

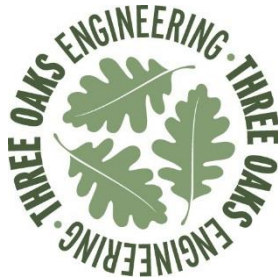
SEPTIC SYSTEM LAYOUT

PIN: 180502787451
Bennett Road
Granville County, NC
Three Oaks Job # 20-790

Prepared For:

Emily Moss
2492 Patton Lane
Franklinton, NC 27525

Prepared By:



324 Blackwell Street, Suite 1200
Durham, NC 27701
(919) 732-1300

September 17, 2020

A handwritten signature in blue ink, appearing to read 'Michael G. Wood', is written over the printed name.

Michael Wood



INTRODUCTION & SITE DESCRIPTION

A septic system layout was conducted on a portion of the 44.22-acre tract located on Bennett Road in Granville County, NC (PIN: 180502787451). The purpose of this evaluation was to field demonstrate adequate available space to support a subsurface septic system (both initial and repair system) for three single-family residences. The property was evaluated in accordance with North Carolina statutes for waste disposal (“Laws and Rules for Sewage Treatment and Disposal Systems”, amended December 6, 2018).

A 2018 soil map, created by Central Carolina Soil Consulting, had previously identified Provisionally Suitable soil areas on the property. These areas were the focus of the investigation. The areas of investigation are identified on Figure 1 as Layout 1, 2, and 3. A four-bedroom single-family residence with a design daily flow of 480 gallons per day (GPD) is proposed for Layout 1. A three-bedroom single-family residence with a design daily flow of 360 gallons per day (GPD) is proposed for Layouts 2 and 3.

INVESTIGATION METHODOLOGY

The field survey was conducted on September 10, 2020, by Michael G. Wood, LSS and Evan T. Morgan, LSS. Soil borings were advanced throughout the lot with a hand-auger and soil color was determined with a Munsell Soil Color Chart. Observations of the landscape (slope, drainage patterns, etc.) as well as soil properties (depth, texture, structure, soil wetness, restrictive horizons, etc.) were recorded. Soil borings were described per the USDA-NRCS, *Field Book for Describing and Sampling Soils, Version 3.0*. Proposed septic system drainlines were demonstrated on-contour with a laser level and marked various colored pin flags. Soil borings were marked with various colored flagging.

FINDINGS

Layout 1

Multiple soil borings were advanced throughout the agricultural field and the locations of the pertinent borings in relation to the drainfield layout are noted on Figure 2. Detailed soil boring descriptions are attached.

Provisionally Suitable Soil. Soil Borings rated as Provisionally Suitable for Conventional Systems (blue flags) or Provisionally Suitable for Modified/Alternative Systems (blue flags) typically exhibited a very friable, sandy loam textured surface with weak, medium, granular structure. Upper subsurface horizons typically exhibited a friable, sandy loam or sandy clay loam, texture with weak, medium, subangular blocky structure that ranged in depth from 25 to 36+ inches. Lower subsurface horizons were typically described with soil wetness.

An area of soil rated as Provisionally Suitable for Modified/Alternative Systems was identified at the bottom of the field and encompasses approximately 4,400 sq-ft (Figure 2). Based on the soil physical properties (texture, structure, consistence), usable soil depth, uniformity, and landscape position of the soil unit, a long-term acceptance rate (LTAR) of 0.325 GPD/sq-ft is proposed.

Septic System Layout-Initial System

Based upon a 480 GPD flow and 0.325 LTAR, 370 linear feet of “Accepted Systems” drainline, utilizing 25% reduction in overall length, is required for the initial system. Six drainlines, totaling 399 linear feet, were field demonstrated on-contour on 9-foot centers (Table 1). Maximum bottom of trench depth is proposed as 13” with a 6-inch soil cap of Group I, II, or III soils to be placed over the entire drainfield. Serial distribution is proposed.

Table 1. Demonstrated Drainlines

Line #	Color	Relative Elevation	Field Length (ft)	System Length (ft)
1-1	Blue	100.00	35	35
1-2	Orange	99.64	60	60
1-3	White	99.06	81	80
1-4	Red	98.63	89	85
1-5	Yellow	97.92	84	80
1-6	Pink	97.39	50	50
			Total	390

Repair System

An area of soil rated as Provisionally Suitable for Subsurface Drip Systems (pink/black flags) was identified upslope of the initial drainfield and encompasses approximately 8,200 sq-ft (Figure 2). Usable soil depths in this area range from 14 to 21 inches below the ground surface. The repair system is proposed as a subsurface drip system. Pre-treatment levels will be determined at the time of Improvement Permit application but are anticipated to be TS-II. Utilizing a LTAR of 0.1 GPD/sq-ft, a 480 GPD system would require 2,400 linear feet of drip tubing and 4,800 sq-ft of usable soil. The identified soil unit is sufficiently large enough to support the repair area.

Layout 2

Multiple soil borings were advanced throughout the side slope and the locations of the pertinent borings in relation to the drainfield layout are noted on Figure 3. Detailed soil boring descriptions are attached.

Provisionally Suitable Soil. Soil Borings rated as Provisionally Suitable for Conventional Systems or Provisionally Suitable for Modified/Alternative Systems typically exhibited a very friable, sandy loam textured surface with weak, medium, granular structure. Upper subsurface horizons typically exhibited a friable, sandy loam or sandy clay loam, texture with weak, medium, subangular blocky structure that ranged in depth from 27 to 31 inches. Lower subsurface horizons were typically described with soil wetness.

An area of soil rated as Provisionally Suitable for Modified/Alternative Systems was identified and encompasses approximately 3,500 sq-ft (Figure 3). Based on the soil physical properties (texture, structure, consistence), usable soil depth, uniformity, and landscape position of the soil unit, a LTAR of 0.3 GPD/sq-ft is proposed.

Septic System Layout-Initial System

Based upon a 360 GPD flow and 0.3 LTAR, 300 linear feet of “Accepted Systems” drainline, utilizing 25% reduction in overall length, is required for the initial system. Five drainlines, totaling 310 linear feet, were field demonstrated on-contour on 9-foot centers (Table 2). Maximum bottom of trench depth is proposed as 14” with a 5-inch soil cap of Group I, II, or III soils to be placed over the entire drainfield. Serial distribution is proposed.

Table 2. Demonstrated Drainlines

Line #	Color	Relative Elevation	Field Length (ft)	System Length (ft)
2-1	White	100.00	68	65
2-2	Red	99.09	61	60
2-3	Yellow	98.09	75	75
2-4	Blue	97.32	56	55
2-5	Orange	96.74	50	50
			Total	305

Repair System

An area of soil rated as Provisionally Suitable for Subsurface Drip Systems was identified around the initial drainfield and encompasses approximately 8,700 sq-ft (Figure 3). Usable soil depths in this area range from 15 to 34 inches below the ground surface. The repair system is proposed as a subsurface drip system. Pre-treatment levels will be determined at the time of Improvement Permit application but are anticipated to be TS-II. Utilizing a LTAR of 0.1 GPD/sq-ft, a 360 GPD system would require 1,800 linear feet of drip tubing and 3,600 sq-ft of usable soil. The identified soil unit is sufficiently large enough to support the repair area.

Layout 3

Multiple soil borings were advanced throughout the upper ridge and the locations of the pertinent borings in relation to the drainfield layout are noted on Figure 4. Detailed soil boring descriptions are attached.

Provisionally Suitable Soil. Soil Borings rated as Provisionally Suitable for Modified/Alternative Systems or Provisionally Suitable for Low-Profile Chamber Systems typically exhibited a very friable, sandy loam textured surface with weak, medium, granular structure. Upper subsurface horizons typically exhibited a friable, sandy loam or firm, sandy clay loam, texture with weak, medium, subangular blocky structure that ranged in depth from 23 to 29 inches. Lower subsurface horizons were typically described with soil wetness.

An area of soil rated as Provisionally Suitable for Low-Profile Chamber Systems was identified and encompasses approximately 3,800 sq-ft (Figure 4). Based on the soil physical properties (texture, structure, consistence), usable soil depth, uniformity, and landscape position of the soil unit, a LTAR of 0.3 GPD/sq-ft is proposed. An additional area of soil rated as Provisionally Suitable for Low-Profile Chamber Systems that encompasses approximately 2,600 sq-ft was identified on an adjacent ridge and could potentially be used to supplement the initial system layout if a larger house size is desired.

Septic System Layout-Initial System

Based upon a 360 GPD flow and 0.3 LTAR, 400 linear feet of Low-Profile Chamber drainline is required for the initial system. Six drainlines, totaling 445 linear feet, were field demonstrated on-contour on 9-foot centers (Table 3). Maximum bottom of trench depth is proposed as 9" with a 6-inch soil cap of Group I, II, or III soils to be placed over the entire drainfield. Serial distribution is proposed.

Table 3. Demonstrated Drainlines

Line #	Color	Relative Elevation	Field Length (ft)	System Length (ft)
L3-1	Blue	100.00	60	60
L3-2	Yellow	98.97	70	70
L3-3	White	97.97	75	75
L3-4	Orange	97	80	80
L3-5	Blue	95.82	80	80
L3-6	Red	94.62	80	80
			Total	445

Repair System

An area of soil rated as Provisionally Suitable for Subsurface Drip Systems was identified downslope of the initial drainfield and encompasses approximately 3,900 sq-ft (Figure 4). Usable soil depths in this area range from 13 to 16 inches below the ground surface. The repair system is proposed as a subsurface drip system. Pre-treatment levels will be determined at the time of Improvement Permit application but are anticipated to be TS-II. Utilizing a LTAR of 0.1 GPD/sq-ft, a 360 GPD system would require 1,800 linear feet of drip tubing and 3,600 sq-ft of usable soil. The identified soil unit is sufficiently large enough to support the repair area.

Site Improvements

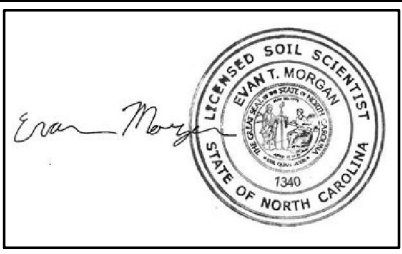
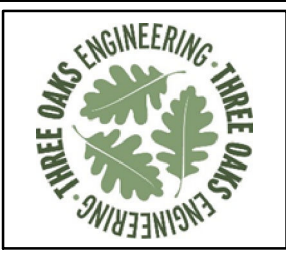
It is recommended that every drainfield have a curtain drain placed around the uppermost drainline to capture and divert subsurface water.

CONCLUSIONS

The findings presented herein represent Three Oaks' professional opinion based on our Soil Evaluation and knowledge of the current laws and rules governing on-site wastewater systems in North Carolina. Sufficient drainline was field demonstrated to support the initial systems for two 360 GPD and one 480 GPD initial ultra-shallow conventional or low-profile chamber drainfields. Repair areas are proposed as subsurface drip systems utilizing an LTAR of 0.1 GPD/sq-ft, TS-II pre-treatment, and 1,800 linear feet of drip tubing for 360 GPD and 2,400 linear feet of drip tubing for 480 GPD.

Soils naturally change across a landscape and contain many inclusions. As such, attempts to quantify them are not always precise and exact. Due to this inherent variability of soils and the subjectivity when determining limiting factors, there is no guarantee that a regulating authority will agree with the findings of this report. Any concurrence with the

findings of this report will be made by Granville County Environmental Health at the time of their evaluation.



Septic System Layout

Bennett Road

Granville County, North Carolina

Date: September 2020

Scale: 0 130 260 Feet

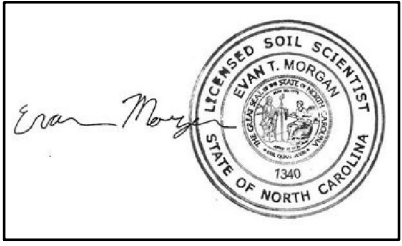
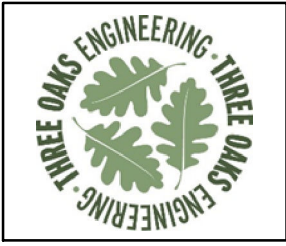
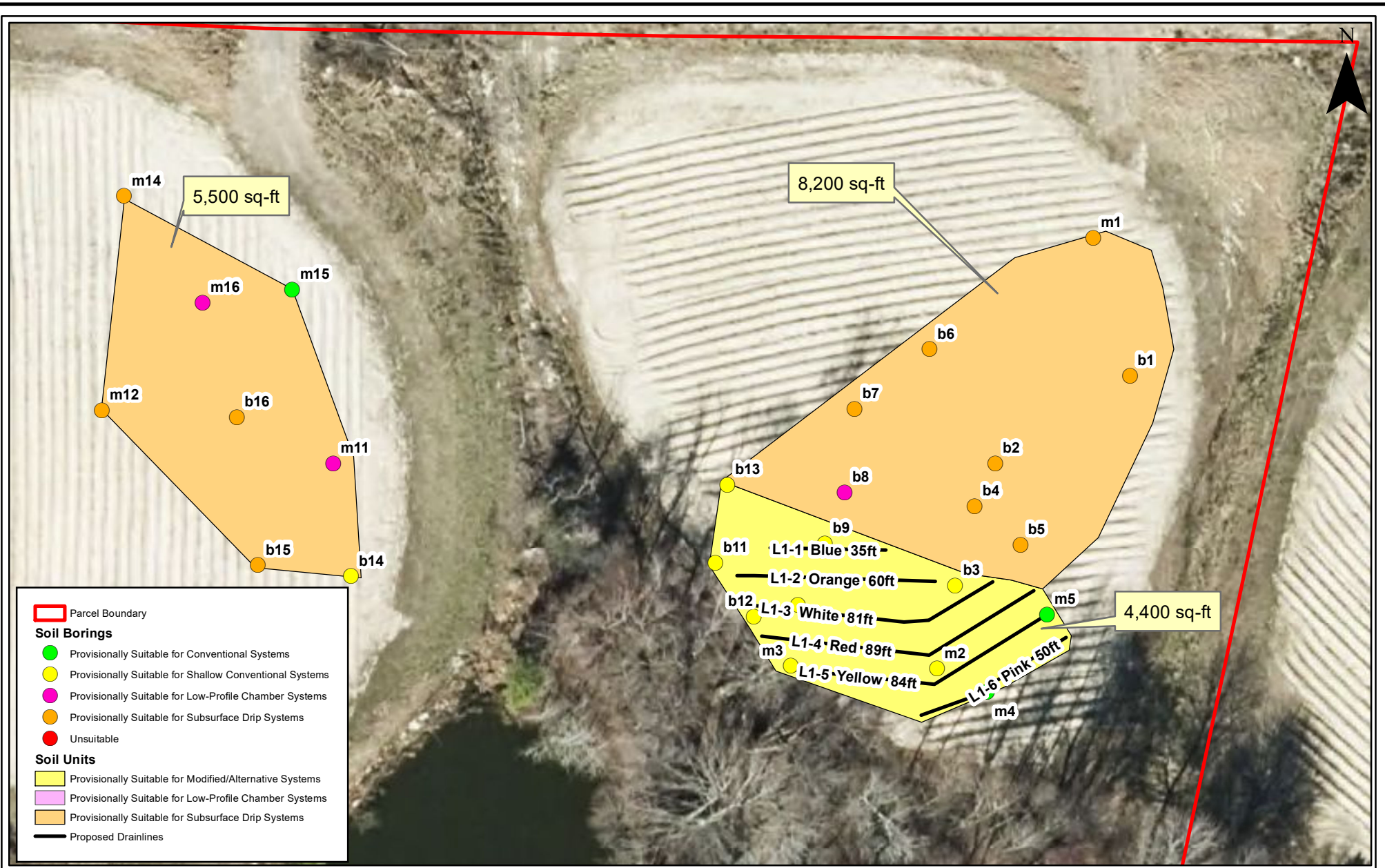
Job No.: 20-790

Drawn By: ETM

Checked By: MGW

Figure

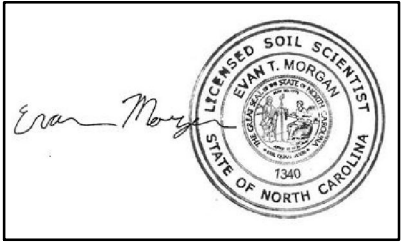
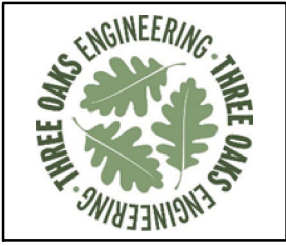
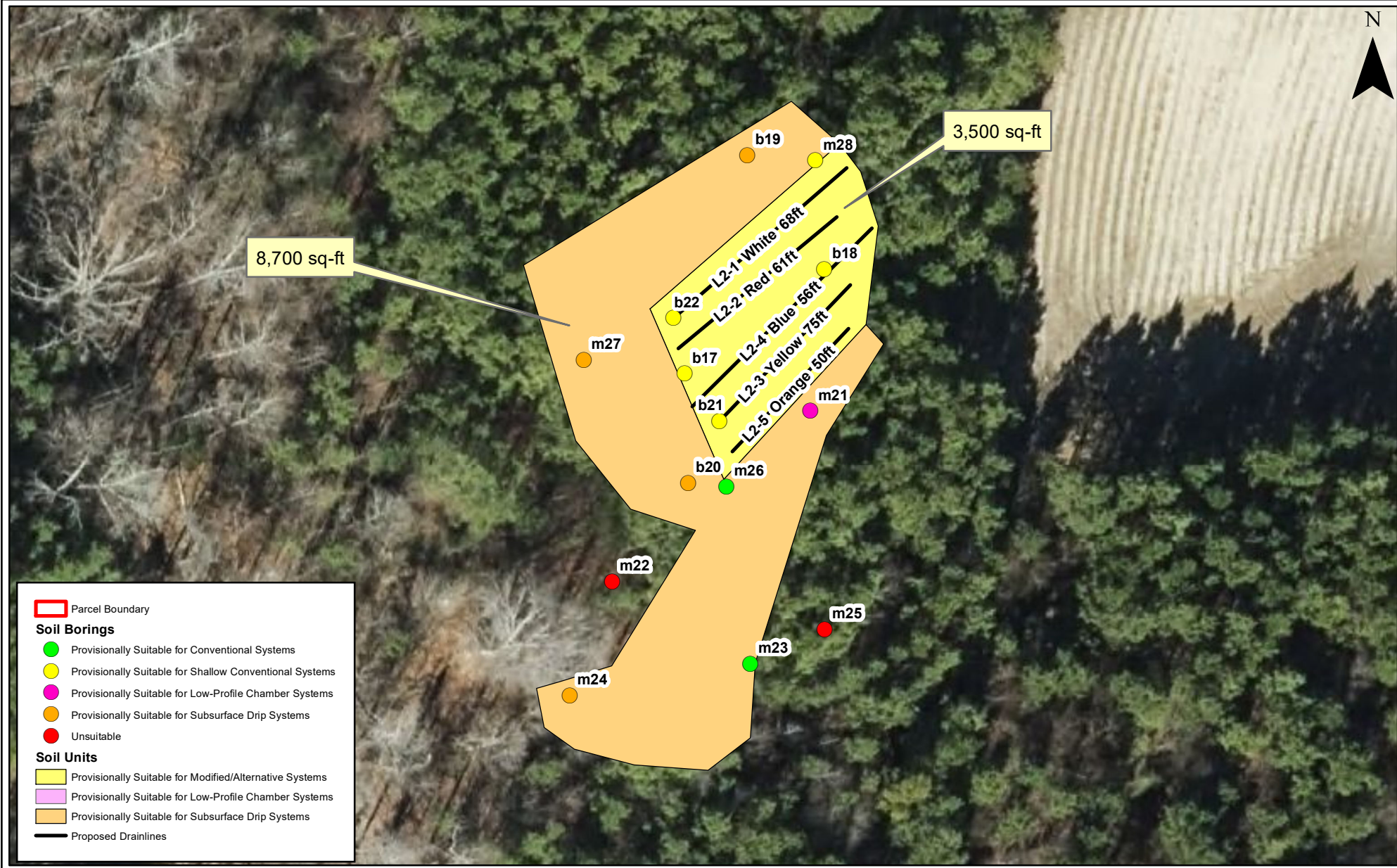
1



Septic System Layout
 Bennett Road
 Layout 1
 Granville County, North Carolina

Date:	September 2020
Scale:	0 10 20 Feet
Job No.:	20-790
Drawn By:	ETM
Checked By:	MGW

Figure
2



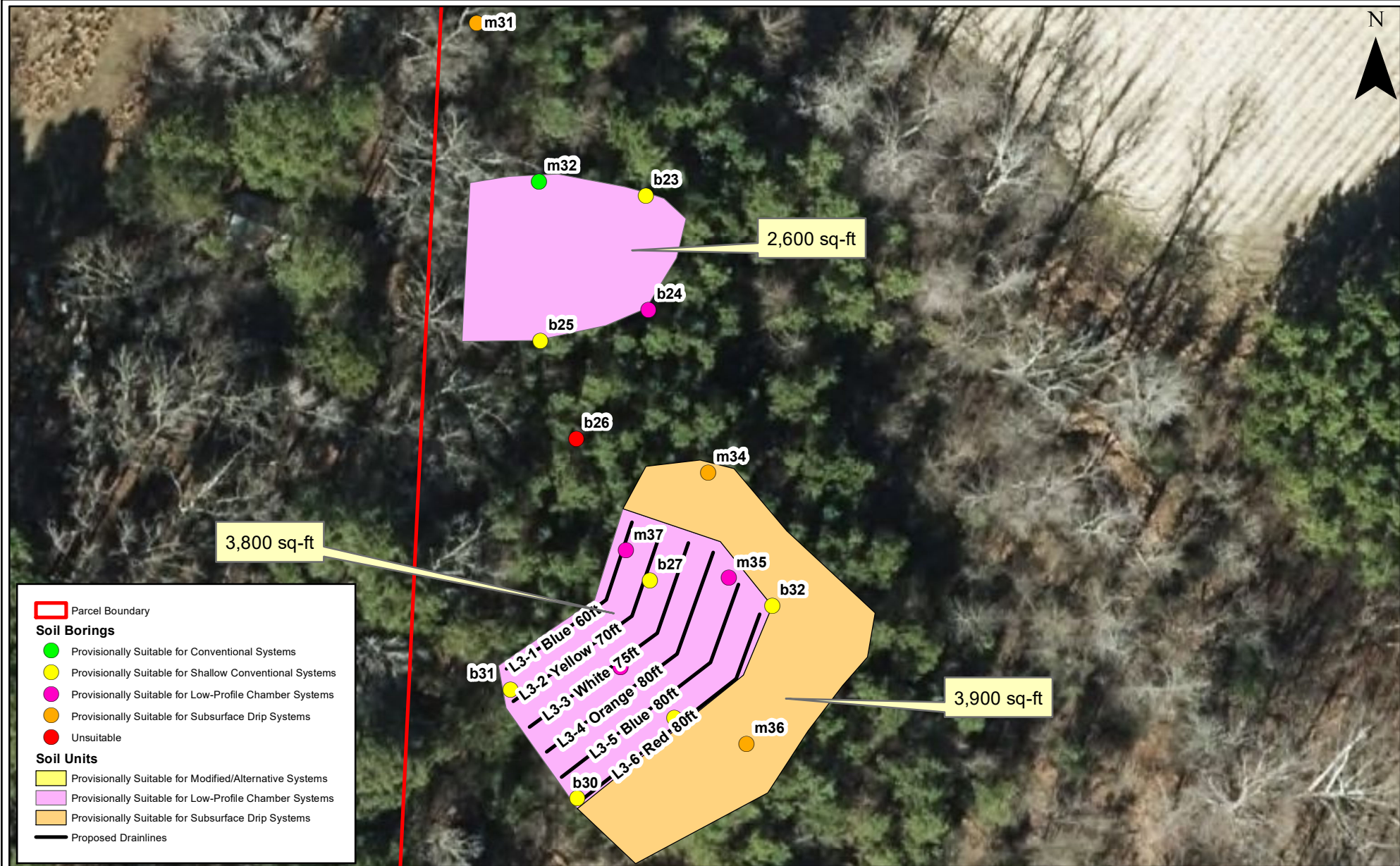
Septic System Layout

Bennett Road
Layout 2

Granville County, North Carolina

Date:	September 2020
Scale:	0 10 20 Feet
Job No.:	20-790
Drawn By:	ETM
Checked By:	MGW

Figure
3



Soil Evaluation Form

Three Oaks Engineering
324 Blackwell Street, Suite 1200
Durham, NC 27701
919.732.1300

Sheet 1 of 7
Job: 20-790 Bennett Road
County: GRANVILLE
Date: 9/16/11

Soil Borings

	M1	M2	M3	M4	M5					
Landscape Position	LS	LS	ES	LS	LS					
Slope (%)	4	4	4	4	4					
Horizon 1 Depth	0-9	0-14	0-14	0-30	0-22					
Texture	SL	SL	SL	SL/LS	SL/LS					
Consistence	VFA	VFA	VFA	VFA	VFA					
Structure	CR	CR	CR	CR/SBK	CR/SBK					
Clay Mineralogy										
Horizon 2 Depth	9-20	14-23	14-30+	30-36+	22-36+					
Texture	SL	SL	SL	SL	SL					
Consistence	FR	FR	FR	FR	FR					
Structure	SBK	SBK	SBK	SBK	SBK					
Clay Mineralogy										
Horizon 3 Depth	20+	23-30+								
Texture	SL	SL								
Consistence	FR	FR								
Structure	M	SBK								
Clay Mineralogy		S								
Horizon 4 Depth										
Texture										
Consistence										
Structure										
Clay Mineralogy										
Horizon 5 Depth										
Texture										
Consistence										
Structure										
Clay Mineralogy										
Soil Wetness	14	28	30							
Restrictive Horizon										
Saprolite										
Other										
CLASSIFICATION	PS-DRP	PS	PS	PS	PS					
LTAR (gpd/ft ²)	.1	0.35	0.4	0.45	0.45					

Comments:

Evaluated by: M. WOOD

Soil Evaluation Form

Three Oaks Engineering
324 Blackwell Street, Suite 1200
Durham, NC 27701
919.732.1300

Sheet 2 of 7
Job: 020-740 Bennett Road
County: GRANVILLE
Date: 9/10/20

Soil Borings

	M11	M12	M13	M14	M15	M16				
Landscape Position	SS	R	R	SS	SS	SS				
Slope (%)	5	2	2	3	5	4				
Horizon 1 Depth	0-9	0-5	0-5	0-10	0-23	0-5				
Texture	SL	SL	SL	SL	SD	SP				
Consistence	VFH	FH	FH	FA	FA	FA				
Structure	GR	GR	GR	GR	GR	GR				
Clay Mineralogy	-	-	-	-	-	-				
Horizon 2 Depth	9-25+	5-16	5-13+	10-14	23-37+	5-17				
Texture	SL	SC	SC	SL	SC	SP				
Consistence	FR	FI	FI	VE-FH	FF	FR				
Structure	SBK	SBK	SBK	M-SB	SBK	SBK				
Clay Mineralogy	-	S	S	-	S	S				
Horizon 3 Depth		16+		14+		17-20				
Texture		SL		SD		SC				
Consistence		FR		FA		FI				
Structure		M		SBK		SBK				
Clay Mineralogy		-		-		S				
Horizon 4 Depth										
Texture										
Consistence										
Structure										
Clay Mineralogy										
Horizon 5 Depth										
Texture										
Consistence										
Structure										
Clay Mineralogy										
Soil Wetness	23"		11	14	35	21				
Restrictive Horizon										
Saprolite		16"								
Other										
CLASSIFICATION	PS-LPC	PS-dip	CL	PS-dip	PS	PS-LPC				
LTAR (gpd/ft ²)	.35	.1		.1	.35	.3				

Comments:

Evaluated by: M. Wood

Soil Evaluation Form

Three Oaks Engineering
324 Blackwell Street, Suite 1200
Durham, NC 27701
919.732.1300

Sheet 3 of 7
Job: 20-790 Bennett Road
County: Granville
Date: 9-10-20

Soil Borings

	M 21	M 22	M 23	M 24	M 25	M 26	M 27	M 28		
Landscape Position	TS	LS	LS	LS	TS	LS	LS	LS		
Slope (%)	5	3	3	3	4	3	3	4		
Horizon 1 Depth	0-26+	0-6	0-23	0-15	0-17+	0-31	0-4	0-31+		
Texture	SL	SL	SL	SL	SL	SL	SL	SL		
Consistence	VFA	VFA	VFA	VFA	FR-FE	VFA	VFA	VFA		
Structure	GR-SBK	GR	SBK-GR	SBK-GR	M-GR	SBK-GR	GR	CL-SBK		
Clay Mineralogy										
Horizon 2 Depth		6-14+	23-34	15+		31+	4-15			
Texture		SL	SL	SL		AR	SL			
Consistence		VFS-FR	FR	FR			FR			
Structure		M-SBK	SBK	SBK			SBK			
Clay Mineralogy							S			
Horizon 3 Depth			34+				15+			
Texture			SC				SC			
Consistence			FI				FR			
Structure			SBK				ABK			
Clay Mineralogy			S				S			
Horizon 4 Depth										
Texture										
Consistence										
Structure										
Clay Mineralogy										
Horizon 5 Depth										
Texture										
Consistence										
Structure										
Clay Mineralogy										
Soil Wetness	23	12	34	15	12		15	27		
Restrictive Horizon										
Saprolite										
Other						31				
CLASSIFICATION	PT-LPC	U	PS	PS-drip	U	PS	PS-drip	PS		
LTAR (gpd/ft ²)	.30		0.35	.1		0.4	.1	0.35		

Comments:

M 22 - 6-14 PASSIVE IN PLACE

Evaluated by:

M WOOD

Soil Evaluation Form

Three Oaks Engineering
324 Blackwell Street, Suite 1200
Durham, NC 27701
919.732.1300

Sheet 4 of 7
Job: 20-790 Barrett Road
County: Granville
Date: 01-10-20

Soil Borings

	M31	M32	M33	M34	M35	M36	M37	M38		
Landscape Position	LS	LS	LS	LS	LS	LS	LS	LS		
Slope (%)	5	5	5	5	5	5	5	5		
Horizon 1 Depth	0-10	0-8	0-13+	0-13	0-23+	0-12	0-19	0-15		
Texture	SL	SL	C	SP	SL	SL	SL	SL		
Consistence	VHL	VFI	VFI	VHL	FR-VL	VHL	VHL	VHL		
Structure	GR	GA	ABK	GR	SBK-GR	GR	SBK-GR	SBK-GR		
Clay Mineralogy	—	—	E-S	—	—	—	—	—		
Horizon 2 Depth	10-16	8-17		13-16+	23-26+	12-18+	19-27	15-18+		
Texture	SC	SP		SC	SP	SP	SP	SP		
Consistence	FS	FA		FS	FI	VFI-FI	FR	FR		
Structure	SBK	SBK		SBK	SBK	M-SBK	SBK	SBK		
Clay Mineralogy	S	S		S	S	S	S	S		
Horizon 3 Depth	16+	17-36+								
Texture	C	SP-cl								
Consistence	VFI	FR								
Structure	ABK	SBK								
Clay Mineralogy	E	S								
Horizon 4 Depth										
Texture										
Consistence										
Structure										
Clay Mineralogy										
Horizon 5 Depth										
Texture										
Consistence										
Structure										
Clay Mineralogy										
Soil Wetness	16	34	11	13	23	16	23	15		
Restrictive Horizon	16									
Saprolite										
Other										
CLASSIFICATION	P-drip	PS	UL	P-drip	PS-LPC	PS-drip	PS-LPC	PS-drip		
LTAR (gpd/ft ²)	.1	0.35		.1	.3	.1	.3	.1		

Comments:

Evaluated by: M. Wood

Soil Evaluation Form

Three Oaks Engineering
324 Blackwell Street, Suite 1200
Durham, NC 27701
919.732.1300

Sheet 5 of 7
Job: 20-790 Bennett Road
County: Graham
Date: 9-10-20

Soil Borings

	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
Landscape Position	L	L	L	L	L	L	L	L	L	L
Slope (%)	4	2	2	2	2	2	4	2	2	2
Horizon 1 Depth	16	18	16	20	17	16	10	21	18	16
Texture	SL	SL	SL	SL	SL	SL	SL	SL	SL	SL
Consistence	VFR	VFR	VFR	FR	FR	FR	FR	FR	VFR	FR
Structure	GR	GR	GR	GR	GR	GR	GR	GR	GR	GR
Clay Mineralogy	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
Horizon 2 Depth			27				26		26	28
Texture			SCL				SCL		SCL	SCL
Consistence			FR				FR		FR	FR
Structure			SBH				SBH		SBH	SBH
Clay Mineralogy			SE				SE		SE	SE
Horizon 3 Depth										
Texture										
Consistence										
Structure										
Clay Mineralogy										
Horizon 4 Depth										
Texture										
Consistence										
Structure										
Clay Mineralogy										
Horizon 5 Depth										
Texture										
Consistence										
Structure										
Clay Mineralogy										
Soil Wetness	16	18	27	20	17	16	18	21	26	
Restrictive Horizon										
Saprolite										
Other										
CLASSIFICATION	PS-Drip	PS-Drip	PS	PS-Drip	PS-Drip	PS-Drip	PS-Drip	PS-LPC	PS	PS
LTAR (gpd/ft ²)	0.15	.15	0.325	.15	.15	.1	.12	.275	0.325	0.35

Comments:

Evaluated by: E. Morgan

Soil Evaluation Form

Three Oaks Engineering
324 Blackwell Street, Suite 1200
Durham, NC 27701
919.732.1300

Sheet 6 of 7
Job: 20-790 Bennett Road
County: Granville
Date: 9-10-20

Soil Borings

	B11	B12	B13	B14	B15	B16	B17	B18	B19	B20	B21
Landscape Position	L	L	L	L	L	L	L	L	L	L	L
Slope (%)	2	2	2	4	5	5	2	4	2	2	4
Horizon 1 Depth	16	28	25	16	17	15	16	18	15	17	18
Texture	SL	SL	SL	SL	SL	SL	SL	SL	SL	SL	SL
Consistence	VFR	VFR	FR	FR	FR	FR	FR	FR	FR	FR	FR
Structure	GR	GR	GR	GR	GR	GR	GR	GR	GR	GR	GR
Clay Mineralogy	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
Horizon 2 Depth	28	38		28			27	28			28
Texture	SCL	SCL		SCL			SCL	SCL			SCL
Consistence	FI	FI		FI			FR	FI			FR
Structure	SBA	SBA		SBA			SBA	SBA			SBA
Clay Mineralogy	SE	SE		SE			SE	SE			SE
Horizon 3 Depth											
Texture											
Consistence											
Structure											
Clay Mineralogy											
Horizon 4 Depth											
Texture											
Consistence											
Structure											
Clay Mineralogy											
Horizon 5 Depth											
Texture											
Consistence											
Structure											
Clay Mineralogy											
Soil Wetness	28	28	25	28	17	15	27	28	15	17	26
Restrictive Horizon											
Saprolite											
Other											
CLASSIFICATION	PS	PS	PS	PS	PS-Drip	PS-Drip	PS	PS	PS-Drip	PS-Drip	PS
LTAR (gpd/ft ²)	0.35	0.35	.325	.3	.1	.1	0.35	0.35	.1	.1	0.325

Comments:

Evaluated by: E. Morgan

Soil Evaluation Form

Three Oaks Engineering
324 Blackwell Street, Suite 1200
Durham, NC 27701
919.732.1300

Sheet 7 of 7
Job: 20-110 Bennett Road
County: Granville
Date: 9-10-20

Soil Borings

	B22	B23	B24	B25	B26	B27	B28	B29	B30	B31	B32
Landscape Position	L	L	L	L	L	L	L	L	L	L	L
Slope (%)	2	2	2	5	2	4	2	5	5	5	5
Horizon 1 Depth	16	18	21	18	12	15	14	17	16	15	16
Texture	SL	SL	SL	SL	SL	SL	SL	SL	SL	SL	SL
Consistence	FR	FR	FR	FR	FR	FR	FR	FR	FR	FR	FR
Structure	GR	GR	GR	GR	GR	GR	GR	GR	GR	GR	GR
Clay Mineralogy	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
Horizon 2 Depth	27	30		28		26	22	29	27	28	28
Texture	SCL	SCL		SCL		SCL	SCL	SCL	SCL	SCL	SCL
Consistence	FF	FR		FF		FR	FF	FR	FF	FF	FF
Structure	SBH	SBH		SBH		SBH	SBH	SBH	SBH	SBH	SBH
Clay Mineralogy	SE	SE		SE		SE	SE	SE	SE	SE	SE
Horizon 3 Depth											
Texture											
Consistence											
Structure											
Clay Mineralogy											
Horizon 4 Depth											
Texture											
Consistence											
Structure											
Clay Mineralogy											
Horizon 5 Depth											
Texture											
Consistence											
Structure											
Clay Mineralogy											
Soil Wetness			21	28	12						
Restrictive Horizon											
Saprolite	27	30				26	22	29	27	28	28
Other					E-P-12						
CLASSIFICATION	PS	PS	PS-LPC	PS	U	PS	PS	PS	PS	PS	PS
LTAR (gpd/ft ²)	0.35	0.375	.3	0.35		0.325	0.3	0.35	0.325	0.325	0.325

Comments:

Evaluated by: E. Morgan