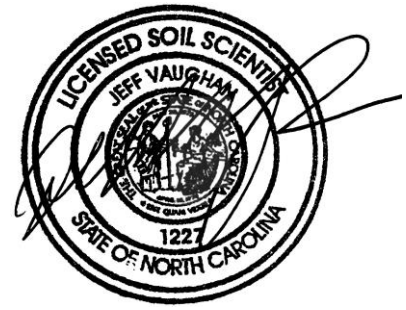




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Soil Suitability for Domestic Sewage Treatment and Disposal Systems

141 Sagamore Drive,
Louisburg, NC
Franklin County

Prepared For:	Mark Carreras, Client
Prepared By:	Jeff Vaughan, Ph.D., L.S.S. Senior Agronomist/Soil Scientist Heath Clapp Associate Soil Scientist
Report Date:	August 28, 2023



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**Soil Suitability for Domestic Sewage Treatment and Disposal Systems
141 Sagamore Drive, Louisburg, NC (Franklin County)**

PREPARED FOR: Mark Carreras, Client

PREPARED BY: Jeff Vaughan
Heath Clapp

DATE: August 28, 2023

Soil suitability for domestic sewage treatment and disposal systems was evaluated on August 21, 2023, for property located at 141 Sagamore Drive in Louisburg, NC. Heath Clapp 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 0.2495 acres (per Franklin County GIS). The property has some trees and a large concrete pad on it. There is also an auxiliary building on 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 white pin flags. Three soil borings were advanced within the soils area on the property (Attachment 3). A portion of the property contained concrete and buildings and disturbed soils, 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.

The area delineated by AWT (denoted by tan on the map in Attachment 3) exhibited soil characteristics and depths at 17 inches of usable depth. The technology of TS-II drip irrigation (drip irrigation with pretreatment) would be required in this area. This area is approximately 1,376 square feet.

Typical profile descriptions of the provisionally suitable soil for this property are in Attachment 4. One distinct soil profile was observed in the soil borings on the property: a deep red clay subsoil or a shallower yellowish brown clay subsoil.

The provisionally suitable soil borings had the following characteristics. No restrictive horizons were found in any provisionally soil borings within 17" of the soil surface. Soil texture was provisionally suitable and was estimated to be sandy loam near the soil surface (A horizons) and sandy clay loam to clay in the subsoil (B horizons). Soil structure was provisionally suitable and was estimated to be granular near the soil surface (A horizons) and angular 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 seasonal high-water table (SHWT) were detected in all borings at 17 inches.

The major soil type on this property is Helena sandy loam (map symbols HeB). The Franklin County Soil Survey indicates that 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/ft² 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 0.1 GPD/ft², but the final LTAR for specific septic system types and septic drainfield locations will be set by the Franklin County Health Department. The detailed computations are in Attachment 6.

Conclusions

Based on the results of this evaluation, the site may be suitable for a TS-II subsurface drip with pre-treatment system, but additional soils and engineering work is needed in order to design and obtain a permit for the system. The additional design costs are approximately \$10,000 and installation costs can range from \$40,000-\$50,000. It is possible that there is not enough suitable area on the property to support this type of system.

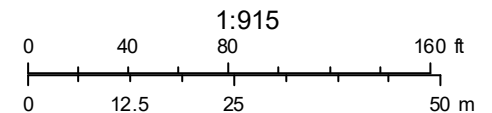
We appreciate the opportunity to assist you in this matter. Please contact us with any questions, concerns, or comments.

ATTACHMENT 1: Property Reference Map

GoMaps



August 23, 2023



Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community
Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

WARNING: THIS IS NOT A SURVEY.
This map is prepared for the inventory of real property found within this jurisdiction, and is compiled from recorded deeds, plats, and other public records and data. Users of this map are hereby notified that the aforementioned public primary information sources should be consulted for verification of the information contained on this map. The County and mapping company assume no legal responsibility for the information contained on this map.

**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 Franklin County Health Department. Any landscapes or soils classified as unsuitable may be reclassified as provisionally suitable by the Franklin County Health Department after a site investigation by department personnel.

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



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Preliminary Soil Evaluation

Mark Carreras
Franklin Co., NC
PIN: 2831-36-8405

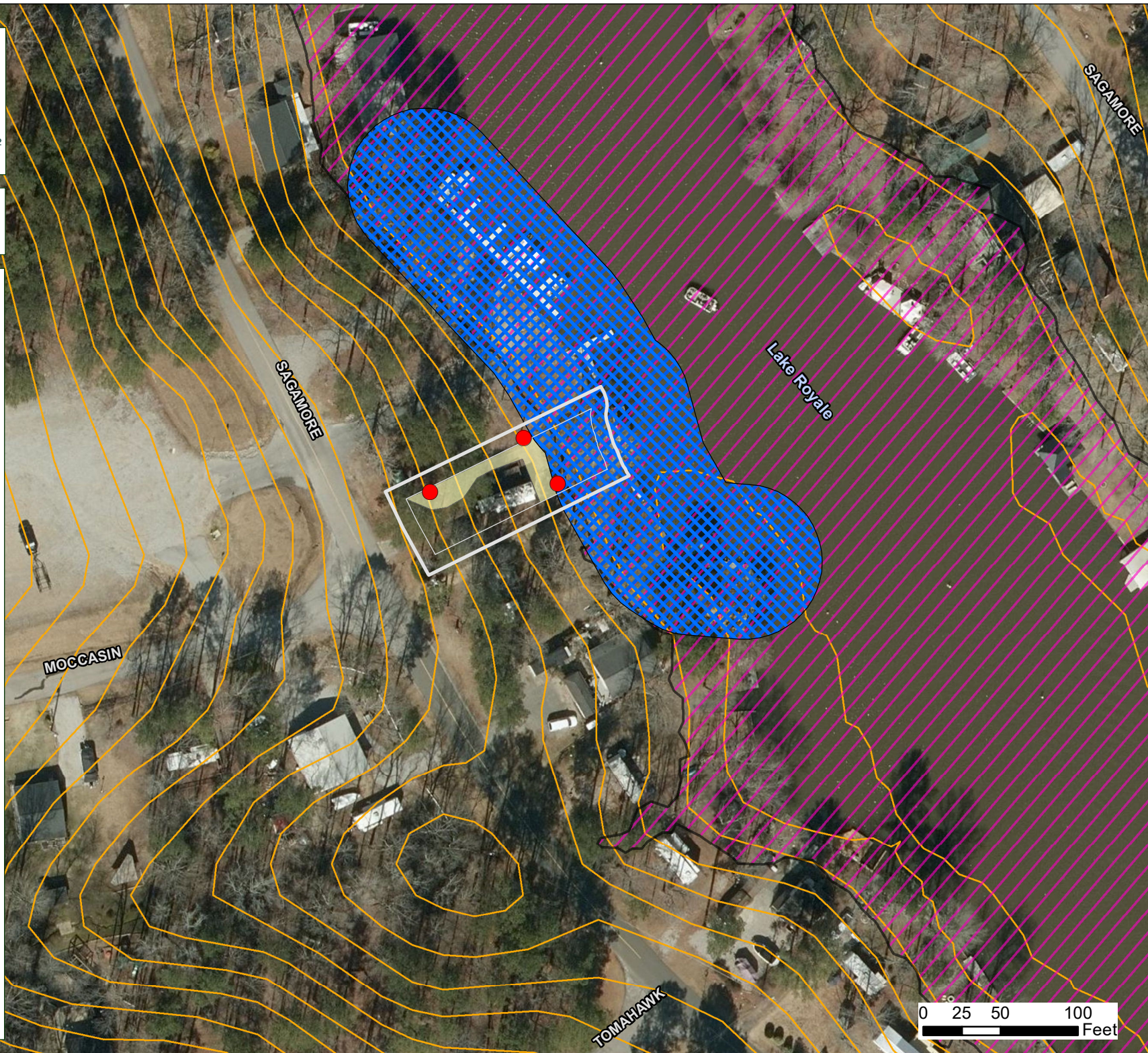


Area for Septic:
~1376 sq.ft.

Soil Types:
HeB: Helena sandy loam

-  Parcel
-  Parcel Buffer 10 ft.
-  2 ft. Contour
-  Surface Water Buffer 50 ft.
- FEMA 100 yr floodplain**
-  AE
- Evaluation Area**
-  Suitable Area
- Soil Boring Depth (in.)**
-  13-17"

Drawn By: William Shoeyink
Reviewed By: Heath Clapp
Date: 8/23/2023



0 25 50 100
Feet



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Preliminary Soil Evaluation

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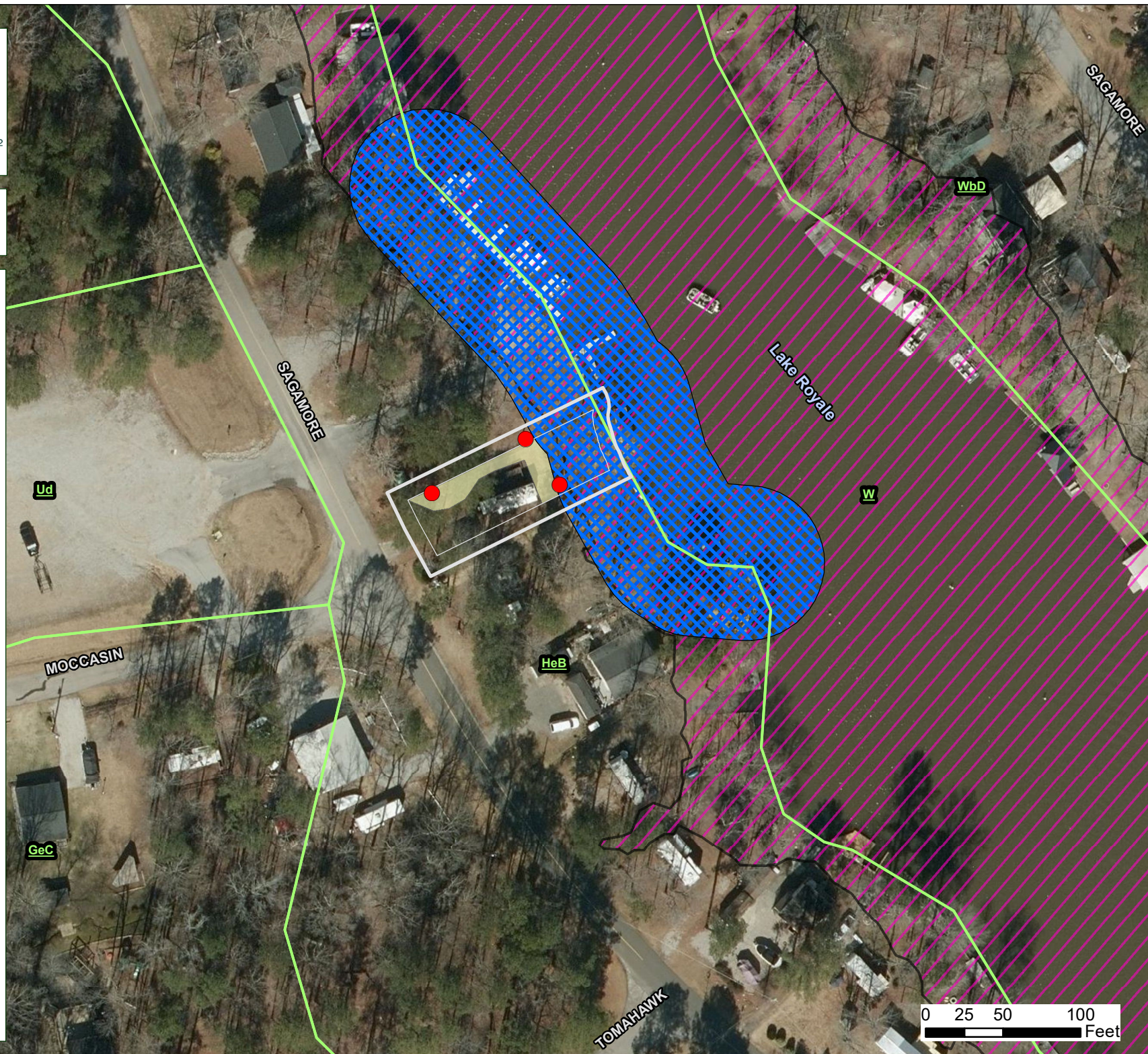


Area for Septic:
~1376 sq.ft.

Soil Types:
HeB: Helena sandy loam

- Parcel
- Parcel Buffer 10 ft.
- Soil Types
- Surface Water Buffer 50 ft.
- FEMA 100 yr floodplain
- AE
- Evaluation Area
- Suitable Area
- Soil Boring Depth (in.)
- 13-17"

Drawn By: William Shoeyink
Reviewed By: Heath Clapp
Date: 8/23/2023



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#: 2831-36-8405
 Property Recorded: _____
 County: Franklin

**SOIL/SITE EVALUATION
FOR
ON-SITE WASTEWATER SYSTEM**

Applicant: Mark Carreras
 Address: 6605 Truxton Lane,
Raleigh, NC 27616

Buyer: X Agent: _____ Phone: (813)767-6537
 Date Evaluated: 8/21/2023
 Proposed Facility: Camper Parking Spot
 Property Size: Approximately 0.2495 acres

Location Site: 141 Sagamore Drive, Lot 315, Louisburg, NC 27549

Water Supply: On Site Well _____ Comm. Well X Public _____ Other _____ Evaluation Method: Auger Boring X Pit _____ Cut _____

TYPICAL PROFILE

Horizon/ Depth (IN)	Matrix	Mottles	Mottle Abundance / Contrast	(a)(1) Texture	(a)(2) Structure	(a)(3) Minerolog y	Consistence Wet	Consistence Moist
A 0-10"	10YR 5/2	None	None	SL	GR	NEXP	NS, NP	Fr
E 10-15"	10YR 6/4	None	None	SL	GR	NEXP	NS, NP	Fr
Bt1 15-17"+	10YR 5/8	10YR 6/2	1, m, D	C	ABK	EXP	S, P	Fi

.1940 Landscape Pos/Slope %	- Suitable, <15%	Profile LTAR	- 0.05 – 0.15 GPD/ft ²
.1942 Wetness Condition	- Suitable	System Type	- Provisionally suitable TS-II drip irrigation with pretreatment system.
.1943/.1956 Saprolite	- Suitable		
.1944 Restrictive Horizon	- Suitable		
.1948 Profile Classification	- Provisionally suitable		

Comments: Represents all borings on the property. SHWT comes in at 17".

EVALUATED BY: Heath Clapp
 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

I

II

III

IV

MOIST CONSISTENCE

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

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

MOTTLES

1 - Few
2 - Common
3 - Many

F - Faint
D - Distinct
P - Prominent

f - Fine
m - Medium
c - Coarse

.1955 LTAR
(gal/day/sqft)

1.2 - .08

0.8 - 0.6

$$0.6 - 0.3$$

0.4 - 0.1

WET CONSISTENCE

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

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

STRUCTURE

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

ATTACHMENT 5: Soil Survey Information

Table 11.—Sanitary Facilities—Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
GmD*:					
Montonia-----	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock, small stones.
GmE*:					
Georgeville-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Montonia-----	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, small stones, slope.
HeB-----	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey, too acid.	Moderate: wetness.	Poor: too clayey, hard to pack, too acid.
HrB-----	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----	Fair: too clayey, hard to pack.
HrC-----	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, hard to pack, slope.
PaC2, PaD2-----	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: too clayey, slope.
PuC*:					
Pacolet-----	Moderate: percs slowly.	Moderate: seepage, slope.	Slight-----	Slight-----	Fair: too clayey.
Urban land-----	Variable-----	Variable-----	Variable-----	Variable-----	Variable.
RaA*:					
Rains-----	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Toisnot-----	Severe: cemented pan, wetness.	Severe: seepage, cemented pan.	Severe: wetness.	Severe: cemented pan, wetness.	Poor: cemented pan, wetness.
ReD*:					
Rion-----	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Fair: too clayey, slope.
Wateree-----	Severe: depth to rock.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: depth to rock.
Wedowee-----	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: small stones, slope.

See footnote at end of table.

**ATTACHMENT 6: Septic System Area Computation
Spreadsheets**

Conventional Septic System Area Computation

Created by: JV
Created on: 6/20/2001
Updated on: 8/23/2023

Client Name: Carreras
Number Bedrooms: 1
Design Flow (gal/day): 120 (120 gal/day/bedroom, minimum 240 gal/day/dwelling)
LTAR (gal/day/ft²): 0.1
Trench Bottom Area (ft²): 1200 (Design flow/LTAR)
Trench Width (ft): 3
On-center distance between trenches (ft): 9
Trench Bottom Length (ft): 400

Minimum Field Area Required (ft²): 3600 (Trench Bottom Length*Trench on-center distance)
Minimum Field Area Required (Innovative) (ft²): 2700 (25% reduction from above)
Total Field Area Required (ft²)⁽¹⁾: 9000 (Minimum field area*2.5)
Total Field Area Required (Innovative) (ft²)⁽¹⁾: 6750 (25% reduction from above)
Total Field Area Required (ft²)⁽¹⁾: 10800 (Minimum field area*3)
Total Field Area Required (Innovative) (ft²)⁽¹⁾: 8100 (25% reduction from above)

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

Client Name: Carreras
Number Bedrooms: 2
Design Flow (gal/day): 240 (120 gal/day/bedroom, minimum 240 gal/day/dwelling)
LTAR (gal/day/ft²): 0.1
Trench Bottom Area (ft²): 2400 (Design flow/LTAR)
Trench Width (ft): 3
On-center distance between trenches (ft): 9
Trench Bottom Length (ft): 800

Minimum Field Area Required (ft²): 7200 (Trench Bottom Length*Trench on-center distance)
Minimum Field Area Required (Innovative) (ft²): 5400 (25% reduction from above)
Total Field Area Required (ft²)⁽¹⁾: 18000 (Minimum field area*2.5)
Total Field Area Required (Innovative) (ft²)⁽¹⁾: 13500 (25% reduction from above)
Total Field Area Required (ft²)⁽¹⁾: 21600 (Minimum field area*3)
Total Field Area Required (Innovative) (ft²)⁽¹⁾: 16200 (25% reduction from above)

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

Client Name: Carreras
Number Bedrooms: 3
Design Flow (gal/day): 360 (120 gal/day/bedroom, minimum 240 gal/day/dwelling)
LTAR (gal/day/ft²): 0.1
Trench Bottom Area (ft²): 3600 (Design flow/LTAR)
Trench Width (ft): 3
On-center distance between trenches (ft): 9
Trench Bottom Length (ft): 1200

Minimum Field Area Required (ft²): 10800 (Trench Bottom Length*Trench on-center distance)
Minimum Field Area Required (Innovative) (ft²): 8100 (25% reduction from above)
Total Field Area Required (ft²)⁽¹⁾: 27000 (Minimum field area*2.5)
Total Field Area Required (Innovative) (ft²)⁽¹⁾: 20250 (25% reduction from above)
Total Field Area Required (ft²)⁽¹⁾: 32400 (Minimum field area*3)
Total Field Area Required (Innovative) (ft²)⁽¹⁾: 24300 (25% reduction from above)

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