Engineers and Soil Scientists

Agri-Waste Technology, Inc.
501 N Salem Street, Suite 203, Apex, NC 27502
agriwaste.com | 919.859.0669

Soil Suitability for Domestic Sewage Treatment and Disposal Systems

Craig Road,
Durham, NC
Durham County

Prepared For:	Ms. Grace Holton & Ms. Meg Holton, Holton Farm, LLC
XCOPY:	Ms. Amy Sears, Berkshire Hathaway Home Services YSU
Prepared By:	Jeff Vaughan, Ph.D., L.S.S. Senior Agronomist/Soil Scientist
	Julie Davidson Senior GIS Analyst
Report Date:	June 28, 2023

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PREPARED BY: Jeff Vaughan
William Snoeyink

DATE: June 28, 2023

Soil suitability for domestic sewage treatment and disposal systems was evaluated on June 26, 2023, for property located on Craig Road near Durham, NC. Jeff Vaughan, Trent Bostic, Heath Clapp, Brent Purdum, and Jordan Harris of Agri-Waste Technology, Inc. (AWT) conducted the soil evaluation. The detailed soil evaluation of the land area will follow. A property reference map is in Attachment 1. A review of the soil and landscape characteristics that dictate soil suitability for domestic sewage treatment and disposal systems can be found in Attachment 2.

The total property area is approximately 68.75 acres. The property is completely wooded. There are several drainage features with moderate slopes on the property (Attachment 3). There are 2 power line easements crossing the property.

Soil Suitability for Domestic Sewage Treatment and Disposal Systems

The aerial map in Attachment 3 details the approximate property boundaries, soil boring locations, soil types, and soil areas for septic systems. Soil borings were flagged in the field with blue or red ribbon (provisionally suitable). Approximately 56 soil borings were advanced within the provisionally suitable soils area on the property (Attachment 3). A portion of the property contained drainage features, complex topography, and/or unsuitable soils and, thus, are unsuitable for septic systems. However, this evaluation was merely a preliminary review to determine what potential this land might have for domestic sewage treatment and disposal systems. Therefore, specific types of septic systems, exact locations of future drainfields and repair areas, plus buffers from property lines (current and potential future lot lines), building foundations, wells, etc. are not fully

considered. These things will need to be more fully considered as the plans develop for the potential future of this site. It is possible that additional soil evaluations will be required once lot layouts are considered and developed for this property so that septic system types and the location of a septic drainfield can be more fully and appropriately considered.

Six areas (see map in Attachment 3) exhibited soil characteristics and soil depths (24" or greater) that are provisionally suitable for conventional or shallow conventional trench septic systems. These areas are shown on the maps in Attachment 3.

Typical profile descriptions of the provisionally suitable soil for this property are in Attachment 4. Three distinct soil profiles were observed in the soil borings on the property: a deep red clay subsoil, a shallower red clay subsoil, and shallower reddish-yellow clay subsoil.

The provisionally suitable soil borings had the following characteristics. No restrictive horizons were found in any provisionally soil borings within 36" of the soil surface. Soil texture was provisionally suitable and was estimated to be silt loam near the soil surface (A and E horizons) and clay in the subsoil (B horizons). Soil structure was provisionally suitable and was estimated to be granular near the soil surface (A and E horizons) and subangular blocky in the subsoil (B horizons). Clay mineralogy was provisionally suitable with very friable to firm moist soil consistence and non-sticky to sticky and non-plastic to plastic wet soil consistence. Indications of saprolite were detected in some soil borings, but were not dominant in profiles.

The major soil types on this property are Georgeville silt loam (map symbols GeB, GeC, and GeD), Tatum gravelly silt loam (map symbol TaE), Goldston very channery silt loam (map symbol GlE), and Chewacla and Wehadkee soils (map symbol Ch). The Durham County Soil Survey indicates that moderate to severe limitations exist for septic systems installed in these soils types (Attachment 5).

The land area required for a conventional or shallow conventional septic system is calculated based on the size of the proposed home and the Long-Term Acceptance Rate (LTAR) of the soil. The LTAR range for the provisionally suitable soils on this property is 0.1 – 0.4 GPD/ft^2 based on the most restrictive soil texture in the subsoil. Table 1 below presents estimated conventional or shallow conventional septic system land area requirements for several home sizes and LTAR's on this property. The LTAR suggested by AWT for a majority of the provisionally suitable soil is 0.25 GPD/ft^2, but the final LTAR for specific septic system types and septic drainfield locations will be set by the Durham County Health Department. The detailed computations are in Attachment 6.

Table 1. Estimated Conventional Septic System Land Requirements (including repair area) for Several Home Sizes and Long-Term Acceptance Rates (LTAR) on this Property.

House Size	Long-Term Acceptance Rate (LTAR)	Area Required for Conventional Septic System	Minimum Area Required for Innovative Conventional Septic System
	-----GPD/ft^2-----	-----ft^2-----	-----ft^2-----
3 bedrooms	0.1 – 0.4	6,750 – 32,400	8,100 – 24,300
3 bedrooms	0.25	~10,800	~7,020
4 bedrooms	0.1 – 0.4	9,000 – 43,200	6,750 – 32,400
4 bedrooms	0.25	~14,400	~10,800
5 bedrooms	0.1 – 0.4	11,250 – 54,000	8,438 – 40,500
5 bedrooms	0.25	~18,000	~13,500

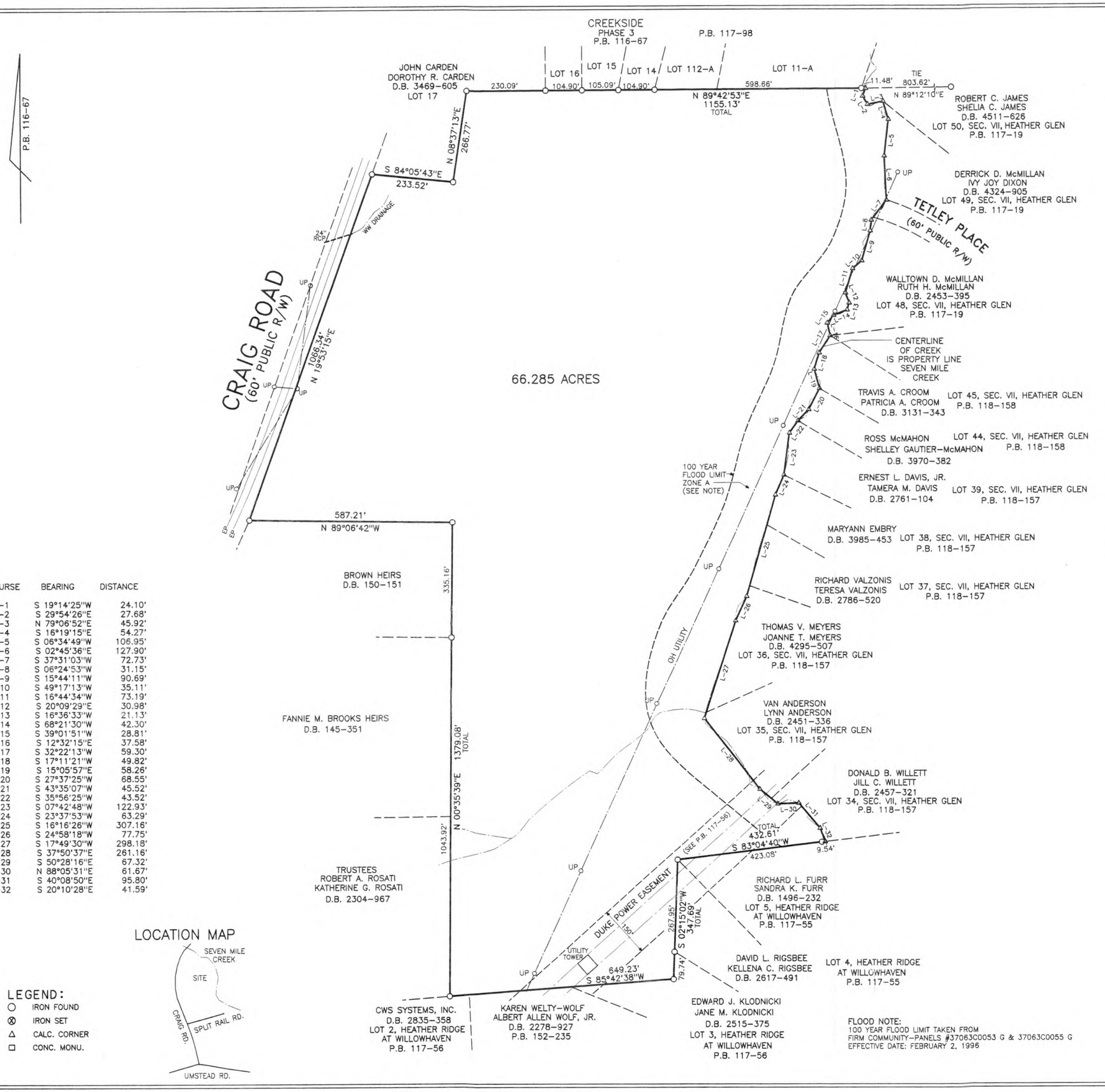
Conclusions

Based on the results of this evaluation, the installation of conventional or shallow conventional septic systems seems very probable on this property in the areas designated on the map in Attachment 3.

We appreciate the opportunity to assist you in this matter. Please contact us with any questions, concerns, or comments.

holtonfarm

ATTACHMENT 1: Property Reference Map



COURSE	BEARING	DISTANCE
L-1	S 19°14'25"W	24.10'
L-2	S 29°54'26"E	27.68'
L-3	N 79°06'52"E	45.92'
L-4	S 16°19'15"E	54.27'
L-5	S 06°34'49"W	106.95'
L-6	S 02°45'36"E	127.90'
L-7	S 37°31'03"W	72.73'
L-8	S 06°24'53"W	31.15'
L-9	S 15°44'11"W	90.69'
L-10	S 49°17'13"W	35.11'
L-11	S 16°44'34"W	73.19'
L-12	S 20°09'29"E	30.98'
L-13	S 16°36'33"W	21.13'
L-14	S 68°21'30"W	42.30'
L-15	S 39°01'51"W	28.81'
L-16	S 12°32'15"E	37.58'
L-17	S 32°22'13"W	59.30'
L-18	S 17°11'21"W	49.82'
L-19	S 15°05'57"E	58.26'
L-20	S 27°37'25"W	68.55'
L-21	S 43°35'07"W	45.52'
L-22	S 35°56'25"W	43.52'
L-23	S 07°42'48"W	122.93'
L-24	S 23°37'53"W	63.29'
L-25	S 16°16'26"W	307.16'
L-26	S 24°58'18"W	77.75'
L-27	S 17°49'30"W	298.18'
L-28	S 37°50'37"E	261.16'
L-29	S 50°28'16"E	67.32'
L-30	N 88°05'31"E	61.67'
L-31	S 40°08'50"E	95.80'
L-32	S 20°10'28"E	41.59'

LOCATION MAP

LEGEND:
- ○ IRON FOUND
- ⊗ IRON SET
- △ CALC. CORNER
- □ CONC. MONU.

FLOOD NOTE:
100 YEAR FLOOD LIMIT TAKEN FROM
FIRM COMMUNITY-PANELS #37063C0053 G & 37063C0055 G
EFFECTIVE DATE: FEBRUARY 2, 1996

I, CHARLES R. BILLINGS, HEREBY CERTIFY THAT UNDER MY DIRECTION AND SUPERVISION THIS MAP WAS DRAWN FROM AN ACTUAL SURVEY MADE UNDER MY SUPERVISION (REFERENCES AS NOTED HEREON); THAT THE ERROR OF CLOSURE CALCULATED BY LATITUDES AND DEPARTURES IS 1:10,000+; THAT THE BOUNDARIES NOT SURVEYED ARE SHOWN AS BROKEN LINES PLOTTED FROM INFORMATION AS NOTED; AND THAT THIS MAP WAS PREPARED IN ACCORDANCE WITH G.S. 47-30 AS AMENDED.

I FURTHER CERTIFY:

A. THAT THE SURVEY CREATES A SUBDIVISION OF LAND WITHIN THE AREA OF A COUNTY OR MUNICIPALITY THAT HAS AN ORDINANCE THAT REGULATES PARCELS OF LAND;
B. THAT THE SURVEY IS LOCATED IN A PORTION OF A COUNTY OR MUNICIPALITY THAT IS UNREGULATED AS TO AN ORDINANCE THAT REGULATES PARCELS OF LAND;
✓ C. ANY ONE OF THE FOLLOWING:
   1. THAT THE SURVEY IS OF AN EXISTING PARCEL OR PARCELS OF LAND AND DOES NOT CREATE A NEW STREET OR CHANGE IN AN EXISTING STREET;
   2. THAT THE SURVEY IS OF AN EXISTING BUILDING OR OTHER STRUCTURE, OR NATURAL FEATURE, SUCH AS A WATERCOURSE; OR
   3. THAT THE SURVEY IS A CONTROL SURVEY.
D. THAT THE SURVEY IS OF ANOTHER CATEGORY, SUCH AS THE RECOMBINATION OF EXISTING PARCELS, A COURT-ORDERED SURVEY, OR OTHER EXCEPTION TO THE DEFINITION OF SUBDIVISION;
E. THAT THE INFORMATION AVAILIBLE TO THE SURVEYOR IS SUCH THAT THE SURVEYOR IS UNABLE TO MAKE A DETERMINATION TO THE BEST OF THE SURVEYOR'S PROFESSIONAL ABILITY AS TO PROVISIONS CONTAINED IN (A) THROUGH (D) ABOVE.

WITNESS MY HAND AND SEAL, MARCH 21, 2005.

CHARLES R. BILLINGS PROFESSIONAL LAND SURVEYOR L-2711

NORTH CAROLINA
SEAL L-2711
LAND SURVEYOR
CHARLES R. BILLINGS

I _____, REVIEW OFFICE OF DURHAM COUNTY, CERTIFY THAT THE MAP OR PLAT TO WHICH THIS CERTIFICATION IS AFFIXED MEETS ALL STATUTORY REQUIREMENTS FOR RECORDING.

REVIEW OFFICER DATE

PROPERTY OF

HOLTON FARM, LLC

PIN REFERENCE: 0805-04-72-9227
PARCEL ID: 184655
TAX MAP REFERENCE: 837-01-012
DEED BOOK REFERENCE: 2765-726
PLAT BOOK REFERENCE: 5-7

OWNER ADDRESS: 337 CAROLINA MEADOWS VILLA
CHAPEL HILL, N.C. 27517

LEBANON TOWNSHIP
DURHAM COUNTY
NORTH CAROLINA

SCALE: 1" = 200' MARCH 21, 2005

FREEHOLD LAND SURVEYS, INC.

113 W. MAIN STREET
P.O. BOX 188, CARRBORO, NC 27510
PHONE 919-929-8090
FAX 919-942-0698

CHARLES R. BILLINGS PROFESSIONAL LAND SURVEYOR L-2711
CONNIE B. FERGUS PROFESSIONAL LAND SURVEYOR L-3559

20941

200m

1 Results

600ft

ATTACHMENT 2: Review of Rules Pertaining to Domestic Sewage Treatment and Disposal Systems

Five categories of soil and landscape characteristics are evaluated to determine soil suitability for domestic sewage treatment and disposal systems and include: topography and landscape position, soil morphological characteristics, soil wetness conditions, soil depth, and restrictive horizons. The soil and landscape characteristics found in a particular location dictate the type(s) of domestic sewage treatment and disposal system that can be used on a parcel of land. The detailed rules can be found in Section .1900 – Sewage Treatment and Disposal Systems, but a general review of the five categories and other relevant rules can be found in the sections below.

.1940 TOPOGRAPHY AND LANDSCAPE POSITION

Uniform slopes less than 15 percent are considered suitable, uniform slopes between 15 and 30 percent are considered provisionally suitable, and slopes greater than 30 percent are considered unsuitable for domestic sewage treatment and disposal systems. Complex slope patterns and slopes dissected by gullies and ravines are considered unsuitable for domestic sewage treatment and disposal systems. Depressions and wetlands are also considered unsuitable for domestic sewage treatment and disposal systems.

.1941 SOIL MORPHOLOGICAL CHARACTERISTICS

Sandy and coarse loamy textured soils (sand, loamy sand, sandy loam, and loam) are considered suitable for domestic sewage treatment and disposal systems. Fine loamy and clayey textured soils (silt, silt loam, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, and clay) are considered provisionally suitable for domestic sewage treatment and disposal systems.

Crumb, granular, and single-grained soil structures are considered suitable for domestic sewage treatment and disposal systems. Blocky soil structures are considered provisionally suitable for domestic sewage treatment and disposal systems. Platy, prismatic, and massive soil structures are considered unsuitable for domestic sewage treatment and disposal systems.

Slightly expansive clay mineralogy is considered suitable for domestic sewage treatment and disposal systems. Slightly expansive clay minerals exhibit loose, very friable, friable, or firm moist soil consistence. Expansive clay mineralogy is considered unsuitable for domestic sewage treatment and disposal systems. Expansive clay minerals exhibit very firm or extremely firm moist soil consistence. Organic soils are considered unsuitable for domestic sewage treatment and disposal systems.

.1942 SOIL WETNESS CONDITIONS

Soil wetness conditions are caused by seasonal high water table, perched water table, tidal water, seasonally saturated soils, or lateral water movement. Soil wetness conditions are indicated by soil colors, either in mottles or mass, with a chroma of 2 or less according to the Munsell color charts. Soil wetness conditions detected 48 inches in depth or deeper are considered suitable for domestic sewage treatment and disposal systems. Soil wetness conditions detected between 36 to 48 inches in depth are considered provisionally suitable for domestic sewage treatment and disposal systems. Soil wetness conditions detected 36 inches in depth or shallower are considered unsuitable for domestic sewage treatment and disposal systems.

.1943 SOIL DEPTH
Soil depths to rock, parent material, or saprolite greater than 48 inches are considered suitable for domestic sewage treatment and disposal systems. Soil depths to rock, parent material, or saprolite between 36 and 48 inches are considered provisionally suitable for domestic sewage treatment and disposal systems. Soil depths to rock, parent material, or saprolite less than 36 inches are considered unsuitable for domestic sewage treatment and disposal systems. Saprolite has a massive, rock-controlled structure, and retains the mineral arrangement of its parent rock in at least 50 percent of its volume. Saprolite only forms from metamorphic and igneous rock parent materials and is typically referred to as "rotten rock".

.1944 RESTRICTIVE HORIZONS
Restrictive horizons are capable of perching ground water or sewage effluent and are strongly compacted or cemented. Restrictive horizons resist soil excavation or augering. Soils with restrictive horizons three inches or more in thickness at depths greater than 48 inches are considered suitable for domestic sewage treatment and disposal systems. Soils with restrictive horizons three inches or more in thickness at depths between 36 and 48 inches are considered provisionally suitable for domestic sewage treatment and disposal systems. Soils with restrictive horizons three inches or more in thickness at depths less than 36 inches are considered unsuitable for domestic sewage treatment and disposal systems.

.1950 LOCATION OF SANITARY SEWAGE SYSTEMS
WAKE COUNTY DEPARTMENT OF ENVIRONMENTAL SERVICES NOTICE
No area for domestic sewage treatment and disposal system installation (or repair in Wake County) may be disturbed by clearing, excavation, filling, vehicle or equipment traffic, or storage of building materials.

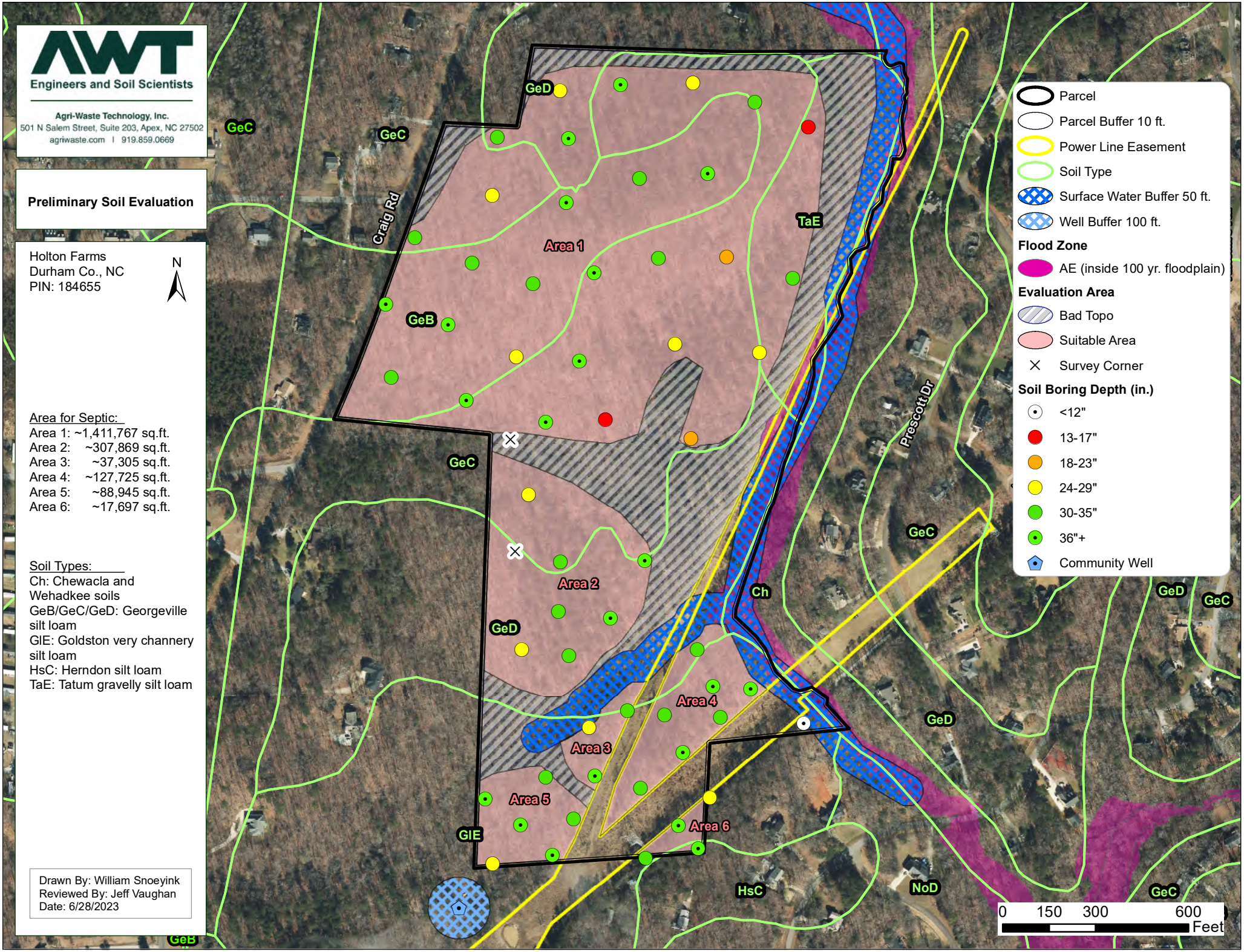
.1947 DETERMINATION OF OVERALL SITE SUITABILITY
.1948 SITE CLASSIFICATION
All of the criteria for the five categories above are to be determined and classified as suitable, provisionally suitable, or suitable according to the respective rules described above. If all criteria are classified the same, that overall site classification will prevail. If there is a variation in the classification of several criteria, the most limiting classification will be used to determine the overall site classification.

A suitable classification generally indicates soil and landscape conditions favorable for the operation of a domestic sewage treatment and disposal system or slight limitations that can be readily overcome by proper design and installation. A provisionally suitable classification indicates soil and/or landscape conditions have moderate limitations for the operation of a domestic sewage treatment and disposal system, but modifications and careful planning, design, and installation can result in satisfactory system function. An unsuitable classification indicates severe soil and/or landscape limitations for the operation of a domestic sewage treatment and disposal system.

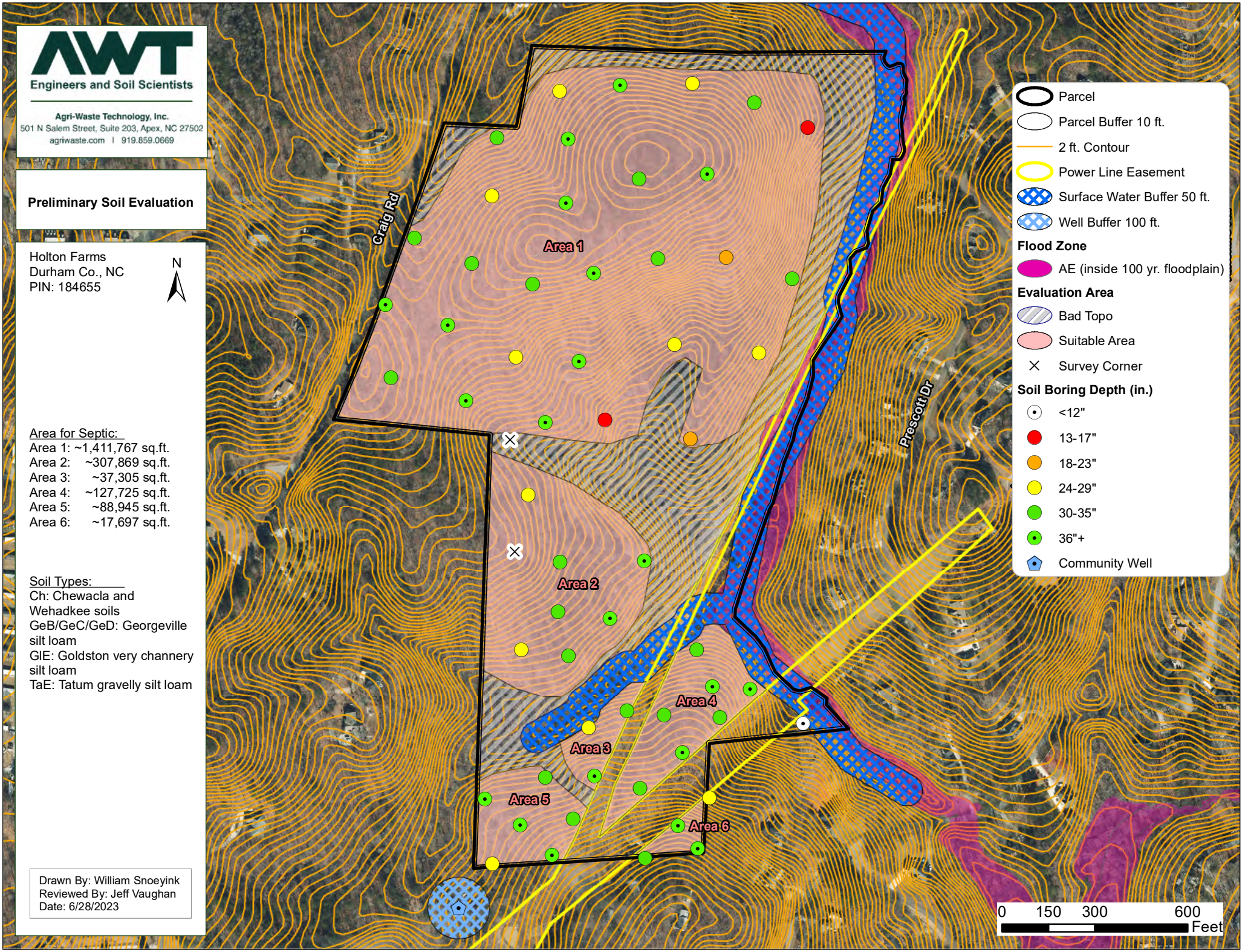
SUMMARY
Suitable/provisionally suitable landscapes and soils to a depth of 36 inches can, in general, be used for conventional gravity driven septic systems. Suitable/provisionally suitable landscapes

and soils to a depth of 24 –36 inches can, in general, be used for alternative septic systems such as shallow conventional and low pressure pipe systems, among others. All alternative systems for provisionally suitable landscapes and soils must be proposed to and approved by the Durham County Health Department. Any landscapes or soils classified as unsuitable may be reclassified as provisionally suitable by the Durham County Health Department after a site investigation by department personnel.

ATTACHMENT 3: Property Map Detailing Soil Suitability for Septic Systems and Soil Types



Surface water and/or bad topo areas have not been officially evaluated for stream ID according to local regulatory requirements. This map is intended for preliminary purposes only and not to be used as a plat/survey or can it be assumed all streams are identified on this property.



Surface water and/or bad topo areas have not been officially evaluated for stream ID according to local regulatory requirements. This map is intended for preliminary purposes only and not to be used as a plat/survey or can it be assumed all streams are identified on this property.

ATTACHMENT 4: Typical Profile Descriptions of Provisionally Suitable Soil

Property ID#: 184655
Property Recorded: .
County: Durham .

SOIL/SITE EVALUATION
FOR
ON-SITE WASTEWATER SYSTEM

Applicant: Ms. Grace Holton & Ms. Meg Holton
Address: Holton Farm, LLC
2315 Ridgefield Drive
Chapel Hill, NC 27517

Owner: X Agent: Phone: (919)619-8607
Date Evaluated: 6/26/23
Proposed Facility: Residential
Property Size: Approximately 68.75 acres

Location Site: Craig Road, Durham, NC

Water Supply: On Site Well X Comm. Well Public Other

Evaluation Method: Auger Boring X Pit Cut

TYPICAL PROFILE

Horizon/ Depth (IN)	Matrix	Mottles	Mottle Abundance / Contrast	(a)(1) Tex-ture	(a)(2) Structure	(a)(3) Minerology	Consistence Wet	Consistence Moist
A 0-4”	**10YR 3/3**	**None**	**None**	**SiL**	**GR**	**NEXP**	**NS, NP**	**Vfr**
E 4-10”	**10YR 7/6**	**None**	**None**	**SiL**	**GR**	**NEXP**	**NS, NP**	**Vfr**
Bt1 10-36”+	**10R 4/6**	**None**	**None**	**C**	**SBK**	**SEXP**	**S, P**	**Fi**

.1940 Landscape Pos/Slope %	- Suitable, <15%	Profile LTAR	- 0.4 – 0.1 GPD/ft^2
.1942 Wetness Condition	- Suitable	System Type	- Provisionally suitable for shallow conventional systems due to texture, structure, and depth.
.1943/.1956 Saprolite	- Suitable		
.1944 Restrictive Horizon	- Suitable		
.1948 Profile Classification	- Provisionally suitable		

Comments: Some indications of saprolite beginning around 30”, but not dominant.

TYPICAL PROFILE

Horizon/ Depth (IN)	Matrix	Mottles	Mottle Abundance /Contrast	(a)(1) Tex-ture	(a)(2) Structure	(a)(3) Minerology	Consistence Wet	Consistence Moist
A 0-4”	**10YR 3/3**	**None**	**None**	**SiL**	**GR**	**NEXP**	**NS, NP**	**Vfr**
E 4-9”	**10YR 7/6**	**None**	**None**	**SiL**	**GR**	**NEXP**	**NS, NP**	**Vfr**
Bt1 9-30”	**7.5YR 6/6**	**None**	**None**	**C**	**SBK**	**SEXP**	**S, P**	**Fi**
Bt2 30-36”+	**7.5YR 6/6**	**10YR 8/1; 10YR 7/8**	**2, m, D**	**C**	**SBK**	**SEXP**	**S, P**	**Fi**

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Comments:

EVALUATED BY: **Jeff Vaughan, Heath Clapp, Brent Purdum, Jordan Harris, Trent Bostic**
COMMENTS:

LEGEND OF ABBREVIATIONS FOR SITE EVALUATION FORM

LANDSCAPE POSITION

CC - Concave Slope
CV - Convex Slope
DS - Debris Slump
D - Depression
DW - Drainage Way
FP - Flood Plain
FS - Foot Slope
H - Head Slope
I - Interflueve
L - Linear Slope
N - Nose Slope
P - Pocosin
R - Ridge
S - Shoulder
T - Terrace

TEXTURE GROUP	TEXTURE CLASS	.1955 LTAR (gal/day/sqft)
I	S - Sand LS - Loamy Sand	1.2 - .08
II	SL - Sandy Loam L - Loam	0.8 - 0.6
III	SCL - Sandy Clay Loam CL - Clay Loam SiL - Silt Loam Si - Silt SiCL - Silt Clay Loam	0.6 - 0.3
IV	SC - Sandy Clay C - Clay SiC - Silty Clay O - Organic	0.4 - 0.1

STRUCTURE

G - Single Grain
M - Massive
CR - Crumb
GR - Granular
SBK - Subgranular Blocky
ABK - Angular Blocky
PL - Platy
PR - Prismatic

MOIST CONSISTENCE

Vfr - Very Friable
Fr - Friable
Fi - Firm
Vfi - Very Firm
Efi - Extremely Firm

MOTTLES

1 - Few
2 - Common
3 - Many

F - Faint
D - Distinct
P - Prominent

f - Fine
m - Medium
c - Coarse

WET CONSISTENCE

NS - Non Sticky
SS - Slightly Sticky
S - Sticky
VS - Very Sticky

NP - Non Plastic
SP - Slightly Plastic
P - Plastic
VP - Very Plastic

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Bt1 10-30”	**10R 4/6**	**None**	**None**	**C**	**SBK**	**SEXP**	**S, P**	**Fi**
Bt2 30-36”	**10R 4/6**	**10YR 8/1; 10YR 7/8**	**2, m, D**	**C**	**SBK**	**SEXP**	**S, P**	**Fi**

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Comments:

TYPICAL PROFILE

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.1940 Landscape Pos/Slope %		Profile LTAR	
.1942 Wetness Condition		System Type	
.1943/.1956 Saprolite			
.1944 Restrictive Horizon			
.1948 Profile Classification			

Comments:

EVALUATED BY: **Jeff Vaughan, Heath Clapp, Brent Purdum, Jordan Harris, Trent Bostic**
COMMENTS:

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TEXTURE GROUP

I
II
III
IV

TEXTURE CLASS

S - Sand
LS - Loamy Sand
SL - Sandy Loam
L - Loam
SCL - Sandy Clay Loam
CL - Clay Loam
SiL - Silt Loam
Si - Silt
SiCL - Silt Clay Loam
SC - Sandy Clay
C - Clay
SiC - Silty Clay
O - Organic

.1955 LTAR (gal/day/sqft)

1.2 - .08
0.8 - 0.6
0.6 - 0.3
0.4 - 0.1

STRUCTURE

G - Single Grain
M - Massive
CR - Crumb
GR - Granular
SBK - Subgranular Blocky
ABK - Angular Blocky
PL - Platy
PR - Prismatic

MOIST CONSISTENCE

Vfr - Very Friable
Fr - Friable
Fi - Firm
Vfi - Very Firm
Efi - Extremely Firm

MOTTLES

1 - Few
2 - Common
3 - Many

F - Faint
D - Distinct
P - Prominent

f - Fine
m - Medium
c - Coarse

WET CONSISTENCE

NS - Non Sticky
SS - Slightly Sticky
S - Sticky
VS - Very Sticky

NP - Non Plastic
SP - Slightly Plastic
P - Plastic
VP - Very Plastic

ATTACHMENT 5: Soil Survey Information

TABLE 7.—*Engineering*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil which may have

Soil series and map symbols	Degree of limitation for—						
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings	Sanitary landfills [1] (trench type)	Local roads and streets	Light industry
Altavista: AlA, AlB	Severe: wet	Severe: wet	Severe: wet	Severe: floods.	Severe: wet; floods.	Severe: floods.	Severe: floods.
Appling:							
ApB	Moderate: percs slowly.	Moderate: slope.	Moderate: too clayey.	Moderate: low strength.	Severe: too clayey.	Moderate: low strength.	Moderate: low strength.
ApC	Moderate: percs slowly.	Severe: slope.	Moderate: too clayey.	Moderate: slope; low strength.	Severe: too clayey.	Moderate: low strength.	Moderate: low strength.
*Cartecay: Cc. For Chewacla part, see Chewacla series.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods; wet.	Severe: floods.	Severe: floods.
Cecil:							
CfB	Moderate: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Moderate: low strength.	Severe: too clayey.	Moderate: low strength.	Moderate: low strength.
CfC	Moderate: percs slowly.	Severe: slope.	Moderate: too clayey.	Moderate: slope; low strength.	Severe: too clayey.	Moderate: low strength.	Moderate: low strength.
CfE	Severe: slope more than 15 percent.	Severe: slope.	Moderate: too clayey.	Severe: slope more than 15 percent.	Severe: too clayey.	Severe: slope.	Severe: slope.
*Chewacla: Ch. For Wehadkee part, see Wehadkee series.	Severe: floods; wet.	Severe: wet	Severe: floods; wet.	Severe: floods; wet.	Severe: floods; wet.	Severe: floods; wet.	Severe: floods; wet.
Congaree: Cp	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Creedmoor:							
CrB	Severe: percs slowly.	Moderate: slope.	Severe: too clayey; wet.	Severe: low strength; shrink-swell.	Severe: wet	Severe: low strength; shrink-swell.	Severe: low strength; shrink-swell.
CrC	Severe: percs slowly.	Severe: slope.	Severe: too clayey; wet.	Severe: low strength; shrink-swell.	Severe: wet	Severe: low strength; shrink-swell.	Severe: low strength; shrink-swell.
Davidson:							
DaB	Moderate: percs slowly.	Moderate: seepage	Moderate: too clayey.	Moderate: shrink-swell.	Severe: too clayey.	Moderate: low strength.	Moderate: low strength.
DaC	Moderate: percs slowly.	Severe: slope.	Moderate: too clayey.	Moderate: shrink-swell.	Severe: too clayey.	Moderate: low strength.	Moderate: low strength.
Georgeville:							
GeB	Moderate: percs slowly.	Moderate: slope.	Moderate: too clayey.	Moderate: shrink-swell; low strength.	Moderate: too clayey.	Severe: low strength.	Moderate: low strength.
GeC	Moderate: percs slowly.	Severe: slope.	Moderate: too clayey.	Moderate: shrink-swell; low strength.	Moderate: too clayey.	Severe: low strength.	Moderate: low strength.
GeD	Severe: slope.	Severe: slope.	Moderate: slope.	Moderate: shrink-swell; low strength.	Severe: slope.	Severe: low strength.	Severe: slope.
Goldston: GlE, GlF	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: dominant slope.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
Granville:							
GrB	Slight	Moderate: seepage.	Slight	Slight	Slight	Slight	Moderate: slope.
GrC	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.	Slight	Moderate: slope.	Severe: slope.
Gullied land: Gu. Too variable. No interpretations.							

TABLE 7.—*Engineering*

Soil series and map symbols	Degree of limitation for—						
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings	Sanitary landfills [1] (Trench type)	Local roads and streets	Light industry
Roanoke: Ro	Severe: floods.	Severe: floods.	Severe: floods; wet.	Severe: floods.	Severe: floods; wet.	Severe: floods; wet.	Severe: floods.
Tatum: TaE	Severe: slope.	Severe: slope.	Severe: depth to rock.	Severe: slope.	Severe: slope; depth to rock.	Severe: slope.	Severe: slope.
Urban land: Ur. Too variable. No interpretations.							
Wahee: Wh	Severe: floods.	Severe: floods.	Severe: floods; wet.	Severe: floods; wet.	Severe: floods; wet.	Severe: floods.	Severe: floods; wet.
Wedowee:							
WmD	Severe: slope.	Severe: slope.	Severe: depth to rock; slope.	Moderate: slope.	Severe: depth to rock.	Moderate: slope; depth to rock.	Severe: slope.
WmE	Severe: slope.	Severe: slope.	Severe: depth to rock; slope.	Severe: slope.	Severe: depth to rock.	Severe: slope.	Severe: slope.
Wehadkee: Wn	Severe: floods; wet.	Severe: floods; wet.	Severe: floods; wet.	Severe: floods.	Severe: floods; wet.	Severe: floods; wet.	Severe: floods; wet.
*White Store:							
WsB	Severe: percs slowly.	Moderate: depth to rock; slope.	Severe: too clayey.	Severe: shrink-swell.	Severe: too clayey.	Severe: low strength; shrink-swell.	Severe: shrink-swell.
WsC, WvC2, WwC	Severe: percs slowly.	Moderate: depth to rock; slope.	Severe: too clayey.	Severe: shrink-swell.	Severe: too clayey.	Severe: low strength; shrink-swell.	Severe: shrink-swell.
WsE, WvE2, WwE Urban land part of WwC and WwE is too variable to rate.	Severe: percs slowly.	Severe: slope.	Severe: slope.	Severe: shrink-swell.	Severe: too clayey.	Severe: slope.	Severe: shrink-swell.
Wilkes: WxE	Severe: slope; depth to rock.	Severe: slope; depth to rock.	Severe: slope; depth to rock.	Severe: dominant slope; shrink-swell; low strength.	Severe: depth to rock; too clayey.	Severe: depth to rock; low strength; slope.	Severe: slope.

[1] Onsite study is needed of the underlying strata, the water table, and the hazards of aquifer pollution and drainage into ground water in landfill deeper than 5 or 6 feet.

Moisture-density or compaction data are important in earthwork. If a soil material is compacted at successively higher moisture content, assuming that the compactive effort remains constant, the density of the compacted material increases until the optimum moisture content is reached. After that, density decreases with increase in moisture content. The highest dry density obtained in the compactive test is termed maximum dry density. As a rule, maximum strength of earthwork is obtained if the soil is compacted to the maximum dry density.

Tests to determine liquid limit and plastic limit measure the effect of water on the consistence of soil material, as has been explained for table 6.

Formation and Classification of the Soils

This section describes the factors of soil formation and explains how these factors have affected the soils in Durham County. It also defines the system of soil classification currently used and classifies each soil series recognized in the county according to that system.

Factors of Soil Formation

Soils are the products of soil-forming processes acting upon materials altered or deposited by geologic forces. The factors that contribute to the differences among soils are parent material, climate, plant and animal life, topography, and time. Climate and plant and animal life, particularly vegetation, are the active forces in soil formation. Their effect on parent material is modified by topography and by the length of time the parent material has been in place. The relative importance of each factor differs from place to place. In some places one factor dominates in the formation of a soil and determines most of its properties, but normally the interaction of all factors determines the kind of soil that forms in any given place.

Parent material

Parent material is the unconsolidated rock from which a soil is formed. It is the soil-forming factor that is primarily

ATTACHMENT 6: Septic System Area Computation Spreadsheets

Conventional Septic System Area Computation

Created by: JV
Created on: 6/20/2001
Updated on: 6/28/2023

Client Name:	*Holton Farm, LLC*	
Number Bedrooms:	*3*	
Design Flow (gal/day):	360	(120 gal/day/bedroom, minimum 240 gal/day/dwelling)
LTAR (gal/day/ft^2)	*0.1*	
Trench Bottom Area (ft^2):	3600	(Design flow/LTAR)
Trench Width (ft):	3	
On-center distance between trenches (ft):	9	
Trench Bottom Length (ft):	1200	
Minimum Field Area Required (ft^2):	10800	(Trench Bottom Length*Trench on-center distance)
Minimum Field Area Required (Innovative) (ft^2):	8100	(25% reduction from above)
Total Field Area Required (ft^2)$^{(1)}$:	27000	(Minimum field area*2.5)
Total Field Area Required (Innovative) (ft^2)$^{(1)}$:	20250	(25% reduction from above)
Total Field Area Required (ft^2)$^{(1)}$:	32400	(Minimum field area*3)
Total Field Area Required (Innovative) (ft^2)$^{(1)}$:	24300	(25% reduction from above)

(1) Provides for reserve area and soil irregularity, 2.5 to 3 is multiplier.

Client Name:	*Holton Farm, LLC*	
Number Bedrooms:	*3*	
Design Flow (gal/day):	360	(120 gal/day/bedroom, minimum 240 gal/day/dwelling)
LTAR (gal/day/ft^2)	*0.4*	
Trench Bottom Area (ft^2):	900	(Design flow/LTAR)
Trench Width (ft):	3	
On-center distance between trenches (ft):	9	
Trench Bottom Length (ft):	300	
Minimum Field Area Required (ft^2):	2700	(Trench Bottom Length*Trench on-center distance)
Minimum Field Area Required (Innovative) (ft^2):	2025	(25% reduction from above)
Total Field Area Required (ft^2)$^{(1)}$:	6750	(Minimum field area*2.5)
Total Field Area Required (Innovative) (ft^2)$^{(1)}$:	5062.5	(25% reduction from above)
Total Field Area Required (ft^2)$^{(1)}$:	8100	(Minimum field area*3)
Total Field Area Required (Innovative) (ft^2)$^{(1)}$:	6075	(25% reduction from above)

(1) Provides for reserve area and soil irregularity, 2.5 to 3 is multiplier.

Client Name:	*Holton Farm, LLC*	
Number Bedrooms:	*3*	
Design Flow (gal/day):	360	(120 gal/day/bedroom, minimum 240 gal/day/dwelling)
LTAR (gal/day/ft^2)	*0.25*	
Trench Bottom Area (ft^2):	1440	(Design flow/LTAR)
Trench Width (ft):	3	
On-center distance between trenches (ft):	9	
Trench Bottom Length (ft):	480	
Minimum Field Area Required (ft^2):	4320	(Trench Bottom Length*Trench on-center distance)
Minimum Field Area Required (Innovative) (ft^2):	3240	(25% reduction from above)
Total Field Area Required (ft^2)$^{(1)}$:	10800	(Minimum field area*2.5)
Total Field Area Required (Innovative) (ft^2)$^{(1)}$:	8100	(25% reduction from above)
Total Field Area Required (ft^2)$^{(1)}$:	12960	(Minimum field area*3)
Total Field Area Required (Innovative) (ft^2)$^{(1)}$:	9720	(25% reduction from above)

(1) Provides for reserve area and soil irregularity, 2.5 to 3 is multiplier.

Conventional Septic System Area Computation

Created by: JV
Created on: 6/20/2001
Updated on: 6/28/2023

Client Name:	*Holton Farm, LLC*	
Number Bedrooms:	*4*	
Design Flow (gal/day):	480	(120 gal/day/bedroom, minimum 240 gal/day/dwelling)
LTAR (gal/day/ft^2)	*0.1*	
Trench Bottom Area (ft^2):	4800	(Design flow/LTAR)
Trench Width (ft):	3	
On-center distance between trenches (ft):	9	
Trench Bottom Length (ft):	1600	
Minimum Field Area Required (ft^2):	14400	(Trench Bottom Length*Trench on-center distance)
Minimum Field Area Required (Innovative) (ft^2):	10800	(25% reduction from above)
Total Field Area Required (ft^2)$^{(1)}$:	36000	(Minimum field area*2.5)
Total Field Area Required (Innovative) (ft^2)$^{(1)}$:	27000	(25% reduction from above)
Total Field Area Required (ft^2)$^{(1)}$:	43200	(Minimum field area*3)
Total Field Area Required (Innovative) (ft^2)$^{(1)}$:	32400	(25% reduction from above)

(1) Provides for reserve area and soil irregularity, 2.5 to 3 is multiplier.

Client Name:	*Holton Farm, LLC*	
Number Bedrooms:	*4*	
Design Flow (gal/day):	480	(120 gal/day/bedroom, minimum 240 gal/day/dwelling)
LTAR (gal/day/ft^2)	*0.4*	
Trench Bottom Area (ft^2):	1200	(Design flow/LTAR)
Trench Width (ft):	3	
On-center distance between trenches (ft):	9	
Trench Bottom Length (ft):	400	
Minimum Field Area Required (ft^2):	3600	(Trench Bottom Length*Trench on-center distance)
Minimum Field Area Required (Innovative) (ft^2):	2700	(25% reduction from above)
Total Field Area Required (ft^2)$^{(1)}$:	9000	(Minimum field area*2.5)
Total Field Area Required (Innovative) (ft^2)$^{(1)}$:	6750	(25% reduction from above)
Total Field Area Required (ft^2)$^{(1)}$:	10800	(Minimum field area*3)
Total Field Area Required (Innovative) (ft^2)$^{(1)}$:	8100	(25% reduction from above)

(1) Provides for reserve area and soil irregularity, 2.5 to 3 is multiplier.

Client Name:	*Holton Farm, LLC*	
Number Bedrooms:	*4*	
Design Flow (gal/day):	480	(120 gal/day/bedroom, minimum 240 gal/day/dwelling)
LTAR (gal/day/ft^2)	*0.25*	
Trench Bottom Area (ft^2):	1920	(Design flow/LTAR)
Trench Width (ft):	3	
On-center distance between trenches (ft):	9	
Trench Bottom Length (ft):	640	
Minimum Field Area Required (ft^2):	5760	(Trench Bottom Length*Trench on-center distance)
Minimum Field Area Required (Innovative) (ft^2):	4320	(25% reduction from above)
Total Field Area Required (ft^2)$^{(1)}$:	14400	(Minimum field area*2.5)
Total Field Area Required (Innovative) (ft^2)$^{(1)}$:	10800	(25% reduction from above)
Total Field Area Required (ft^2)$^{(1)}$:	17280	(Minimum field area*3)
Total Field Area Required (Innovative) (ft^2)$^{(1)}$:	12960	(25% reduction from above)

(1) Provides for reserve area and soil irregularity, 2.5 to 3 is multiplier.

Conventional Septic System Area Computation

Created by: JV
Created on: 6/20/2001
Updated on: 6/28/2023

Client Name:	*Holton Farm, LLC*	
Number Bedrooms:	*5*	
Design Flow (gal/day):	600	(120 gal/day/bedroom, minimum 240 gal/day/dwelling)
LTAR (gal/day/ft^2)	*0.1*	
Trench Bottom Area (ft^2):	6000	(Design flow/LTAR)
Trench Width (ft):	3	
On-center distance between trenches (ft):	9	
Trench Bottom Length (ft):	2000	
Minimum Field Area Required (ft^2):	18000	(Trench Bottom Length*Trench on-center distance)
Minimum Field Area Required (Innovative) (ft^2):	13500	(25% reduction from above)
Total Field Area Required (ft^2)$^{(1)}$:	45000	(Minimum field area*2.5)
Total Field Area Required (Innovative) (ft^2)$^{(1)}$:	33750	(25% reduction from above)
Total Field Area Required (ft^2)$^{(1)}$:	54000	(Minimum field area*3)
Total Field Area Required (Innovative) (ft^2)$^{(1)}$:	40500	(25% reduction from above)

(1) Provides for reserve area and soil irregularity, 2.5 to 3 is multiplier.

Client Name:	*Holton Farm, LLC*	
Number Bedrooms:	*5*	
Design Flow (gal/day):	600	(120 gal/day/bedroom, minimum 240 gal/day/dwelling)
LTAR (gal/day/ft^2)	*0.4*	
Trench Bottom Area (ft^2):	1500	(Design flow/LTAR)
Trench Width (ft):	3	
On-center distance between trenches (ft):	9	
Trench Bottom Length (ft):	500	
Minimum Field Area Required (ft^2):	4500	(Trench Bottom Length*Trench on-center distance)
Minimum Field Area Required (Innovative) (ft^2):	3375	(25% reduction from above)
Total Field Area Required (ft^2)$^{(1)}$:	11250	(Minimum field area*2.5)
Total Field Area Required (Innovative) (ft^2)$^{(1)}$:	8437.5	(25% reduction from above)
Total Field Area Required (ft^2)$^{(1)}$:	13500	(Minimum field area*3)
Total Field Area Required (Innovative) (ft^2)$^{(1)}$:	10125	(25% reduction from above)

(1) Provides for reserve area and soil irregularity, 2.5 to 3 is multiplier.

Client Name:	*Holton Farm, LLC*	
Number Bedrooms:	*5*	
Design Flow (gal/day):	600	(120 gal/day/bedroom, minimum 240 gal/day/dwelling)
LTAR (gal/day/ft^2)	*0.25*	
Trench Bottom Area (ft^2):	2400	(Design flow/LTAR)
Trench Width (ft):	3	
On-center distance between trenches (ft):	9	
Trench Bottom Length (ft):	800	
Minimum Field Area Required (ft^2):	7200	(Trench Bottom Length*Trench on-center distance)
Minimum Field Area Required (Innovative) (ft^2):	5400	(25% reduction from above)
Total Field Area Required (ft^2)$^{(1)}$:	18000	(Minimum field area*2.5)
Total Field Area Required (Innovative) (ft^2)$^{(1)}$:	13500	(25% reduction from above)
Total Field Area Required (ft^2)$^{(1)}$:	21600	(Minimum field area*3)
Total Field Area Required (Innovative) (ft^2)$^{(1)}$:	16200	(25% reduction from above)

(1) Provides for reserve area and soil irregularity, 2.5 to 3 is multiplier.