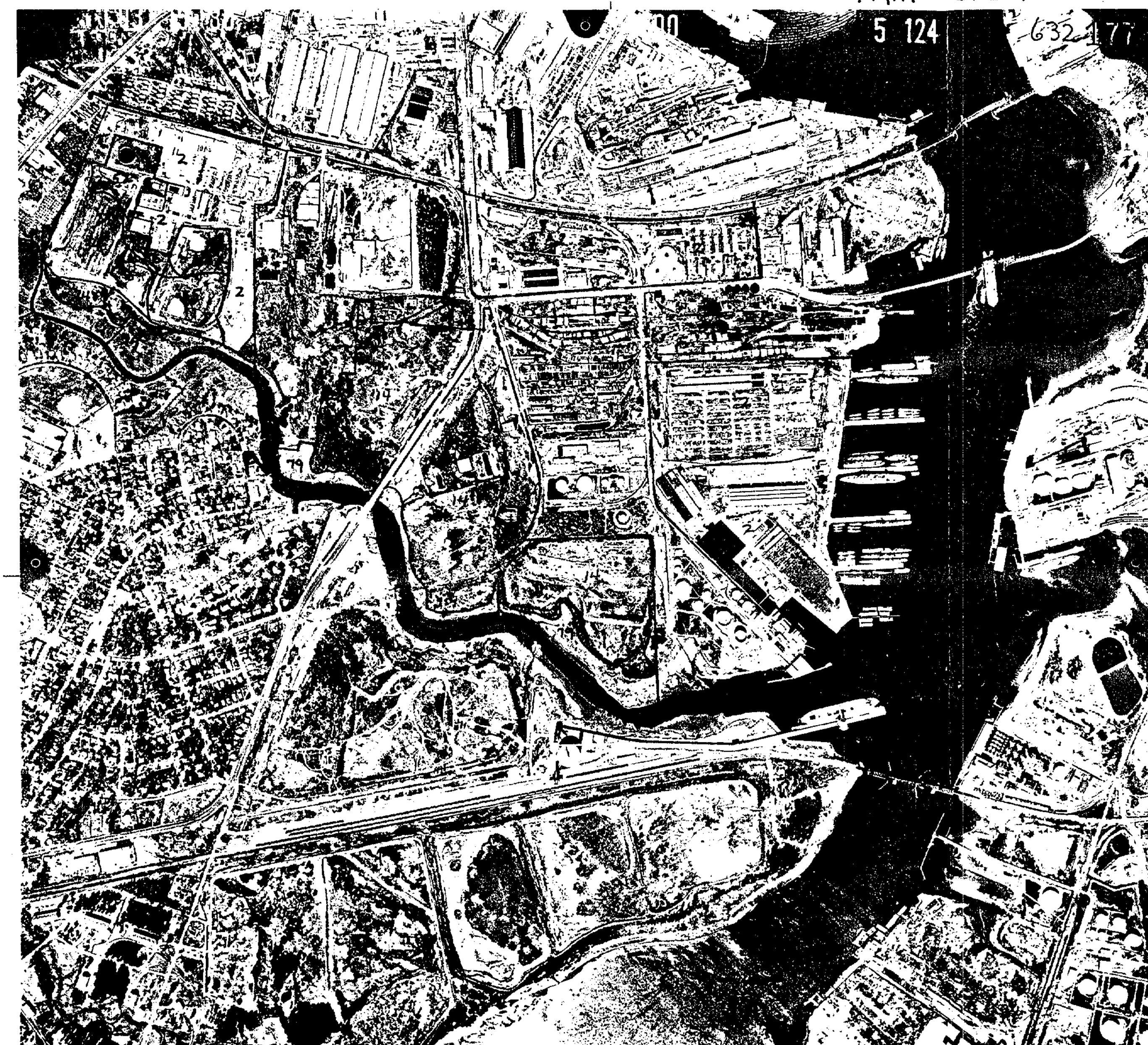


CITY OF PORTSMOUTH
RECREATION AREA
5
4
ST. JULIENS CREEK
SOUTHERN BRANCH OF ELIZABETH RIVER
MONEY POINT
INDUSTRIAL
LEGEND
NOTES
KEY MAP
N
SCALE IN FEET
DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
162741
NORFOLK NAVAL SHIPYARD
ST. JULIENS CREEK ANNEX
CHESAPEAKE, VIRGINIA
GENERAL DEVELOPMENT MAP
EXISTING CONDITIONS
(SECTOR 6)
4062741

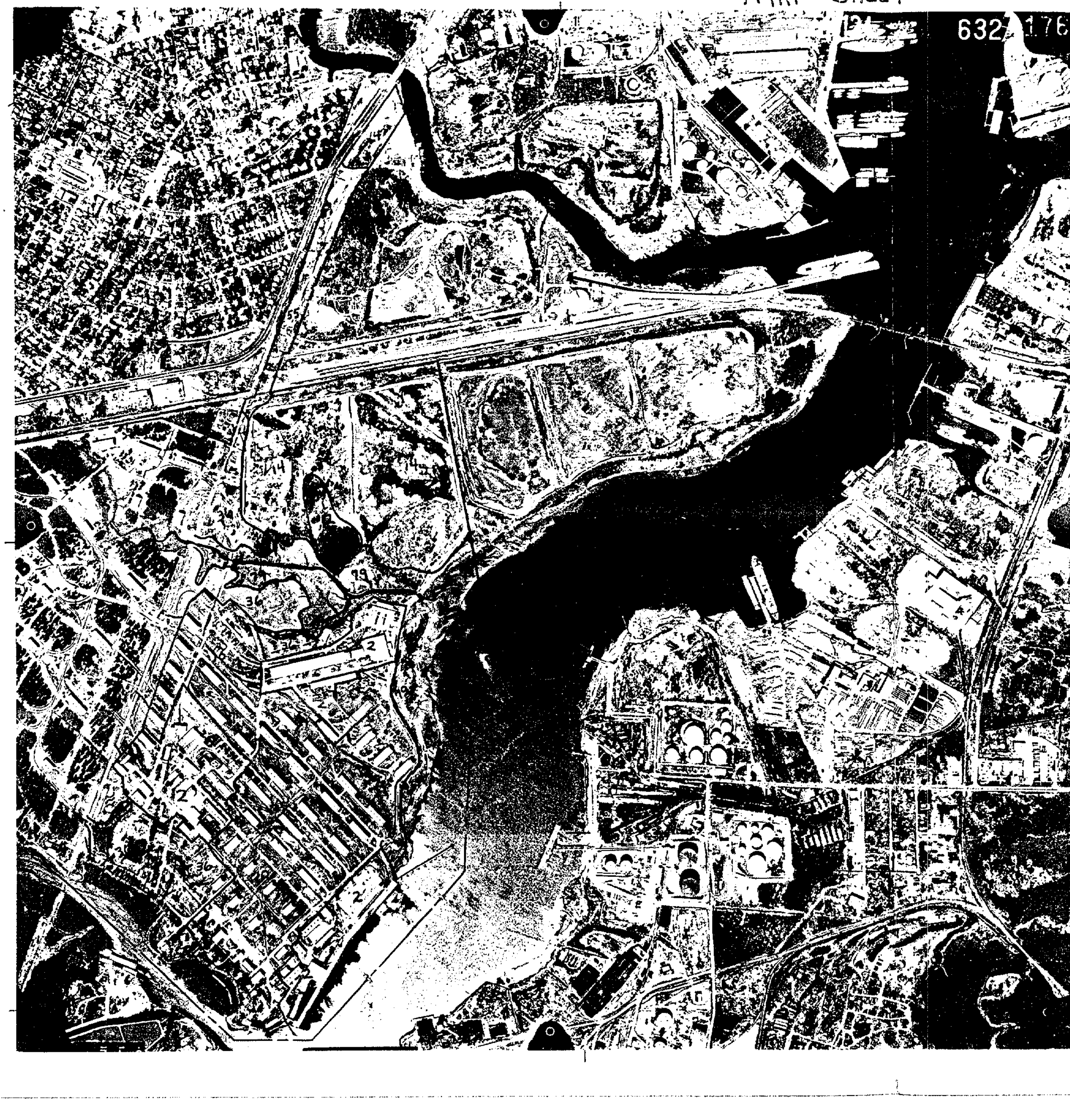
PAGE 2 OF 2

Map Sheet # 1

Map Sheet #2



Map Sheet #3



MAP SHEET # 4

MAP SHEET #5