



Soil & Environmental Consultants, Inc.

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April 24, 2024
Project #16021.S1

Lilium Homes, Inc.
Attn: Juana Martinez
5 W. Mason Street
Franklinton, NC 27525

Re: Soil/Site Evaluation on Davis Property, ~115-Acre Site on Woodland Church Rd,
Granville County, NC

Soil & Environmental Consultants, Inc. (S&EC) performed a preliminary soil and site evaluation on the above referenced tract. This was performed at your request as part of the preliminary planning process in order to determine areas of soil that have potential for subsurface wastewater disposal per our agreement/contract from March 18, 2024. Fieldwork was performed during the week of April 15 and week of April 22, 2024.

S&EC traversed 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. The site was evaluated during dry/moist soil conditions. From these observations, an evaluation of the site was developed, relative to subsurface disposal of wastewater. Soil boundaries were estimated and sketched onto the map based on GPS data, site features, and topographic conditions. The soil/site evaluation criteria used is that contained in 15A NCAC 18E "Wastewater Treatment and Dispersal Systems".

FINDINGS

This site is located in the acid crystalline piedmont region of Granville County. The upland soils on this tract are similar to the Cecil, Pacolet, Madison, Appling, Wedowee, Enon, Poindexter, and Wilkes soil series. The Cecil, Pacolet, Madison, Appling, and Wedowee soils are generally useable for subsurface septic systems. The Enon, Poindexter, and Wilkes soils have shallow unsuitable/limiting soil characteristics and are generally unsuitable for conventional type subsurface septic systems but in some areas may be used for alternative subsurface septic systems (such as low-profile chamber or drip). Some soil areas may need to be evaluated through backhoe pit evaluations at the time of septic permitting due to steep slopes, some marginal soils, and/or shallow saprolite (weathered rock material).

The accompanying AutoCAD/GPS Sketch Soils/Site Evaluation map indicates the areas with potential use for subsurface wastewater disposal. The red cross hatched units indicate areas of soils which are at least 26 to 36+ inches deep to prohibitive soil characteristics and these areas have potential for Gravel Pipe, Accepted 25% Reduction Products (Standard Chamber or EZ-Flow), Panel Block (PPBPS), Low Profile Chamber, shallow placed drain lines (shallow placed lines with fill required over the disposal field), and/or Low Pressure Pipe (LPP) septic systems. The red cross hatched areas generally have soils supportive of long-term acceptance rate (LTAR) for Gravel, Accepted, PPBPS, or Low Profile Chamber septic systems of 0.25 to 0.325 and/or LPP/drip LTARs ranging from 0.1 to 0.15.

The magenta hatched units indicate areas of soils which are at least 26 to 30+ inches deep to prohibitive soil characteristics and these areas have potential for shallow placed Gravel Pipe, shallow placed Accepted 25% Reduction Products (Standard Chamber or EZ-Flow), shallow placed horizontal Panel Block (PPBPS), Low Profile Chamber, and/or Low Pressure Pipe (LPP) septic systems. The magenta hatched areas generally have soils supportive of long-term acceptance rate (LTAR) for Gravel, Accepted, PPBPS, or Low Profile Chamber septic systems of 0.225 to 0.275 and/or LPP/drip LTARs ranging from 0.08 to 0.15.

The green brick hatched units indicate areas of soils which are at least 18 to 22+ inches deep to prohibitive soil characteristics and these areas have potential for pretreatment (NSF/ANSI 40, TS-I, TS-II, and/or RCW) subsurface drip septic systems with inclusions of soil/saprolite areas that could be evaluated through backhoe pits to see if there are more cost effective septic types that could potentially work. The green brick hatched areas generally have soils supportive of long-term acceptance rate (LTAR) for drip LTARs ranging from 0.1 to 0.15. Drip septic systems within these areas may need Special Site Evaluations/soil hydraulic conductivity (Ksat) testing (depending on soil conditions, pretreatment standard utilized, & site plan) and will need a wastewater engineered design prior to securing a septic permit. The pretreatment standard used for the drip may vary with individual soil areas based on the soil characteristics and proposed site/lot development plans.

The blue hatched units indicate areas of soils which are at least 13 to 18+ inches deep to prohibitive soil characteristics and these areas have potential for pretreatment (NSF/ANSI 40, TS-I, TS-II, and/or RCW) subsurface drip septic systems. The blue hatched areas generally have soils supportive of long-term acceptance rate (LTAR) for drip LTARs ranging from 0.07 to 0.15. Drip septic systems within these areas may need Special Site Evaluations/soil hydraulic conductivity (Ksat) testing (depending on soil conditions & site plan) and will need a wastewater engineered design prior to securing a septic permit. The pretreatment standard used for the drip may vary with individual soil areas based on the soil characteristics and proposed site/lot development plans. These areas are considered unsuitable for septic until proven to be suitable for subsurface septic through the use of Ksats and/or a targeted detailed soils delineation within these areas.

The blue dot locations shown on the map indicate soil boring locations that are considered unsuitable for subsurface septic systems, but these locations and the nearby area can be further evaluated by a licensed soil scientist through backhoe pit evaluations to determine if a saprolite, sand lined trench, and/or a pretreatment subsurface drip septic system may have potential in this area. If the soils/saprolite in the area with the blue dots can support an advanced, alternative subsurface septic system, Ksat testing may be required, and the system may need to be designed by a wastewater engineer prior to septic permitting.

The septic LTARs in given soil areas units may vary higher or lower than what S&EC has stated above based on specific lot evaluations/proposed septic areas. The ultimate LTAR and septic system type will be determined by the local health department and/or licensed soil scientist after their lot specific evaluation. Unit "UN" on the attached map indicates areas of soil that are less than 13 inches to prohibitive soil characteristics and/or has unsuitable landscape position and are generally unsuitable for the type of systems mentioned above. Unit "NE" on the attached map indicates areas that were not evaluated due to being outside of the scope of S&EC's evaluation, due to existing soil/dirt spoil piles, or due to existing concrete pads.

The site plan for each lot must ensure that adequate soil area for system and repair is unaffected by site elements (house placement, driveway, wells, patios, decks, etc.) on that, or adjacent lots. The area ultimately designated by the health department or licensed soil scientist on the site plan for the septic system and repair must remain undisturbed (no mechanical clearing, excavation, heavy traffic, or other significant site disturbing activities) until authorized by the authorizing agent (local health dept, AOWE, or PE). A lot with initially adequate useable soil area may be rendered unusable as a result of improper site planning and/or disturbance. A field layout and/or septic design of the proposed septic system(s) may be required as part of the individual lot development process.

GENERAL WASTEWATER CONSIDERATIONS

Once potentially useable areas are located through vertical borings, the next consideration is the horizontal extent of those areas. The size and configuration of the useable soil area dictate the utility of that area. The size of a subsurface disposal field is determined by: 1) the design daily flow (DDF) from the source (120 gallons per day [GPD] per bedroom in dwelling units or 60 gallons per day per person when occupancy exceeds two persons per bedroom in dwelling units, whichever is greater; commercial and industrial facilities DDF are based on the criteria in 15A NCAC 18E.0401), 2) the long term acceptance rate (LTAR) of the soil (based on the septic drain line lateral type, hydraulic conductivity of the soil or saprolite, the soil or saprolite texture, mineralogy, structure, porosity, etc.), and 3) the design/configuration of the septic system. Any wastewater system that meets one or more of the conditions within 15A NCAC 18E.0303 or due to local regulations shall be designed by a professional engineer (PE). The septic configuration must be such that an efficient layout of disposal lines (on contour) is possible. An additional consideration is the required setbacks for the system from various elements such as wells (50’ to 100’), streams and ponds (50’) or more (depending on watershed regulations), property lines (10’), watershed buffers, etc. (see Attachment 1).

For this soils/site evaluation, S&EC assumes the septic tank effluent entering the drainfield meets the standards for Domestic Strength Effluent (DSE) as defined by 15A NCAC 18E .0402 (and shown in the table below) unless a higher effluent standard is needed for the septic system(s) (such as advanced pretreatment using a standard of NSF/ANSI 40, TS-I, TS-II, or Reclaimed Water [RCW]). DSE is usually produced by the usual wastewater usage from a dwelling unit. Any septic tank effluent going to the drainfield exceeding the DSE standard below or any facility defined as having potential for generating high strength wastewater effluent as defined by 15A NCAC 18E.0401 shall be addressed in writing by a wastewater engineer.

Constituent	Maximum DSE (mg/L)
BOD (Five Day Biochemical Oxygen Demand)	≤ 350
TSS (Total Suspended Solids)	≤ 100
TKN (Total Kjeldahl Nitrogen)	≤ 100
FOG (Fats, Oils and Grease)	≤ 30

The utility of a potential usable soil area for a subsurface system is most accurately determined by an on-ground layout of the proposed system. The total area needed for system and repair areas will depend upon the system type, the layout of that system and the total design flow (factors mentioned above).

A typical area needed (outside of septic setbacks) in the **red cross hatched areas for a 3 bedroom residence septic is approximately 10,000 to 12,000 ft²** (could be more depending on site features) or approximately 600 to 660 linear feet of Accepted 25% reduction product (system and repair), approximately 400 to 440 linear feet of PPBPS drain line (system and repair), or approximately 800 to 880 linear feet of gravel & pipe drain line or low profile chamber drain line (system and repair). A typical area needed (outside of septic setbacks) in the **red cross hatched areas for a 4 bedroom residence septic is approximately 12,000 to 14,000 ft²** (could be more depending on site features) or approximately 800 to 880 linear feet of Accepted 25% reduction product (system and repair), approximately 540 to 590 linear feet of PPBPS drain line (system and repair), or approximately 1070 to 1170 linear feet of gravel & pipe drain line or low profile chamber drain line (system and repair). The red cross hatched areas generally have soils supportive of long-term acceptance rate (LTAR) for Gravel, Accepted, PPBPS, or Low-Profile Chamber septic systems of 0.25 to 0.325 and/or LPP/drip LTARs ranging from 0.1 to 0.15.

A typical area needed (outside of septic setbacks) in the **magenta hatched areas for a 3 bedroom residence septic is approximately 11,000 to 13,500 ft²** (could be more depending on site features) or approximately 720 linear feet of Accepted 25% reduction product (system and repair) or approximately 960 linear feet of gravel & pipe drain line or low profile chamber drain line (system and repair). A typical area needed (outside of septic setbacks) in the **magenta hatched areas for a 4 bedroom residence septic is approximately 13,000 to 16,000 ft²** (could be more depending on site features) or approximately 960 linear feet of Accepted 25% reduction product (system and repair) or approximately 1280 linear feet of gravel & pipe drain line or low profile chamber drain line (system and repair). The magenta hatched areas generally have soils supportive of long-term acceptance rate (LTAR) for Gravel, Accepted, or Low-Profile Chamber septic systems of 0.225 to 0.275 and/or LPP/drip LTARs ranging from 0.08 to 0.15.

A typical area needed (outside of septic setbacks) in the **green brick or blue hatched areas for a 3 bedroom residence septic is approximately 15,000 to 18,000 ft²** (could be more depending on site features) or approximately 3000 to 4500 linear feet of pretreatment (NSF/ANSI 40, TS-I, TS-II, and/or RCW) drip drain line (system and repair). A typical area needed (outside of septic setbacks) in the **green brick or blue hatched areas for a 4 bedroom residence septic is approximately 17,000 to 20,000 ft²** (could be more depending on site features) or approximately 4000 to 6000 linear feet of pretreatment (NSF/ANSI 40, TS-I, TS-II, and/or RCW) drip drain line (system and repair). The green brick and blue hatched areas generally have soil supportive of long-term acceptance rate (LTAR) for drip range of 0.07 to 0.15. The pretreatment standard used for the drip may vary with individual soil areas based on the soil characteristics and proposed site/lot development plans.

These estimates reference Subchapter 18E – Wastewater Treatment and Dispersal Systems for North Carolina and use a LTAR of 0.225 to 0.35 gpd/ft² for Gravel, Accepted, PPBPS, and low profile chamber (18E.0901[c]), 0.06 to 0.15 gpd/ft² for LPP (18E.0907[c]), and 0.06 to 0.15 gpd/ft² for drip septic systems (18E.0908[d]). This assumes DSE effluent entering the drainfield unless a higher effluent standard is needed for the septic system(s) such as advanced pretreatment. The local health department and/or licensed soil scientist will determine the ultimate septic system type and LTAR after their lot specific evaluation. Some septic systems (such as drip systems) on these properties may need a special site evaluation/soil hydraulic conductivity (Ksat) testing and a wastewater engineered design prior to securing a septic permit. S&EC can assist with Special Site Evaluations/Ksat testing, septic layouts, and design daily flow sizing calculations if requested.

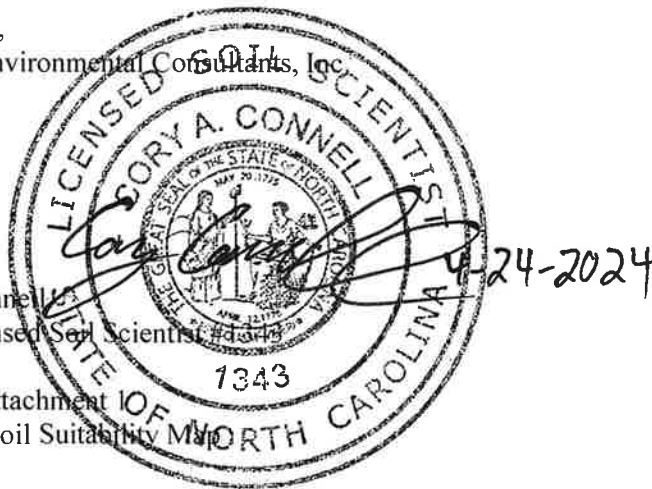
This report discusses the general location of potentially useable soils for on-site subsurface wastewater disposal and, of course, does not constitute or imply any approval or permit as needed by the client from the local health department. S&EC is a professional consulting firm that specializes in the delineation of soil areas for wastewater disposal, and the layout and design of wastewater treatment systems. 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 these governing agencies. Because of this, S&EC cannot guarantee that areas delineated and/or systems designed will be permitted by the governing agencies. As always, S&EC recommends that anyone making financial commitments on a tract be fully aware of individual permit requirements on that tract prior to final action.

An individual septic system permit will be required for each lot/area prior to obtaining a building permit. This will involve a detailed evaluation by the local health department or a licensed soil scientist to determine, among other things, system type, system size and layout, well, drive and house location. Only after developing this information can a final determination be made concerning specifics of system design and site utilization.

This report and site evaluation is not conformant to the Engineered Option Permit (EOP), Authorized Onsite Wastewater Evaluator (AOWE) Permit Option, or the G.S. 130A-335(a2) hybrid private septic permitting process. Additional site testing and evaluations will be required to utilize a private septic permitting process and/or to obtain a septic permit from the local health department. The soil report and map associated with this project is for the exclusive use of the addressee and the use or reliance by all others is expressly denied without the written consent of S&EC.

Soil & Environmental Consultants, Inc. is pleased to be of service in this matter and we look forward to assisting with any site analysis needs you may have in the future. Please feel free to call with any questions or comments.

Sincerely,
Soil & Environmental Consultants, Inc.



Cory Connell
NC Licensed Soil Scientist #1343

Encl: Attachment I
Soil Suitability Map

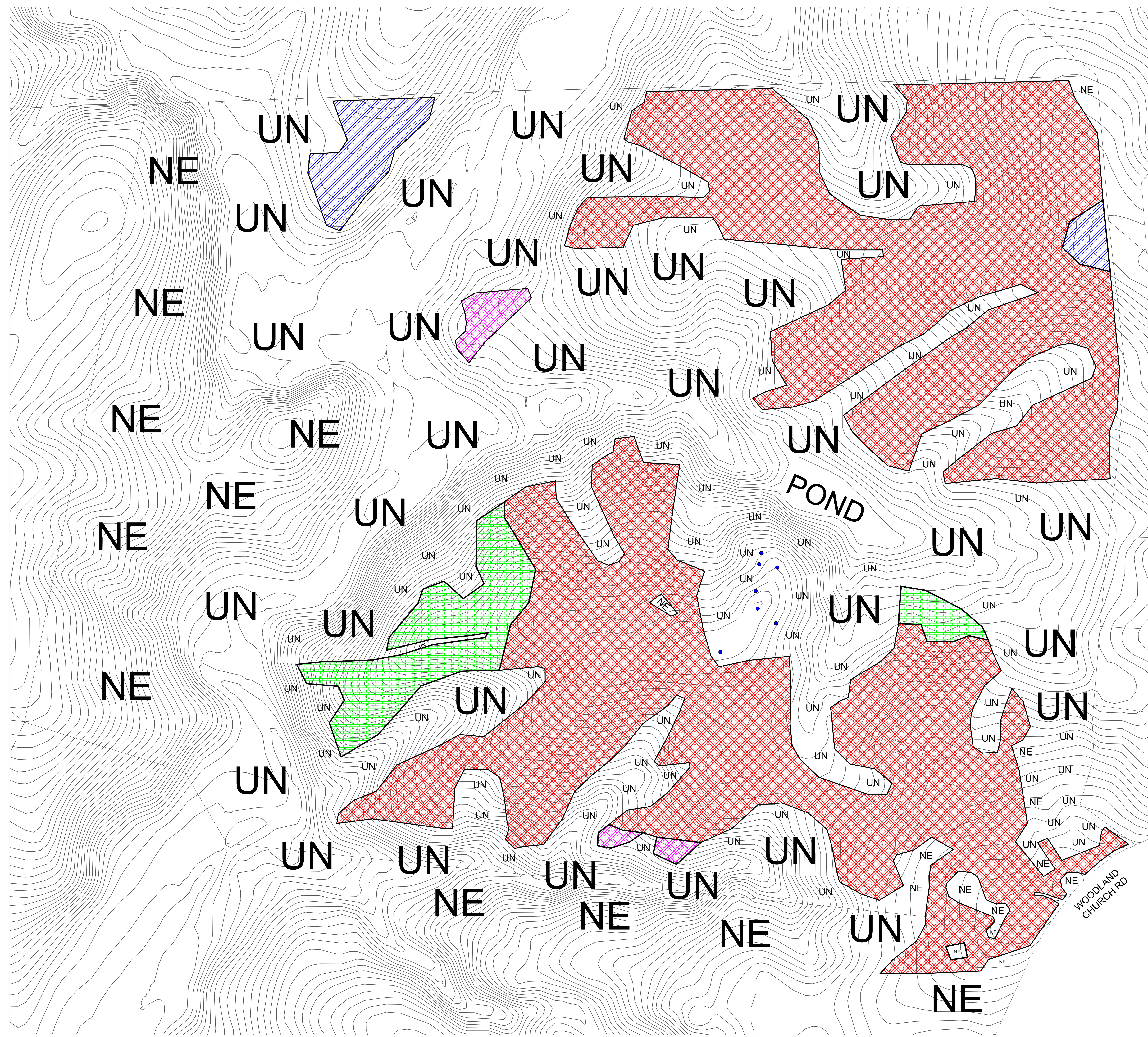
Attachment 1**15A NCAC 18E .0601 LOCATION OF WASTEWATER SYSTEMS**

- (a) Every wastewater system shall be located the minimum setbacks from the site features specified in Table IX. The setback shall be measured on the ground surface, unless otherwise specified in this Rule, from the nearest wastewater system component sidewall or as otherwise specified in a system specific rule or PIA Approval.

TABLE IX. Minimum setbacks from all wastewater systems to site features

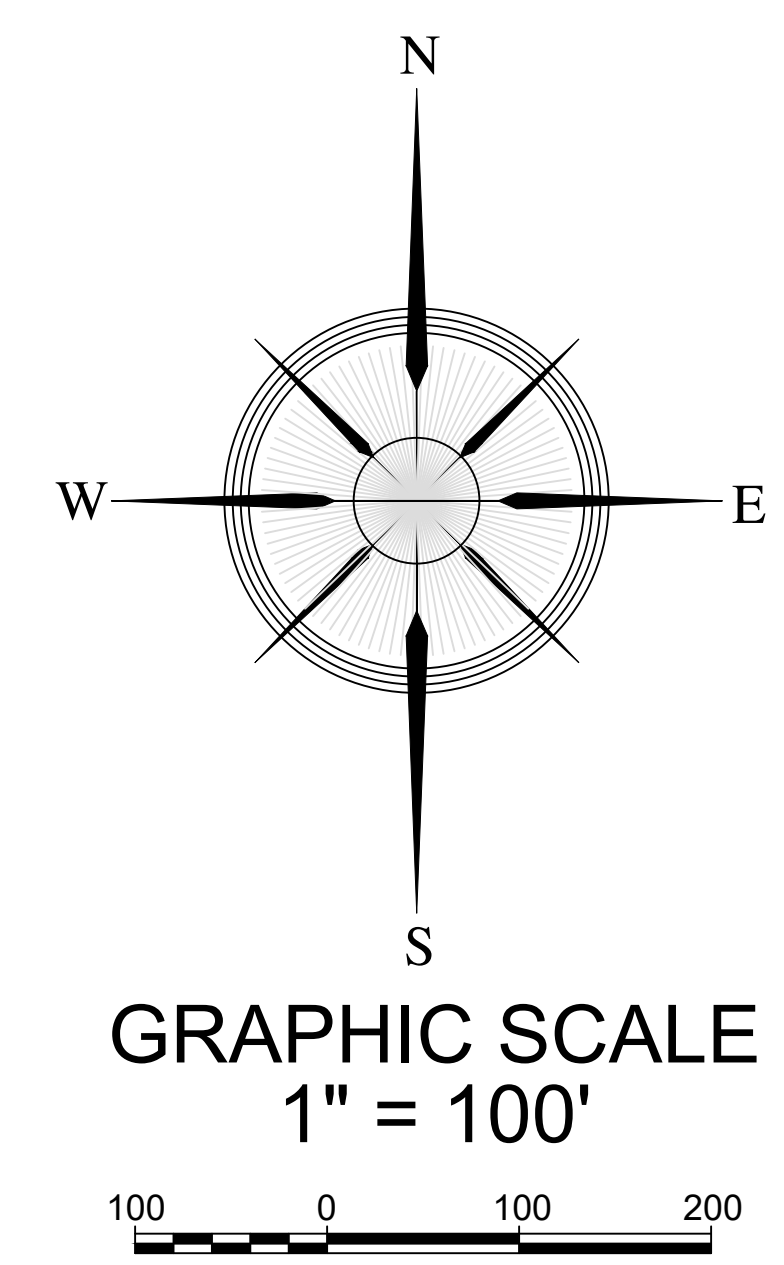
Site Features	Setback (feet)
Any transient or non-transient non-community water supply well, community well, shared water supply well, well that complies with 15A NCAC 18A .1700, or water supply spring	100
A private drinking water well or upslope spring serving a single-family dwelling unit	50
Any other well or source not listed in this table, excluding monitoring wells	50
Surface waters classified WS-I, from ordinary high-water mark	100
Waters classified SA, from mean high-water mark	100
Any Class I or Class II reservoir, from normal water level	100
Lake or pond, from normal water level	50
Any other stream, non-water supply spring, or other surface waters, from the ordinary high-water mark	50
Tidal influenced waters, such as marshes and coastal waters, from mean high-water mark	50
Permanent stormwater retention basin, from normal water level	50
Any water line, unless the requirements of Paragraph (l) have been met. Collection sewers & water lines shall not cross except in conditions stated in 15A NCAC 18E .0601 (m).	10
Closed loop geothermal wells	50 for drainfields at the time the well is constructed and 15 for water-tight sewer collection mains & septic supply lines (see 15A NCAC 02C.0222)
Building foundation and deck supports	5
Patio, porch, stoop, lighting fixtures, or signage, including supporting structures such as posts or pilings	1
Any basement, cellar, or in-ground swimming pool	15
Buried storage tank or basin, except stormwater	10
Above ground swimming pool and appurtenances that require a building permit	5
Top of slope of embankment or cuts of two feet or more vertical height with a slope greater than 50 percent	15
Top of slope of embankment or cuts of two feet or more vertical height with a slope greater than 33 percent and less than or equal to 50 percent	15 If the site has suitable soil depth that extends for a minimum horizontal distance of 15 feet from the edge of the dispersal field, no minimum setback is required.
Top of slope of embankment or cuts of two feet or more vertical height with a slope less than 33 percent	0
Groundwater lowering system, as measured on the ground surface from the edge of the feature	25
Downslope interceptor drains and surface water diversions with a vertical cut of more than two feet, as measured on the ground surface from the edge of the feature	15
Upslope and sideslope interceptor drains and surface water diversions with a vertical cut of more than two feet, as measured on the ground surface from the edge of the feature	10
A stormwater collection system as defined in 15A NCAC 02H .1002(48), excluding gutter drains that connect to a stormwater collection system, with a vertical cut of more than two feet as measured from the center of the collection system	10
Bio-retention area, injection well, infiltration system, or dry pond	25
Any other dispersal field, except designated dispersal field repair area for project site	20
Any property line	10
Burial plot or graveyard boundary	10
Above ground storage tank from dripline or foundation pad, <i>whichever is more limiting</i>	5
Utility transmission and distribution line poles and towers, including guy wires, <i>unless a greater setback is required by the utility company</i>	5
Utility transformer, ground-surface mounted	5
Underground utilities	5

Note: Collection sewers and septic supply lines shall be located the minimum setbacks to site features shown in Table IX (above), unless a different minimum setback is specified in Table XII. If the design flow is over 3,000 gallons per day (GPD) some setbacks may exceed the setbacks stated above, see Table XI. Depending on local and county regulations some setbacks may be more restrictive.



LEGEND

	Areas contain soils with 26 to 36 inches or more of useable material and have the potential for Gravel pipe, Accepted, Panel Block, Low Profile Chamber, shallow placed drain lines, and/or low pressure pipe septic systems.
	Areas contain soils with 26 to 30 inches or more of useable material and have the potential for shallow placed Gravel pipe, shallow placed Accepted, shallow placed horizontal Panel Block, Low Profile Chamber, and/or low pressure pipe septic systems.
	Areas contain soils with 18 to 22 inches or more of useable material and have the potential for pretreatment (NSF/ANSI 40, TS-I, TS-II, and/or RCW) subsurface drip septic systems with inclusions of areas that could be evaluated through backhoe pits by the county health dept or a soil scientist to see if there are more cost effective septic types that could potentially work. Ksats and an engineered septic system may be needed within these areas.
	Areas contain soils with 13 to 18 inches or more of useable material and have the potential for pretreatment (NSF/ANSI 40, TS-I, TS-II, and/or RCW) subsurface drip septic systems. Ksats and an engineered septic system will likely be needed within these areas.
●	Soil boring locations that are considered UNSUITABLE for subsurface septic systems but these locations and the nearby area can be further evaluated by a licensed soil scientist through backhoe pit evaluations to determine if a appropriate, sand lined trench, and/or pretreatment subsurface drip septic system may have potential in this area. If the soils/appropriate in this area can support an advanced, alternative subsurface septic system, Ksats may be required and the system may need to be engineered prior to septic permitting.
UN	Unsuitable areas due to soil wetness condition, soil depth, clay mineralogy, and/or landscape position.
NE	Areas that were not evaluated due to being outside S&EC's scope of work, due to existing soil/dirt piles, or due to existing concrete pads.



**THIS MAP AND CORRESPONDING SITE EVALUATION IS NOT CONFORMANT TO THE ENGINEERED OPTION PERMIT (EOP), A2 HYBRID, OR AOWE SEPTIC PERMITTING PROCESS. ADDITIONAL SITE TESTING AND EVALUATIONS WILL BE REQUIRED TO UTILIZE A PRIVATE SEPTIC PERMITTING PROCESS OR OBTAIN A SEPTIC PERMIT THROUGH THE LOCAL HEALTH DEPARTMENT.

**SUITABLE FOR PRELIMINARY PLANNING PURPOSES ONLY. SITE WILL REQUIRE APPROVAL BY THE COUNTY HEALTH DEPARTMENT AND/OR SOIL SCIENTIST ON A CASE BY CASE BASIS. THIS MAP SHOULD BE USED AS A GENERAL GUIDE. SOME ADJUSTMENTS WILL BE NECESSARY IN THE FIELD DUE TO SOIL VARIABILITY AND TOPOGRAPHIC IRREGULARITIES. THIS MAP ONLY REFLECTS EXISTING SOIL SUITABILITY FOR ON-SITE SEPTIC TANK SYSTEMS. SOME OTHER CONSIDERATIONS THAT AFFECT SITE SUITABILITY THAT SHOULD BE CONSIDERED IN DEVELOPMENT DESIGN ARE:

- 1) 10' SETBACK FROM PROPERTY LINE
- 2) 50' TO 100' SETBACK FROM ANY WELL (DEPENDING ON THE SEPTIC TYPE & WELL TYPE)

SEE ACCOMPANYING S&EC REPORT.

PRELIMINARY SOIL/SITE EVALUATION. SOIL LINES WERE DELINEATED IN THE FIELD BY S&EC PERSONNEL. THE SOIL LINES WERE SKETCHED ONTO THE MAP BASED ON TOPOGRAPHY, GPS POINTS, AND OTHER SITE FEATURES. SOME AREAS MAY NEED BACKHOE PIT EVALUATIONS AT THE TIME OF SEPTIC PERMITTING. 4-24-2024

NOT A SURVEY.
2-FOOT CONTOURS &
PARCEL BOUNDARIES FROM
NCONEMAP.COM.

		Soil & Environmental Consultants, Inc. 8412 Falls of Neuse Rd., Suite 104 • Raleigh, North Carolina 27615 • Phone: (919) 846-5900 • Fax: (919) 846-9467 www.SandEC.com	
Location:	GRANVILLE CO., NC	Client:	LILIAM HOMES INC
Project:	DAVIS PROPERTY, WOODLAND CHURCH ROAD	Sheet Title:	PRELIMINARY SOILS/SITE EVALUATION MAP
Project No.:	16021.51	Project Manager:	CC
Drawn:	CC	Field Work:	CC, JL, MB
Date:	APRIL 24, 2024	Sheet No.:	E size of