Engineers and Soil Scientists

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Soils & Site Evaluation Report – On-site Wastewater Systems

1352 Cypress Church Road
Cameron, NC
Harnett County

PIN: 9544-65-7451 & 9544-66-2660

Prepared for: Mike Erpenbach, Client

Prepared by: Karl Shaffer, LSS
Senior Soil Scientist

Report date: November 28, 2017

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Mike Erpenbach, 1352 Cypress Church Road, Cameron, NC
Harnett County, NC
(PARCELS 9544-65-7451, 9544-66-2660)

PREPARED FOR: Mike Erpenbach, Client

PREPARED BY: Karl Shaffer, LSS
Senior Soil Scientist

DATE: November 28, 2017

Agri-Waste Technology, Inc. (AWT) was contracted to perform a soils & site evaluation on Parcels 9544-65-7451 and 9544-66-26609505 at 1352 Cypress Church Road in Harnett County, NC. These parcels are contiguous, and the client wishes for review of potential of 1-2 septic sites over these parcels. Municipal water and wastewater services are not available at this property; therefore, on-site water (well) and wastewater (septic) will be required. Surrounding properties are served by on-site systems also; however, no significant setback adjustments are anticipated based on the location of their components. The following report and attachments summarize the findings of the evaluation performed by Karl Shaffer and Trent Bostic on November 27, 2017.

The combined subject properties are approximately 39 acres in size. A map of the property, based on current Harnett County GIS information, is included in Attachment 1 to this report. The exact location of the soil borings can be found on the attached site and soils maps. The following information describes the findings of the soil evaluation. The evaluated areas are in mature woods of mainly pines and a few hardwoods. The areas evaluated are on a gently sloping convex ridge and associated sideslopes. The slopes over the subject area range from 1 to 6 percent, with the majority being under 4 percent.

Findings

Two distinct areas, separated by a drainageway with wet soils, were evaluated. The soils noted are a variant of the Blaney and Gilead soil series. Blaney soils are deep and well drained with a thick sandy surface. The soils noted on the property have similar characteristics, except that depth to seasonal wetness ranges from 28 to 40 inches versus the typical well drained Blaney soils. The Gilead soils noted on the tract have depth to seasonal wetness ranging from 10 to 18 inches and thus classify as unsuitable for septic systems.

Two separate and distinct areas are defined on the attached site map that depict areas of Blaney soils that have a minimum depth to any soil limitation of 24 inches. The average soil condition is that the depth to limiting condition, that being seasonal high water table, is typically 30 inches or more. These areas are those defined as the better suited soils of those evaluated for on-site (septic) systems. For all these soils mentioned, the subsoil clays are non-expansive and the soils are classified as provisionally suitable for conventional or shallow conventional on-site wastewater systems in North Carolina. A typical soil profile description is attached to this report. Soil borings were flagged in the field and their locations/depths are noted on the attached evaluation map.

Two soils "polygons" lines are shown on the soil map encompassing the area defined by soils with depths greater than 24 inches. The deeper soils (greater than 30 inches) should be targeted for the primary septic system location, with the shallower soils being used, where necessary, for the septic repair area. Should the home be sited in an area lower in elevation than these suitable soils, a pump system may be employed.

Area A is in the wooded section on the northern parcel and on a gently sloping convex ridge. These soils are in the Blaney series variants as described above. This area is approximately 29,000 square feet and easily is adequate for a new septic system and repair area for a 4-bedroom or 5-bedroom home. The area south of Area A is Gilead soils which are unsuitable for septic systems.

Area B is on the southern parcel and is wooded with gentle sideslopes. These soils are a variant of Blaney soils as described above. This area is approximately 30,800 square feet and easily is adequate for a new septic system and repair area for a 4-bedroom or 5-bedroom home, or possibly two smaller septic systems. This area was noted to have a brittle consistence in the subsoil from about 18 to 30 inches. The soil structure is subangular blocky parting to small platy structure. Texture is sandy loam to light sandy clay loam. We feel that this minor amount of brittleness is insignificant and should not affect the ability of this site to be permitted for conventional or shallow conventional septic use. However, further testing may need to be employed to verify this. Should this specific area not be suited for a conventional type septic system due to soil structure, alternative system types may be employed to overcome this site limitation.

Typically, conventional septic systems require approximately 10,000 to 15,000 ft^2 of space (depending on the number of bedrooms in the home). The attached spreadsheet gives approximate area requirements for a 3, 4, or 5 bedroom home to be sited in the suitable soils areas. The exact size will be dictated by the LTAR selected by the Harnett County Health

Department at the time of permitting. Our recommendation is that these soils support a LTAR of 0.40 gallons per day per square foot. The spreadsheet defines the area needed for both the primary and repair areas.

Conclusions

Based on the site findings, there appears to be sufficient area with suitable soils and space for construction of at least two new single family homes with conventional or shallow conventional septic systems (repair system with conventional or shallow conventional soils) at the two locations noted on the tract. The Harnett County Department of Environmental Services will ultimately be responsible for issuing the permit.

We appreciate the opportunity to assist you. Please contact us with any questions, concerns, or comments upon review of this package.

Sincerely,

Karl Shaffer

Karl Shaffer, LSS

Summary of Attachments

Attachment 1: GIS Map
Attachment 2: AWT Evaluation Map
Attachment 3: Typical Soil Profile Descriptions
Attachment 4: Example Loading Rate & Area Calculations

ATTACHMENT 1: GIS Map

Agri-Waste Technology, Inc.
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Soil Evaluation Map

Erpenbach
Harnett Co., NC

N

Suitable Soil Area:

Area A- 29,203 sq.ft.
Area B- 30,789 sq.ft.

Soil Types:

BnB-Blaney loamy sand
GaB-Gilead loamy sand
Ro-Roanoke loam

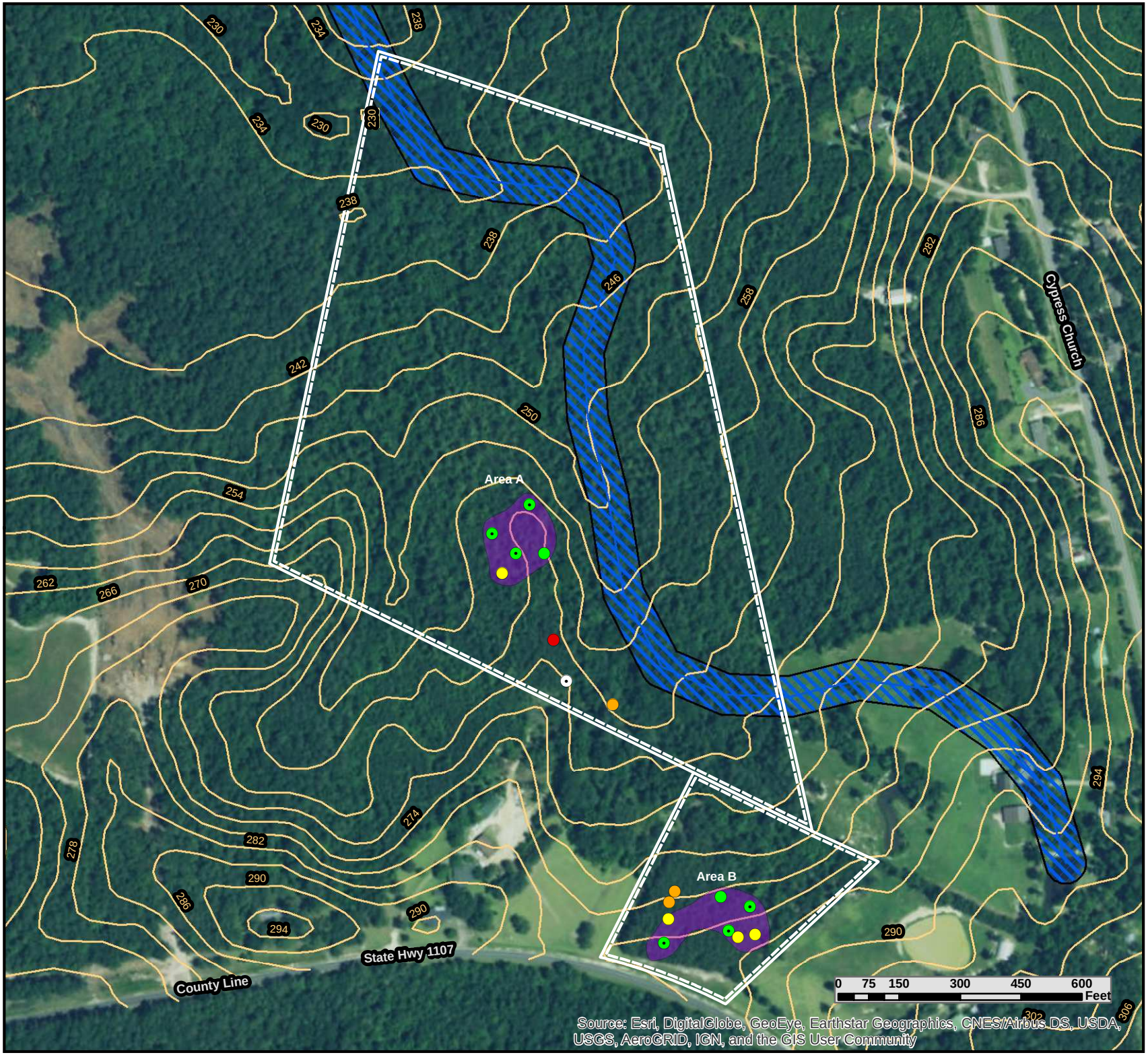
Legend

- Parcel
- Parcel Buffer 10'
- Suitable Soil Area
- 2 ft. Contour
- Surface Water
- Surface Water Buffer 50'

Soil Boring Depth (in.)

- <12"
- 12-17"
- 18-23"
- 24-29"
- 30-35"
- 36"+

Drawn By: Julie Davidson
Reviewed By: Jeff Vaughan
Date: 11/28/17



*** This map was created for proposed planning purposes only. It is not intended to be used as a plat or survey map of any type.***

ATTACHMENT 2: AWT Evaluation Map

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Soil Evaluation Map

Erpenbach
Harnett Co., NC

N

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Legend

- Parcel
- Parcel Buffer 10'
- Suitable Soil Area
- Surface Water
- Surface Water Buffer 50'
- Soil Type

Soil Boring Depth (in.)

- <12"
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Drawn By: Julie Davidson
Reviewed By: Jeff Vaughan
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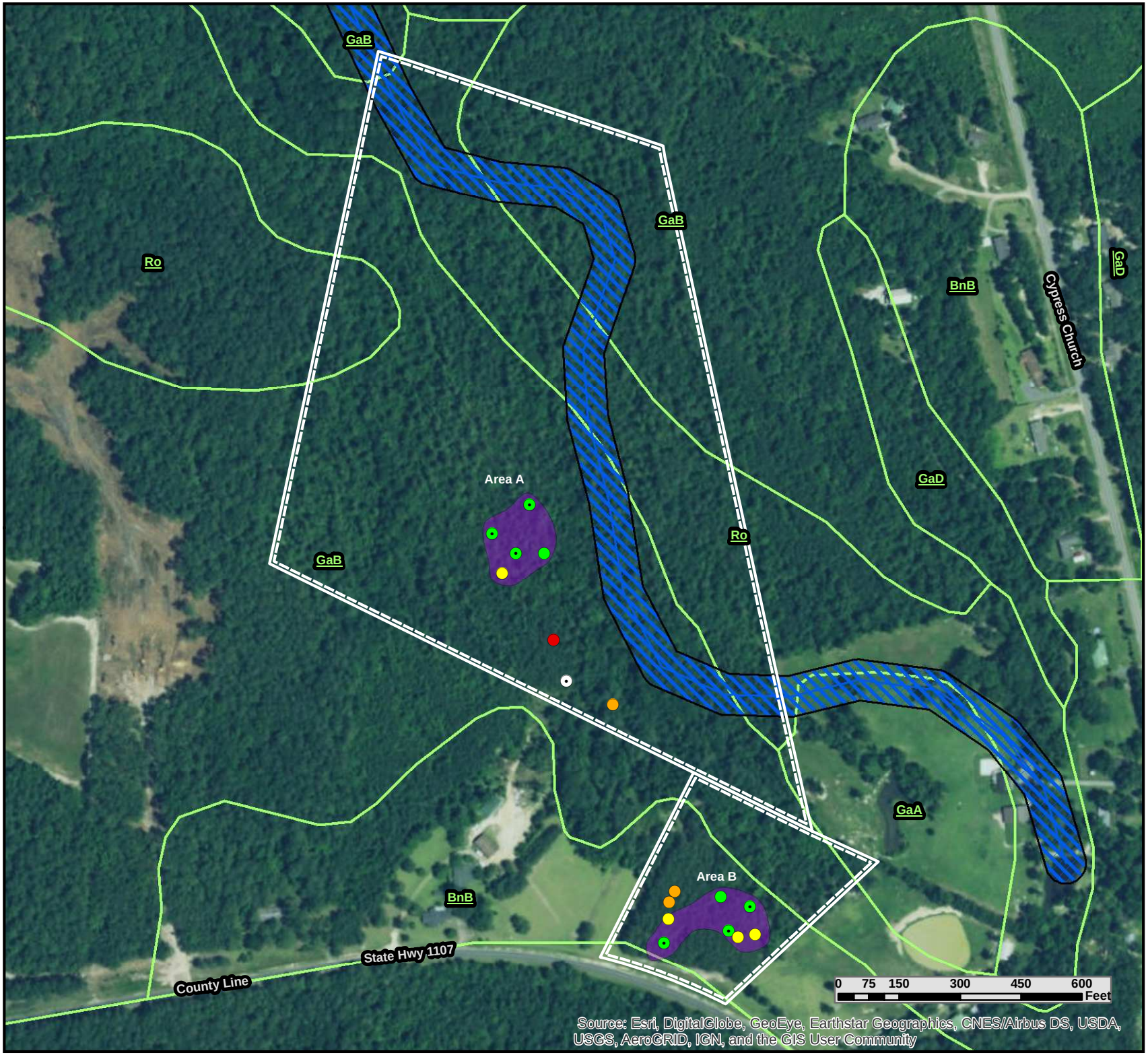

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ATTACHMENT 3: Typical Soil Profile Descriptions

PIN#: 9544-65-7451 & 9544-66-2660
County: Harnett

SOIL/SITE EVALUATION
FOR
ON-SITE WASTEWATER SYSTEM

Client: Mike Erpenbach

Owner:_____ Agent:_____ Buyer: X

Address:

Proposed Facility: Residences- 2

Property Size: 39 acres

Location Site: 1352 Cypress Church Road Cameron, NC Harnett County

Water Supply: On-Site Well X Comm. Well___ Public___ Other___ Evaluation Method: Auger Boring X Pit____Cut_____

TYPICAL PROFILE- PROVISIONALLY SUITABLE SOILS

Horizon/ Depth (IN)	Matrix	Mottles	Mottle Abundance / Contrast	(a)(1) Texture	(a)(2) Structure	(a)(3) Mineralogy	Consistence (Wet)	Consistence (Moist)
A 0-8"	**10YR 4/3**	**N/A**	**N/A**	**LS**	**GR**	**NEXP**	**NS, NP**	**VFr**
E 8-22"	**10YR8/1**	**NA**	**NA**	**LS**	**S.G., Loose**	**NEXP**	**NS, NP**	**VFr**
Bt1 22-34"	**10 YR 6/6**	**NA**	**NA**	**SL**	**1fSBK**	**NEXP**	**NS,NP**	**Fr**
Bt2 34-40+"	**10YR 5/6**	**C2d10YR6/2, c2d5YR5/8**	**Common**	**SCL**	**1mSBK**	**NEXP**	**NS, NP**	**Fr**

.1940 Landscape Pos/Slope %	convex ridge and sideslopes 2-4%	Profile LTAR (estimated)	0.40 GPD/FT^2
.1942 Wetness Condition	- PS	System Type	Conventional or shallow conventional for primary and repair (see report for details)
.1943/.1956 Saprolite	- PS		
.1944 Restrictive Horizon	- PS		
.1948 Profile Classification	- PS		

Depth to seasonal wetness ranges from 24 to over 36 inches across the area proposed for the septic systems (both). Some soils have arenic surface, Bt horizons are sandy loam and sandy clay loam. Bt structure is weak SBK but small thin platy pieces were excavated and the soil feels somewhat brittle due to lack of soil moisture. Trench excavation will readily eliminate this condition.

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

STRUCTURE

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

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

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 4: Example Loading Rate & Area Calculations

Conventional Septic System Area Computation

Created by: KS
Created on: 11/27/2017
Updated on: NA

Client Name:	*Erpenbach*	
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	(Conventional - Pipe & Gravel)
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:	*Erpenbach*	
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	(Conventional - Pipe & Gravel)
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:	*Erpenbach*	
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	(Conventional - Pipe & Gravel)
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.