S&EC

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North Chatham Investments, Inc.
Attn: Mr. Travis Blake
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Revised August 15, 2005
Project #: 9380.S2

Preliminary Soils Report

Ref: 15-501 & Lystra Road - Chatham County, NC (evaluation limited to proposed non impacted areas).

Executive Summary:
Soil & Environmental Consultants, PA (S&EC) has performed a limited soil/site evaluation at the proposed Medical Park site in Chatham County, NC. The basis of this report is that these areas are being proposed to be used for a surface irrigation wastewater disposal system. The system daily flow was not provided to S&EC, therefore this report only discusses the soil evaluation, the dominant soil series on-site, and the general permeability classes based on the soil series.

This report is being prepared as a "draft report" for review and comment and it does not have all of the required information needed to complete a design of an irrigation system. NC Licensed Soil Scientist Larry Sink completed the fieldwork during February 2005.

Introduction:
S&EC traversed limited areas on the property and observed landforms (slope, drainage patterns, past use, etc.) as well as soil conditions (depth, texture, structure, seasonal wetness, restrictive horizons, etc.) through the use of hand auger borings. This site is in the piedmont region of central Chatham County. The corresponding upland soil series identified on the tract are all named and the criteria for each series as described by the Natural Resource Conservation Service (NRCS) is provided. These soils are divided into groups based on like soil characteristics of the site.

Soil/Site Conditions: Non impacted area
Based on the hand-auger borings, the upland soils on this tract are similar to the Saw, Wedowee, Helena and Rawlings soil series. The low areas or flood plain are similar to the Chewacla and Wehadkee soil series. S&EC did not include data for the flood plain soil series. Please keep in mind that the attached soil descriptions are NOT the descriptions for your specific sight but rather the general pedon description provided by NRCS for that soil series.

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The attached sketch map approximates the location of each soil series and it can be used as a general guide. Additional fieldwork will be necessary for any detailed engineering planning. This additional fieldwork may include flagging the boundary between the soil series and locating that boundary either by GPS or a survey. That additional fieldwork will provide an accurate base map for use in sizing and locating a surface disposal field.

After completing the detailed soils map the next step in the process will be to determine the rate that the wastewater can be applied to the site. The first step in this determination is to establish the average rate at which clean water will pass through each of the described units. This is accomplished by running multiple tests called Hydraulic Conductivity measurements for each horizon in each mapped unit. Once these rates of water movement are established the process moves on to the hydrologist. The hydrologist analyzes the detailed soils information, conductivity results and his own tests results with the aid of a computer model to determine the application rate for each map unit. I offer this explanation so that you will realize that at this point we can only compare **projected permeabilities**. S&EC cannot establish an accurate loading rate at this point. The compared permeability classes are located on the last page of each NRCS Profile description.

An example of this comparison is the Wedowee's most restrictive permeability class at 0.6 to 2.0 inches per hour, and the Helena's most restrictive layer has a permeability class of 0.06 to 0.2 inches per hour. Each soil series has the projected permeability class for each of its horizons listed on the same page. These numbers cannot be used to expect an application rate, only to make general comparisons. Since treated wastewater is used for irrigation, the permeability class or drainage rate for the soil series are generally calculated at a percentage (6 to 10%) of the permeability of the most restrictive horizon in the soil.

Likewise based on the NRCS information and utilizing the attached Table 1 for typical ranges of soil infiltration rates, an estimated value may be obtained based on the surface texture and site slope within the irrigated areas. The infiltration rate for Table 1 was obtained from the Sprinkler Irrigation Association, Sprinkler Irrigation (1969).

Irrigation on landscape areas:
At this time the daily flow is unknown and S&EC was not requested to identify the soils in the area of the proposed buildings, parking lot, etc. In these areas, the soils will need to be amended (top soil added, mulch, etc) after site construction. S&EC assumes that the site will be altered for preparation and planting of trees, bushes, etc. However based on other projects in which S&EC assisted where it was proposed to use landscape areas for irrigating, those areas

generally accepted 15 inches to 18 inches of water per year. The assumption made here is that treated wastewater applied to the landscaped area can infiltrate the soil with no runoff. Upon completion of landscaping, the landscaped areas must be evaluated to determine their potential for accepting wastewater at the design application rate.

The contribution of the impervious roads to the landscaping plots is not known. An excessive amount of runoff from impervious surfaces into the landscape areas may further restrict the volume of wastewater that can be applied to these areas. We also suggest that soil water content and wetness, as well as runoff from the landscape areas, be monitored during irrigation season.

Conclusion:
The attached sketch map gives an indication of the dominate soil types in the non impacted areas. The accompanying NRCS data can be used as a general guide to project permeabilities within each soil unit. Typical infiltration rates can be obtained based on the NRCS data and site slope. However, as noted above, additional site work is needed. Again, the next step would be to get actual numbers from field observations for further calculations for the application rates. This process is normally required on all large wastewater systems.

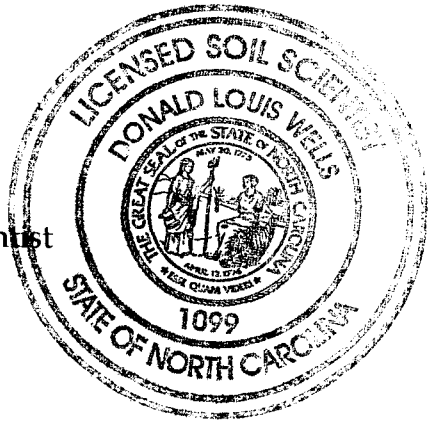
This report discusses the general location of soils for on-site surface wastewater dispersal, and does not constitute or imply any approval or granting of a permit as needed by the client from the State. S&EC is a professional consulting firm that specializes in the delineation of soil areas for wastewater disposal. As a professional consulting firm, S&EC is hired for its professional opinion in these matters. The rules governing wastewater treatment (interpreted and governed by local and state agencies) are evolving constantly, and in many cases, affected by the opinions of individuals employed by the governing agencies.

If you have any questions or require additional information then please give us a call.

Prepared by:

Don Wells

Don Wells
NC Licensed Soil Scientist



Reviewed by:

Ricky Pontello
NC Licensed Soil Scientist

Table 1

Typical ranges of soil infiltration rates by soil texture and slope.

	Basic Infiltration Rate (in/hr)* Slope		
Texture	0-3%	3-9%	9+%
sands	1.0+	0.7+	0.5+
loamy sands	0.7-1.5	0.5-1.0	0.4-0.7
sandy loams and fine sandy loams	0.5-1.0	0.4-0.7	0.3-0.5
very fine sandy loam and silt loam	0.3-0.7	0.2-0.5	0.15-0.3
sandy clay loam and silty clay loam	0.2-0.4	0.15-0.25	0.1-0.15
clay and silty clay	0.1-0.2	0.1-0.15	< 0.1

Source: Sprinkler Irrigation Association, Sprinkler Irrigation (1969)

* For good vegetative cover, these rates may be 25-50% greater. For poor surface conditions, rates may be as much as 50% less.

LOCATION HELENA NC+AL GA SC VA
Established Series
Rev. AG
05/2000

HELENA SERIES

The Helena series consists of very deep, moderately well drained, slowly permeable soils that formed in residuum weathered from a mixture of felsic, intermediate, or mafic igneous or high-grade metamorphic rocks such as aplitic granite or granite gneiss that is cut by dykes of gabbro and diorite, or mixed with hornblende schist or hornblende gneiss. These soils are on broad ridges and toeslopes of the Piedmont uplands. Slope is dominantly between 2 to 10 percent but ranges from 0 to 15 percent. Mean annual precipitation is 46 inches, and mean annual temperature is 61 degrees F, near the type location.

TAXONOMIC CLASS: Fine, mixed, semiactive, thermic Aquic Hapludults

TYPICAL PEDON: Helena sandy loam - in a cultivated field on a 4 percent slope. (Colors are for moist soil unless otherwise stated.)

Ap--0 to 8 inches; grayish brown (10YR 5/2) sandy loam; weak, medium, and coarse granular structure; very friable; many fine roots; moderately acid; abrupt smooth boundary. (4 to 10 inches thick)

E--8 to 12 inches; light yellowish brown (10YR 6/4) sandy loam; weak medium granular structure; very friable; few fine roots; few fine black concretions; strongly acid; clear wavy boundary. (0 to 10 inches thick)

BE--12 to 19 inches; brownish yellow (10YR 6/6) sandy clay loam; moderate medium prismatic structure that parts to moderate medium angular blocky; friable; sticky, plastic; few fine roots; few fine pores; few faint clay films on faces of peds; few medium quartz gravel; common fine faint pale brown (10YR 6/3) iron depletions; very strongly acid; clear wavy boundary. (0 to 7 inches thick)

Bt1--19 to 24 inches; yellowish brown (10YR 5/8) clay; weak coarse angular blocky structure; firm; sticky, plastic; few fine roots; few fine pores; few faint clay films on faces of peds; few fine prominent light brownish gray (10YR 6/2) iron depletions; very strongly acid; clear wavy boundary.

Bt2--24 to 39 inches; yellowish brown (10YR 5/8) clay; weak coarse subangular blocky and angular blocky structure; very firm, sticky, very plastic; few fine roots; few fine pores; common distinct clay films on faces of peds; many medium prominent gray (10YR 6/1) iron depletions; very strongly acid; clear wavy boundary.

Bt3--39 to 43 inches; light yellowish brown (10YR 6/4) clay loam; weak medium subangular blocky structure; extremely firm, sticky, very plastic; common distinct clay

films on faces of peds; few brown concretions; common medium distinct light gray (10YR 7/1) iron depletions; very strongly acid; clear wavy boundary. (Combined thickness of the Bt horizon is 17 to 42 inches.)

BCg--43 to 46 inches; light gray (10YR 7/1) clay loam; weak coarse subangular blocky structure; friable, sticky, plastic; many coarse prominent strong brown (7.5YR 5/6) soft masses of iron accumulation; very strongly acid; clear wavy boundary. (0 to 14 inches thick)

C--46 to 60 inches; strong brown (7.5YR 5/8) sandy loam saprolite; many coarse prominent light gray (10YR 7/1) streaks; massive; friable; few coarse veins of gray clay; common fragments of granitic rock; very strongly acid.

TYPE LOCATION: Durham County, North Carolina; 0.4 mile west of Mangum Store on SR 1603; 400 feet north on a farm road and 400 feet east in a cultivated field.

RANGE IN CHARACTERISTICS: Solum thickness ranges from 40 to more than 60 inches. Depth to bedrock is greater than 5 feet. The soil is extremely acid to strongly acid except where the surface has been limed. Limed soils are typically moderately acid or slightly acid in the upper part. Gravel fragments range from 0 to 35 percent, by volume, throughout the profile. Some pedons may have few to common dark concretions in the upper part of the profile.

The A or Ap horizon has hue of 10YR or 2.5Y, value of 3 to 6, and chroma of 1 to 4. It is loamy sand, loamy coarse sand, coarse sandy loam, fine sandy loam, sandy loam, or loam in the fine-earth fraction. In eroded phases the Ap horizon is clay loam or sandy clay loam in the fine-earth fraction.

The E horizon, where present, has hue of 10YR to 5Y, value of 5 to 8, and chroma of 2 to 4. Texture is loamy sand, loamy coarse sand, coarse sandy loam, fine sandy loam, sandy loam, or loam in the fine-earth fraction.

The BE or BA horizon, where present, has hue of 7.5YR to 5Y, value of 5 to 8, and chroma of 3 to 8. It is sandy clay loam or clay loam in the fine-earth fraction.

The Bt horizon has hue of 7.5YR to 5Y, value of 5 to 8, and chroma of 3 to 8. In some pedons, the lower Bt horizon has 5YR hues or is multicolored in shades of yellow, brown, gray, or red. Iron depletions with chroma of 2 or less occur within 24 inches of the upper boundary of the Bt horizon. Soft masses of iron accumulation in shades of yellow, brown, or red may also be present. Texture is dominantly clay loam, sandy clay, or clay in the fine-earth fraction, but some pedons have thin subhorizons of sandy clay loam.

The Btg horizon, where present, has hue of 10YR or 2.5Y, value of 4 to 7, and chroma of 1 or 2. Soft masses of iron accumulation in shades of yellow, brown, or red commonly are present. Texture is clay loam, sandy clay, or clay in the fine-earth fraction. Some pedons have thin subhorizons of sandy clay loam.

The BC and BCg horizons, where present, have colors similar to the Bt horizon or the Btg horizon, respectively. Texture is clay loam, sandy clay loam, loam, fine sandy loam, or sandy loam in the fine-earth fraction.

The C horizon has hue of 5YR to 5Y, value of 5 to 8, and chroma of 3 to 8, or is multicolored in shades of gray, yellow, brown, red or white. The Cg horizon, where present, has hue of 10YR to 5Y, value of 5 to 7, and chroma of 1 or 2 and is typically multicolored in shades of yellow or brown. The C and Cg horizons are saprolite that has a texture of sandy loam, fine sandy loam, sandy clay loam, or loam in the fine-earth fraction. Bodies or seams of clay loam or clay are in some pedons.

COMPETING SERIES: These are the Annemaine, Beason, Cid, Craven, Creedmoor, Dogue, Eulonia, Gritney, Lignum, Maubila, Nemours, Nevarc, Peawick, Sacul, and Telfair series. Annemaine, Benson, Craven, Dogue, Eulonia, Gritney, Maubila, Nemours, Nevarc, Peawick, Sacul, and Wolftever soils lack a C horizon of saprolite. In addition, Annemaine, Eulonia, Nemours, Newco, and Sacul soils have redder hue, and Beason, Craven and Dogue soils contain more silt. Also, Peawick soils commonly have aluminum saturation greater than 50 percent. Cid soils have a lithic contact between depths of 20 and 40 inches. Creedmoor soils have a higher coefficient of linear extensibility, more exchangeable aluminum than Helena, and the C horizon is weathered Triassic saprolite. Lignum and Prosperity soils have paralithic contact within 40 to 60 inches.

GEOGRAPHIC SETTING: The Helena soils are on broad ridges, toe slopes and heads of drains in the Piedmont uplands. Slopes are mostly between 2 and 10 percent and range from 0 to 15 percent. The soil formed in residuum weathered from a mixture of felsic, intermediate, or mafic igneous or high-grade metamorphic rocks such as aplitic granite or granite gneiss that is cut by dykes of gabbro and diorite, or mixed with hornblende schist or hornblende gneiss. Mean annual precipitation ranges from 37 to 69 inches, and mean annual temperature ranges from 58 to 65 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are Appling, Cecil, Cullen, Durham, Enon, Hard Labor, Iredell, Louisburg, Mecklenburg, Pacolet, Prosperity, Rion, Santuc, Sedgefield, Vance, Wedowee, Wilkes, and Worsham series. Appling, Cecil, Hard Labor, Pacolet, and Wedowee soils have kaolinitic mineralogy. Cullen and Vance soils are well drained. Durham and Rion soils have less than 35 percent clay in the Bt horizon. Enon, Iredell, Mecklenburg, Sedgefield, and Wilkes soils have base saturation of more than 35 percent. In addition, Wilkes soils are loamy and shallow. All of these except for Iredell, Sedgefield, and Worsham soils are on landscape positions that have better surface drainage. Iredell, Prosperity, Santuc, and Sedgefield soils are in similar landscape positions to Helena. Worsham soils are in heads of drains and upland drainageways. Santuc soils have a fine-loamy particle size class

DRAINAGE AND PERMEABILITY: Moderately well drained; medium to rapid runoff; slow permeability. There is a perched water table in late winter and early spring.

USE AND VEGETATION: About two-thirds of this soil is used for crops and pasture. Common crops are tobacco, corn, soybeans, small grain, and vegetables. Less common

are cotton and hay. The remaining acreage is in forests of mixed hardwood and pine. Native species include loblolly pine, shortleaf pine, Virginia pine, sweetgum, willow oak, red oak, white oak, yellow-poplar, and American elm. Understory species include sourwood, flowering dogwood, winged elm, eastern cedar, hophornbean, eastern redbud, and sassafras.

DISTRIBUTION AND EXTENT: Piedmont of Alabama, Georgia, North Carolina, South Carolina, and Virginia. The series is of large extent; the area is more than 300,000 acres.

MLRA OFFICE RESPONSIBLE: Raleigh, North Carolina

SERIES ESTABLISHED: Person County, North Carolina, 1928.

REMARKS: The August 1991 revision changed depth to bedrock from "more than 48 inches to more than 60 inches" to be consistent with one depth to bedrock class as shown on the Soil Interpretation Records for Helena.

Diagnostic horizons and features recognized in this pedon are:
Ochric epipedon - the zone from the surface of the soil to 12 inches (Ap and E horizons)
Argillic horizon - the zone between depths of 12 and 46 inches below the surface (BE, Bt1, Bt2, Bt3 and BCg horizons)
Aquic conditions - periodic episaturation and redox depletions within 24 inches of the upper boundary of the argillic horizon (beginning in the Bt1 horizon)

Revised: RLV 8/14/98

MLRA = 136

ADDITIONAL DATA:

TABULAR SERIES DATA:
SOI-5 Soil Name Slope Airtemp FrFr/Seas Precip Elevation
NC0058 HELENA 0- 15 58- 65 85-240 37- 69 350- 900
NC0176 HELENA 0- 15 58- 65 185-240 37- 69 350- 900
NC0266 HELENA 0- 15 58- 65 185-240 37- 69 350- 900

SOI-5	FloodL	FloodH	Watertable	Kind	Months	Bedrock	Hardness
NC0058	NONE		1.5-2.5	PERCHED	JAN-APR	60-60	
NC0176	NONE		1.5-2.5	PERCHED	JAN-APR	60-60	
NC0266	NONE		1.5-2.5	PERCHED	JAN-APR	60-60	

SOI-5	Depth	Texture	3-Inch	No-10	Clay%	-CEC-
NC0058	0-12	SL FSL L	0- 5	90-100	5-20	1- 6
NC0058	0-12	SCL CL	0- 5	95-100	20-35	4- 8
NC0058	12-19	SCL CL	0- 5	95-100	20-35	4- 7
NC0058	19-43	CL SC C	0- 5	95-100	35-60	7- 13
NC0058	43-60	VAR	-	-	-	-
NC0176	0-12	GR-FSL GR-L GR-COSL	0- 5	50- 75	5-20	1- 6
NC0176	0-12	GR-LCOS GR-LS GR-S	0- 5	50- 75	3-12	1- 4
NC0176	0-12	GR-CL GR-SCL	0- 5	50- 75	20-35	4- 8
NC0176	12-19	SCL CL SL	0- 5	95-100	20-35	4- 7
NC0176	19-43	CL SC C	0- 5	95-100	35-60	7- 13

NC0176	43-60	VAR	-	-	-	-
NC0266	0-12	LS LCOS	0- 5	90-100	3-12	1- 4
NC0266	12-19	SCL CL	0- 5	95-100	20-35	4- 7
NC0266	19-43	CL SC C	0- 5	95-100	35-60	7- 13
NC0266	43-60	VAR	-	-	-	-

SOI-5	Depth	-pH-	O.M.	Salin	Permeab	Shnk-Swll
NC0058	0-12	3.5- 6.5	.5-2.	0- 0	2.0- 6.0	LOW
NC0058	0-12	3.5- 6.5	.5-1.	0- 0	0.2- 0.6	LOW
NC0058	12-19	3.5- 5.5	0.-.5	0- 0	0.2- 0.6	MODERATE
NC0058	19-43	3.5- 5.5	0.-.5	0- 0	0.06- 0.2	HIGH
NC0058	43-60	-	-	-	-	
NC0176	0-12	4.5- 6.5	.5-2.	0- 0	2.0- 6.0	LOW
NC0176	0-12	4.5- 6.5	.5-2.	0- 0	6.0- 20	LOW
NC0176	0-12	4.5- 6.5	.5-1.	0- 0	0.2- 0.6	LOW
NC0176	12-19	4.5- 5.5	0.-.5	0- 0	0.2- 0.6	MODERATE
NC0176	19-43	4.5- 5.5	0.-.5	0- 0	0.06- 0.2	HIGH
NC0176	43-60	-	-	-	-	
NC0266	0-12	3.5- 6.5	.5-2.	0- 0	6.0- 20	LOW
NC0266	12-19	3.5- 5.5	0.-.5	0- 0	0.2- 0.6	MODERATE
NC0266	19-43	3.5- 5.5	0.-.5	0- 0	0.06- 0.2	HIGH
NC0266	43-60	-	-	-	-	

National Cooperative Soil Survey
U.S.A.

LOCATION RAWLINGS GA
Established Series
Rev. WGG, REE, MJB
07/1999

RAWLINGS SERIES

The Rawlings Series consists of moderately deep, well drained, moderately permeable soils, that formed in material weathered from felsic igneous and metamorphic rock, primarily granite and granite gneiss. The Rawlings soils are on summits and side slopes of the Piedmont uplands. Slope ranges from 6 to 45 percent. Near the type location, the mean annual temperature is 60 degrees F, and the mean annual precipitation is 45 inches.

TAXONOMIC CLASS: Fine-loamy, mixed, subactive, thermic Typic Hapludults

TYPICAL PEDON: Rawlings gravelly sandy loam on a southwest facing 19 percent slope, at an elevation of 620 feet, in woodland. (Colors are for moist soil.)

A1--0 to 2 inches; dark brown (7.5YR 4/2) gravelly sandy loam; moderate medium granular structure; very friable; many very fine, fine, and medium, and few coarse roots; few fine flakes of mica; 10 percent pebbles, 5 percent cobbles, and 5 percent stones; slightly acid; abrupt smooth boundary.

A2--2 to 10 inches; brown (7.5YR 4/3) sandy loam; weak fine subangular blocky structure; very friable; common very fine, fine, medium, and coarse roots; few fine flakes of mica; 10 percent pebbles; moderately acid; gradual wavy boundary. (Combined thickness of the A horizon is 5 to 12 inches.)

Bt1--10 to 15 inches; brown (7.5YR 4/4) sandy loam; weak medium subangular blocky structure; friable, slightly sticky and slightly plastic; common very fine, fine, medium, and coarse roots; few distinct brown (10YR 5/3) clay films on faces of peds; few fine flakes of mica; 5 percent pebbles; moderately acid; clear wavy boundary.

Bt2--15 to 30 inches; reddish brown (5YR 4/4) sandy clay loam; moderate coarse subangular blocky structure; friable, slightly sticky and moderately plastic; few very fine, fine, medium, and coarse roots; many distinct brown (7.5YR 5/3) clay films on faces of peds; common fine flakes of mica; 2 percent pebbles; moderately acid; clear irregular boundary.

Bt3--30 to 33 inches; brown (7.5YR 4/3) sandy clay loam; weak medium subangular blocky structure; friable, slightly sticky and slightly plastic; few very fine, fine, medium, and coarse roots; few distinct brown (10YR 5/3) clay films on faces of peds; common fine flakes of mica; 2 percent pebbles; moderately acid; abrupt irregular boundary. (Combined thickness of the Bt horizons is 12 to 27 inches.)

R--33 inches; hard granite gneiss with widely spaced fractures.

TYPE LOCATION: Morgan County, Georgia; located within Hard Labor Creek State Park, about 5,100 feet southeast of the confluence of Hard Labor Creek and Mountain Hill Branch; USGS Quadrangle, Rutledge North, GA (1971), lat. 33 degrees 34 minutes 37 seconds N. and long. 83 degrees 39 minutes 16 seconds W.

RANGE IN CHARACTERISTICS: Solum thickness ranges from 20 to 39 inches. Depth to hard bedrock is 20 to 40 inches. Reaction ranges from very strongly acid to moderately acid throughout the profile, unless limed. Rock fragments range from 0 to 35 percent by volume in the A, E, and C horizons, and from 0 to 15 percent by volume in the BA, BE, Bt, and BC horizons. Content of mica flakes ranges from none to common in the A, E, BE, BA, and upper Bt horizons, and from few to many in the lower Bt, BC, and C horizons.

The A or Ap horizon has hue of 5YR to 10YR, value of 3 to 5, and chroma of 2 to 4. In areas not significantly affected by erosion, it is sandy loam or loam in the fine-earth fraction. In severely eroded areas, texture is sandy clay loam in the fine-earth fraction.

The E horizon, if it occurs, is less than 6 inches thick, and has hue of 5YR to 10YR, value of 4 to 6, and chroma of 3 to 8. It is loamy sand or sandy loam in the fine-earth fraction.

The BA or BE horizon, if it occurs, is less than 8 inches thick, has hue of 5YR to 10YR, value of 4 to 6, and chroma of 3 to 6. It is sandy loam, loam, or sandy clay loam.

The Bt horizon typically has hue of 2.5YR to 7.5YR, value of 4 or 5, and chroma of 4 to 8, but includes hue of 10YR with value of 4 or 5, and chroma of 4 to 6. Mottles are none to common in shades of red, brown, and yellow. It is sandy loam, loam, sandy clay loam, or clay loam.

The BC horizon, if it occurs, is less than 10 inches thick, and has hue of 2.5YR to 10YR, value of 4 to 6, and chroma of 4 to 8. Mottles in shades of red, brown, and yellow are none to common. It is sandy loam, loam, sandy clay loam, or clay loam.

The C horizon, if it occurs, is less than 15 inches thick, and is similar in color to the BC horizon. It is loamy saprolite in the fine-earth fraction.

The Cr horizon, if it occurs, is less than 6 inches thick of highly weathered felsic igneous or metamorphic bedrock, which overlies the R horizon.

The R horizon is hard felsic igneous or metamorphic bedrock, primarily granite or granite gneiss.

COMPETING SERIES: These are the Buckhead, Cheaha, Fruithurst, Montonia, Rion, Rome, Sherwood, State, Sugargrove, Tidings, and Wickham series of the same family, and the Saw series in a related family. Buckhead, Rion, Rome, State, and Wickham soils do not have bedrock within 60 inches of the soil surface. Cheaha soils have sandstone bedrock, and have greater than 15 percent sandstone cobbles in each horizon. Fruithurst and Montonia soils have a paralithic contact of weathered slate or serecite schist at depths of 20 to 40 inches. Saw soils are in a fine family. Sherwood soils have sandstone bedrock

at depths of 30 to 60 inches. Sugargrove soils have a paralithic contact of weathered interbedded siltstone and limestone at depths of 40 to 60 inches. Tidings soils have a paralithic contact of weathered interbedded sandstone and shale at depths of 40 to 60 inches.

GEOGRAPHIC SETTING: Rawlings soils are on gently sloping to steep summits and side slopes in the Piedmont uplands. Slope ranges from 6 to 45 percent. These soils formed in material weathered from felsic igneous and metamorphic rock, primarily granite or granite gneiss. Mean annual temperature is in the range of 59 to 62 degrees F. Mean annual precipitation is in the range of 45 to 50 inches.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the competing Buckhead, and Wickham soils, and the Cecil, Gwinnett, Lloyd, and Pacolet soils. Except for Gwinnett soils, none of these soils have bedrock within a depth of 60 inches. Gwinnett soils have a paralithic contact of hornblende gneiss at depths of 40 to 60 inches. Additionally, Cecil, Gwinnett, Lloyd, and Pacolet soils are in fine families, and are generally on less sloping landform positions, and Wickham soils are on stream terraces. Buckhead soils are on landform positions similar to those of Rawlings.

DRAINAGE AND PERMEABILITY: Well drained; medium to very rapid runoff; moderate permeability.

USE AND VEGETATION: Most of the acreage is wooded, with the remainder in pasture. Common trees in forested areas are loblolly pine, white oak, southern red oak, hickory, and American beech. Common understory plants include flowering dogwood, American holly, muscadine grape, honeysuckle, greenbrier, and poison ivy.

DISTRIBUTION AND EXTENT: Piedmont area of Georgia. The series is of small extent.

MLRA OFFICE RESPONSIBLE: Raleigh, North Carolina

SERIES ESTABLISHED: Morgan County, Georgia; 1998

REMARKS: The Rawlings series was formerly included with the Rion series. However, Rion soils do not have bedrock within a depth of 60 inches of the soil surface.

Diagnostic horizons and features recognized in this pedon are:

Ochric epipedon - the zone from the surface to 10 inches (A1 and A2 horizons)

Argillic horizon - the zone between depths of 10 and 33 inches (Bt horizon)

Lithic contact - the occurrence of hard bedrock at a depth of 33 inches (R horizon)

MLRA- 136

TABULAR SERIES DATA:

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SOI-5  Soil Name    Slope  Airtemp FrFr/Seas Precip  Elevation
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GA0111 RAWLINGS 6- 45 59- 62 184-241 39- 49 500-800

SOI-5	FloodL	FloodH	Watertable	Kind	Months	Bedrock	Hardness
GA0111	NONE		6.0-6.0		-	20-40	HARD

SOI-5	Depth	Texture	3-Inch	No-10	Clay%	-CEC-
GA0111	0-10	SL	0- 5	80-100	5-20	3- 6
GA0111	0-10	ST-SL	5- 15	55- 85	5-20	2- 5
GA0111	10-15	COSL SL SCL	0- 5	80-100	10-30	3- 9
GA0111	15-33	SCL CL L	0- 15	60-100	18-35	3- 12
GA0111	33-43	UWB	-	-	-	-

SOI-5	Depth	-pH-	O.M.	Salin	Permeab	Shnk-Swll
GA0111	0-10	4.5- 7.3	.5-2.	0- 0	2.0- 6.0	LOW
GA0111	0-10	4.5- 7.3	.5-2.	0- 0	2.0- 6.0	LOW
GA0111	10-15	4.5- 6.5	0.-.5	0- 0	0.6- 2.0	LOW
GA0111	15-33	4.5- 6.0	0.-.5	0- 0	0.6- 6.0	LOW
GA0111	33-43	-	-	-	-	

National Cooperative Soil Survey
U.S.A.

LOCATION WEDOWEE AL+GA NC SC VA
Established Series
Rev. WBP:PGM
07/1999

WEDOWEE SERIES

The Wedowee series consists of very deep, well drained, moderately permeable soils that formed in residuum from weathered crystalline rock of the Piedmont Plateau. These soils are on narrow ridges and on side slopes of uplands. Slope is dominantly less than 25 percent but ranges from 0 to 60 percent. Near the type location, the average annual temperature is about 63 degrees F. and average annual precipitation is about 53 inches.

TAXONOMIC CLASS: Fine, kaolinitic, thermic Typic Kanhapludults

TYPICAL PEDON: Wedowee sandy loam, on a convex 12 percent slope, in forest. (Colors are for moist soil.)

A--0 to 4 inches; dark grayish brown (10YR 4/2) sandy loam; weak fine granular structure; very friable; strongly acid; clear smooth boundary. (1 to 5 inches thick)

E--4 to 10 inches; yellow (10YR 7/6) loam; weak fine granular structure; very friable; strongly acid; gradual smooth boundary. (0 to 6 inches thick)

BE--10 to 14 inches; brownish yellow (10YR 6/6) loam; weak fine subangular blocky structure; friable; strongly acid; clear smooth boundary. (0 to 6 inches thick)

Bt--14 to 24 inches; strong brown (7.5YR 5/6) sandy clay; moderate medium subangular blocky structure; friable; common distinct clay films on faces of peds; strongly acid; gradual smooth boundary. (8 to 24 inches thick)

BC--24 to 32 inches; strong brown (7.5YR 5/6) sandy clay loam; common medium distinct very pale brown (10YR 7/4) and yellowish red (5YR 5/8) mottles; weak medium subangular blocky structure; friable; few faint clay films on faces of peds; strongly acid; gradual smooth boundary. (6 to 12 inches thick)

C--32 to 60 inches; mottled strong brown (7.5YR 5/6), very pale brown (10YR 7/4), and yellowish red (5YR 5/8) saprolite of sandy clay loam texture; rock structure; friable; strongly acid.

TYPE LOCATION: Randolph County, Alabama. One mile north of Rock Mills on north side of State Highway 22.

RANGE IN CHARACTERISTICS: Depth to hard rock is more than 60 inches. Reaction ranges from extremely acid to strongly acid throughout except where lime has been added. Flakes of mica range from none to few in the A horizon and the upper part of

the B horizon and from none to common in the lower part of the B horizon and the C horizon.

The A horizon has hue of 7.5YR to 2.5Y, value of 3 to 6 and chroma of 2 to 8. It is coarse loamy sand, coarse sandy loam, sandy loam, fine sandy loam, loam; or their gravelly analogues. In eroded areas, the A horizon is sandy clay loam or clay loam ,or their gravelly analogues. Content of coarse fragments, dominantly gravel size, range from 0 to 35 percent by volume.

The E horizon, present in most pedons, has hue of 7.5YR to 2.5Y, value of 4 to 7, and chroma of 3 to 8. Texture and coarse fragment content are the same as the A horizon.

The BE horizon, present in most pedons, has hue of 5YR to 10YR, value of 4 to 7 and chroma of 3 to 8. It is loam, fine sandy loam, sandy loam, sandy clay loam or clay loam.

The Bt horizon typically has hue of 7.5YR or 10YR, value of 4 to 6 and chroma of 6 to 8, but includes hue of 5YR with the same range in value and chroma. Mottles in shades of brown, yellow, and red are in the lower part of the Bt horizon in most pedons and in the upper part of the Bt horizon in some pedons. Texture of the Bt horizon is sandy clay loam, clay loam, sandy clay or clay. Clay content of the particle-size control section averages 35 to 45 percent.

The BC horizon has hue of 2.5YR to 10YR, value of 5 to 7 and chroma of 4 to 8. Mottles in shades of red, brown, and yellow range from none to common. It is sandy clay loam, clay loam, loam or fine sandy loam.

The C horizon is multicolored, highly weathered gneiss, granite, or schist saprolite with a crushed texture of sandy clay loam, clay loam, loam, fine sandy loam, sandy loam, or sandy clay.

COMPETING SERIES: These include the Appling, Bethlehem, Cecil, Madison, Nankin, Pacolet, and Tumbleton series in the same family. Appling and Cecil soils have thicker Bt horizons. Additionally, Cecil soils have dominant hue of 5YR or redder throughout the Bt horizon. Bethlehem soils have a paralithic contact within 20 to 40 inches of the surface. Madison soils have hue of 5YR or redder dominant in the Bt horizon and have many flakes of mica in the lower part of the solum. Nankin and Tumbleton soils developed in unconsolidated clayey and loamy sediments and have a solum thickness of more than 40 inches. Pacolet soils have Bt horizons with hue of 2.5YR or redder.

GEOGRAPHIC SETTING: Wedowee soils are on sloping to steep uplands of the Southern Piedmont MLRA. Slopes are mainly 5 to 25 percent, but range from 0 to 60 percent. The soils have formed in residuum from weathered acid crystalline rocks. The climate is warm and humid. Average annual precipitation ranges from 42 to 56 inches and average annual temperature ranges from 58 to 65 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: In addition to the competing Appling, Cecil, Madison, and Pacolet series, these are the Durham, Louisburg, and Worsham

series. Durham soils are fine-loamy. Louisburg soils do not have a continuous Bt horizon and are coarse-loamy. Worsham soils are poorly drained.

DRAINAGE AND PERMEABILITY: Well drained. Runoff is medium to rapid and internal drainage is medium. Permeability is moderate.

USE AND VEGETATION: Most areas are wooded. Common trees include loblolly pine, Virginia pine, red oak, white oak, post oak, hickory, blackgum, maple, and dogwood. Principal crops grown are cotton, corn, tobacco, small grain, hay, peaches, pecans, and pasture.

DISTRIBUTION AND EXTENT: The Piedmont of Alabama, Georgia, North Carolina, South Carolina and Virginia. The series is of moderate extent.

MLRA OFFICE RESPONSIBLE: Raleigh, North Carolina

SERIES ESTABLISHED: Randolph County, Alabama; 1969.

REMARKS: Wedowee soils were formerly mapped as thin solum phases of the Appling series. The 5/90 revision changed the classification to Typic Kanhapludults in recognition of the low activity clay content of the argillic horizon.

Revised: RLV 11/24/97

Diagnostic horizons and features recognized in this pedon are:

Ochric epipedon - the zone from the surface of the soil to a depth of 14 inches (A, E, and BE horizons)
Argillic and kandic horizon - the zone from approximately 14 to 24 inches (Bt horizon)

TABULAR SERIES DATA:

SOI-5	Soil Name	Slope	Airtemp	FrFr/Seas	Precip	Elevation
AL0046	WEDOWEE	0- 60	58- 65	175-225	42- 56	300-1200
AL0138	WEDOWEE	0- 60	58- 65	175-225	42- 56	300-1200
AL0146	WEDOWEE	0- 60	58- 65	175-225	42- 56	300-1200

SOI-5	FloodL	FloodH	Watertable Kind	Months	Bedrock Hardness
AL0046	NONE		6.0-6.0	-	60-60
AL0138	NONE		6.0-6.0	-	60-60
AL0146	NONE		6.0-6.0	-	60-60

SOI-5	Depth	Texture	3-Inch	No-10	Clay%	-CEC-
AL0046	0-10	SL FSL L	0- 0	80-100	5-20	2- 8
AL0046	0-10	SCL CL	0- 0	90-100	20-30	2- 8
AL0046	10-14	L SCL	0- 0	90-100	14-30	3- 10
AL0046	14-32	SC CL C	0- 0	95-100	35-45	3- 10
AL0046	32-60	SCL CL SL	0- 0	70-100	15-30	3- 8
AL0138	0-10	BY-SL BY-L	10- 20	70- 90	5-20	2- 8
AL0138	10-14	L SCL	0- 5	90-100	14-30	3- 10
AL0138	14-32	SC CL C	0- 0	95-100	35-45	3- 10
AL0138	32-60	SCL CL SL	0- 0	70-100	15-30	3- 8
AL0146	0-10	GR-SL GR-FSL GR-L	0- 5	50- 80	6-20	2- 8
AL0146	0-10	GR-SCL GR-CL	0- 5	50- 80	20-30	2- 8
AL0146	10-14	L SCL	0- 0	90-100	14-30	3- 10

AL0146	14-32	SC CL C				0- 0	95-100	35-45	3- 10	
AL0146	32-60	SCL CL SL				0- 0	70-100	15-30	3- 8	

SOI-5	Depth	-pH-	O.M.	Salin	Permeab	Shnk-Swll
AL0046	0-10	3.6- 5.5	.5-3.	0- 0	2.0- 6.0	LOW
AL0046	0-10	3.6- 5.5	.5-3.	0- 0	0.6- 2.0	LOW
AL0046	10-14	3.6- 5.5	0.-.5	0- 0	0.6- 2.0	LOW
AL0046	14-32	3.6- 5.5	0.-.5	0- 0	0.6- 2.0	LOW
AL0046	32-60	3.6- 5.5	0.-.5	0- 0	0.6- 2.0	LOW
AL0138	0-10	3.6- 5.5	0.-1.	0- 0	2.0- 6.0	LOW
AL0138	10-14	3.6- 5.5	0.-.5	0- 0	0.6- 2.0	LOW
AL0138	14-32	3.6- 5.5	0.-.5	0- 0	0.6- 2.0	LOW
AL0138	32-60	3.6- 5.5	0.-.5	0- 0	0.6- 2.0	LOW
AL0146	0-10	3.6- 5.5	.5-3.	0- 0	2.0- 6.0	LOW
AL0146	0-10	3.6- 5.5	.5-3.	0- 0	0.6- 2.0	LOW
AL0146	10-14	3.6- 5.5	0.-.5	0- 0	0.6- 2.0	LOW
AL0146	14-32	3.6- 5.5	0.-.5	0- 0	0.6- 2.0	LOW
AL0146	32-60	3.6- 5.5	0.-.5	0- 0	0.6- 2.0	LOW

National Cooperative Soil Survey
U.S.A.

LOCATION SAW NC+GA
Established Series
Rev. AG:CMM
07/1999

SAW SERIES

The Saw Series consists of moderately deep, well drained soils on ridges and side slopes of the Piedmont uplands. They formed in residuum weathered from felsic igneous rocks such as porphyritic granite and granite. Slopes range from 2 to 45 percent. Near the type location, mean annual air temperature is 61 degrees F., and mean annual precipitation is 47 inches.

TAXONOMIC CLASS: Fine, kaolinitic, thermic Typic Kanhapludults

TYPICAL PEDON: Saw sandy loam on a 4 percent slope at an elevation of 890 feet--cultivated. (Colors are for moist soil.)

Ap--0 to 8 inches; reddish brown (7.5YR 4/4) sandy loam; weak medium granular structure; friable; common fine roots; 1 percent by volume porphyritic granite gravel and feldspar crystals 1/16 to 1/4 inch in diameter; moderately acid; clear smooth boundary. (5 to 10 inches thick)

Bt--8 to 20 inches; red (2.5YR 4/8) clay; few fine prominent brownish yellow (10YR 6/6) mottles; moderate fine subangular blocky structure; firm; sticky, plastic; few fine roots; common distinct clay films on faces of peds; 3 percent by volume porphyritic granite gravel and feldspar crystals 1/16 to 1/4 inch in diameter; common fine flakes of mica; moderately acid; gradual wavy boundary. (12 to 20 inches thick)

BC1--20 to 23 inches; red (2.5YR 4/6) sandy clay loam; weak fine subangular blocky structure; firm; slightly sticky, slightly plastic; 5 percent by volume porphyritic granite gravel and feldspar crystals 1/16 to 1/4 inch in diameter; common fine flakes of mica; moderately acid; gradual wavy boundary.

BC2--23 to 26 inches; red (2.5YR 4/6) sandy loam; weak medium subangular blocky structure; friable; 5 percent by volume porphyritic granite gravel and feldspar crystals 1/16 to 1/2 inch in diameter; many fine flakes of mica; moderately acid; gradual wavy boundary. (Combined thickness of the BC horizons is 0 to 10 inches.)

C--26 to 29 inches; multicolored gravelly sandy loam; saprolite weathered from porphyritic granite; massive; very friable; 20 percent by volume porphyritic granite gravel and feldspar crystals 1/16 to 1/2 inch in diameter; many fine flakes of mica; moderately acid. abrupt irregular boundary. (0 to 6 inches thick)

R--29 inches; hard porphyritic granite.

TYPE LOCATION: Rowan County, North Carolina; 4.3 miles west of China Grove on NC 152 highway; 550 feet north on private road; 600 feet west along field irrigation road; 35 feet south of road in field.

RANGE IN CHARACTERISTICS: Solum thickness ranges from 19 to 33 inches. Depth to hard bedrock is 20 to 40 inches. Reaction is very strongly acid to moderately acid unless limed. Limed soils are typically moderately acid to neutral in the A and E horizons, and very strongly acid to slightly acid in the BA, BE, and Bt horizons. Rock fragments, dominantly of gravel size, range from 0 to 35 percent by volume in the A, Ap, or C horizons, and from 0 to 15 percent by volume in the E, BE, BA, Bt, and BC horizons. Content of feldspar crystals ranges from none to common in the upper part and from none to many in the lower part. Content of mica flakes ranges from few to common in the A, Ap, E, BE, BA, and Bt horizons and from few to many in the BC and C horizons.

The A or Ap horizon has hue of 5YR to 10YR, value of 4 to 6, and chroma of 2 to 6. In areas not significantly affected by erosion, it is sandy loam in the fine-earth fraction. In eroded areas, texture is sandy clay loam or clay loam in the fine-earth fraction.

Some pedons have an E horizon that has hue of 5YR to 10YR, value of 4 to 6, and chroma of 3 to 8. It is sandy loam.

Some pedons have a BE or BA horizon that has hue of 2.5YR to 10YR, value of 4 to 6, and chroma of 4 to 8. It is sandy clay loam or clay loam.

The Bt horizon has hue of 2.5YR to 7.5YR, value of 4 to 6, and chroma of 6 or 8. In some pedons, part of the Bt horizon has hue of 10YR, value of 5 or 6, and chroma of 6 or 8. The Bt horizon is clay, sandy clay, or clay loam.

Some pedons have a BC horizon that has hue of 2.5YR to 10YR, value of 4 to 6, and chroma of 6 or 8. It is sandy clay loam, clay loam, or sandy loam.

Some pedons have a C horizon that is similar in color to the BC horizon, or is multicolored. It is sandy loam in the fine-earth fraction.

The R horizon is hard felsic igneous bedrock such as porphyritic granite or granite. Some pedons have a thin Cr horizon of soft weathered felsic igneous rock which overlies the R horizon.

COMPETING SERIES: These are the Appling, Bethlehem, Cecil, Madison, Nankin, Pacolet, Tumbleton and Wedowee series in the same family. None of these soils except Bethlehem have bedrock within depths of 20 to 40 inches. In addition they typically have thicker Bt horizons. Bethlehem soils have soft weathered bedrock instead of hard bedrock at depths of 20 to 40 inches, and formed from sillimanite schist and phyllite schist. Tumbleton soils formed in coastal plain sediments.

GEOGRAPHIC SETTING: Saw soils are on gently sloping to steep ridges and side slopes in the Piedmont uplands. Slope ranges from 2 to 45 percent, and is commonly 2 to 15 percent. These soils formed in residuum weathered from felsic igneous rocks such as porphyritic granite or granite. Mean annual air temperature ranges from 59 to 62 degrees F., and mean annual precipitation ranges from 39 to 49 inches.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the competing Appling, Cecil, Madison, and Pacolet soils, and the Ashlar, Helena, Rion, Vance, Wake, and Wedowee soils. Except for Ashlar soils, none of these soils have bedrock within depths of 20 to 40 inches, and except for Wake soils, they typically have thicker Bt horizons. Ashlar soils have a cambic horizon and are in a coarse-loamy family. Helena soils are moderately well drained, Rion soils are in a fine-loamy family, and Vance soils are in a mixed mineralogy family. Wake soils have hard bedrock within depths of 8 to 20 inches. All of these soils except Helena are on ridges and side slopes. Helena soils are on toe slopes and around the heads of drainageways.

DRAINAGE AND PERMEABILITY: Well drained; medium to very rapid runoff; moderate permeability.

USE AND VEGETATION: More than half of the acreage is cultivated, with the remainder in pasture or woodland. The main crops are corn, soybeans, small grain, and hay. Common trees in forested areas are loblolly pine, shortleaf pine, Virginia pine, white oak, northern red oak, southern red oak, post oak, scarlet oak, sweetgum, and hickory. Common understory plants include flowering dogwood, American holly, muscadine grape, sourwood, honeysuckle, greenbrier, and poison ivy.

DISTRIBUTION AND EXTENT: Piedmont area of North Carolina and Georgia. The series is of small extent.

MLRA OFFICE RESPONSIBLE: Raleigh, North Carolina

SERIES ESTABLISHED: Rowan County, North Carolina; 1996

REMARKS: The Saw series was formerly included with the Pacolet and Lockhart series. However, Pacolet soils do not have bedrock within depths of 20 to 40 inches, and Lockhart soils are in a loamy-skeletal family.

Diagnostic horizons and features recognized in this pedon are:

Ochric epipedon - the zone from the surface to 8 inches (Ap horizon)

Argillic horizon - the zone between depths of 8 and 20 inches (Bt horizon)

Kandic horizon - the zone between depths of 8 and 20 inches (Bt horizon)

Lithic contact - the occurrence of hard bedrock at a depth of 29 inches (R horizon)

MLRA: 136

TABULAR SERIES DATA:

SOI-5	Soil Name	Slope	Airtemp	FrFr/Seas	Precip	Elevation
NC0240	SAW	2- 45	59- 62	184-241	39- 49	700-1000

SOI-5	FloodL	FloodH	Watertable	Kind	Months	Bedrock	Hardness
NC0240	NONE		6.0-6.0		-	20-40	HARD

SOI-5	Depth	Texture	3-Inch	No-10	Clay%	-CEC-
NC0240	0- 8	SL	0- 5	80-100	5-20	3- 6
NC0240	0- 8	SCL CL	0- 5	85-100	20-40	3- 7
NC0240	0- 8	GR-SL	5- 15	55- 85	5-20	2- 5
NC0240	8-20	C SC CL	0- 5	80-100	35-60	3- 9
NC0240	20-29	SCL SL GR-SL	0- 15	55-100	5-30	2- 6
NC0240	29-39	UWB	-	-	-	-

SOI-5	Depth	-pH-	O.M.	Salin	Permeab	Shnk-Swll
NC0240	0- 8	4.5- 7.3	.5-2.	0- 0	2.0- 6.0	LOW
NC0240	0- 8	4.5- 7.3	.5-1.	0- 0	0.6- 2.0	LOW
NC0240	0- 8	4.5- 7.3	.5-2.	0- 0	2.0- 6.0	LOW
NC0240	8-20	4.5- 6.5	0.-.5	0- 0	0.6- 2.0	LOW
NC0240	20-29	4.5- 6.0	0.-.5	0- 0	0.6- 6.0	LOW
NC0240	29-39	-	-	-	-	

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