Southeastern Soil & Environmental Associates, Inc.

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June 16, 2004

Mr. Joe West
Harnett County Health Department
PO Box 09
Lillington, N.C. 27546

Re: Soil/site evaluation and drainage design, Proposed Lots 34 - 35, Highland Forest Subdivision, Harnett County, North Carolina

Dear Mr. West,

A preliminary soils investigation and drainage design has been completed for the above referenced lots. The purpose of the investigation was to evaluate and identify the extent of soil areas that have the ability to be modified to support a subsurface waste disposal systems for proposed 3 bedroom homes. All ratings and determinations were made in accordance with "Laws and Rules for Sanitary Sewage Collection, Treatment, and Disposal, 15A NCAC 18A .1900".

Southeastern Soil and Environmental Associates, Inc. (SSEA) performed these soil evaluations in June, 2004. SSEA traversed the property and observed landforms (slope, drainage patterns, etc.) as well as soil conditions through the use of hand auger borings, compact constant head permeameter (CCHP) in formulating a drainage design for the proposed site. From these observations and readings, a drainage design is enclosed for submission to the Harnett County Health Department.

DISCUSSION OF SOILS

The soils in the proposed area were somewhat uniform in nature consisting of 130 or more inches of loamy sand/sandy loam. The deeper borings revealed no confining layer within 10 feet of the soil surface. Loamy sand and sand (C) horizons were loose and very friable with no evidence of compaction. A typical long term acceptance rate (LTAR) for this soil type would range between 0.6 gpd/sq. ft. and 1.2 gpd/sq. ft.

DISCUSSION OF DRAINAGE

The site has existing drainage (ditch) on the northern and western sides of the property and empties into a creek north of the property. The purpose of additional drainage is to lower the water table to a depth of 36 or more inches.

HYDRAULIC CONDUCTIVITY

2 (CCHP) conductivity measurements were made in the proposed area in the C horizons. Values ranged from 63.02 cm/hr (24.81 in/hr) to 71.66 cm/hr (28.21 in/hr) in the C sand/loamy sand horizons. The lower C horizon, however, will control subsurface drainage if drains are installed in this layer. The lowest conductivity observed in the C horizon was 63.02 cm/hr (24.81 in/hr). Using a conservative approach, this lower rate (24.81 in/hr) was used in designing the drainage system.

DRAINAGE EQUATION

The Ellipse Equation was used to determine drain spacing (see attached). The method was developed by Dr. Bob Uebler in developing drainage systems for the Coastal Plain area. It is suitable for small area drainage. Based on the equation, assuming a desired 36 inch drawdown and 4.00 foot drain depth, drain spacing would need to equal 245 feet or less. Since the proposed lots have varying widths of frontage (but less than 245 feet) and it is desirable to locate the drain tiles on the property lines, the drain spacing used will vary. Drains will be spaced on every other lot line. The enclosed design was based on this spacing.

DRAINAGE OUTLET

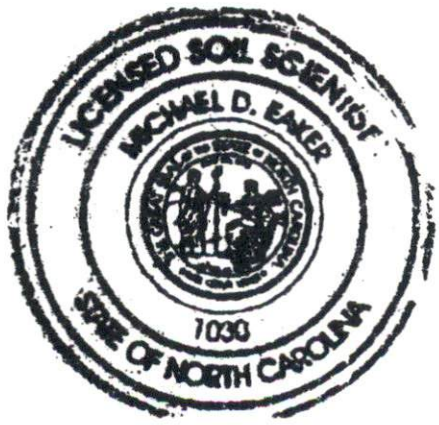
Topographical elevations were taken to determine the adequacy of the existing drainage in relation to the planned drainage. Because the designed drainage requires a drain depth of at least 4.00 feet and a minimum grade of 0.1% is required, an outlet depth of 4.8 feet is required. Based on elevational data, an adequate outlet (5.0 ft or greater) exists to the west (see map).

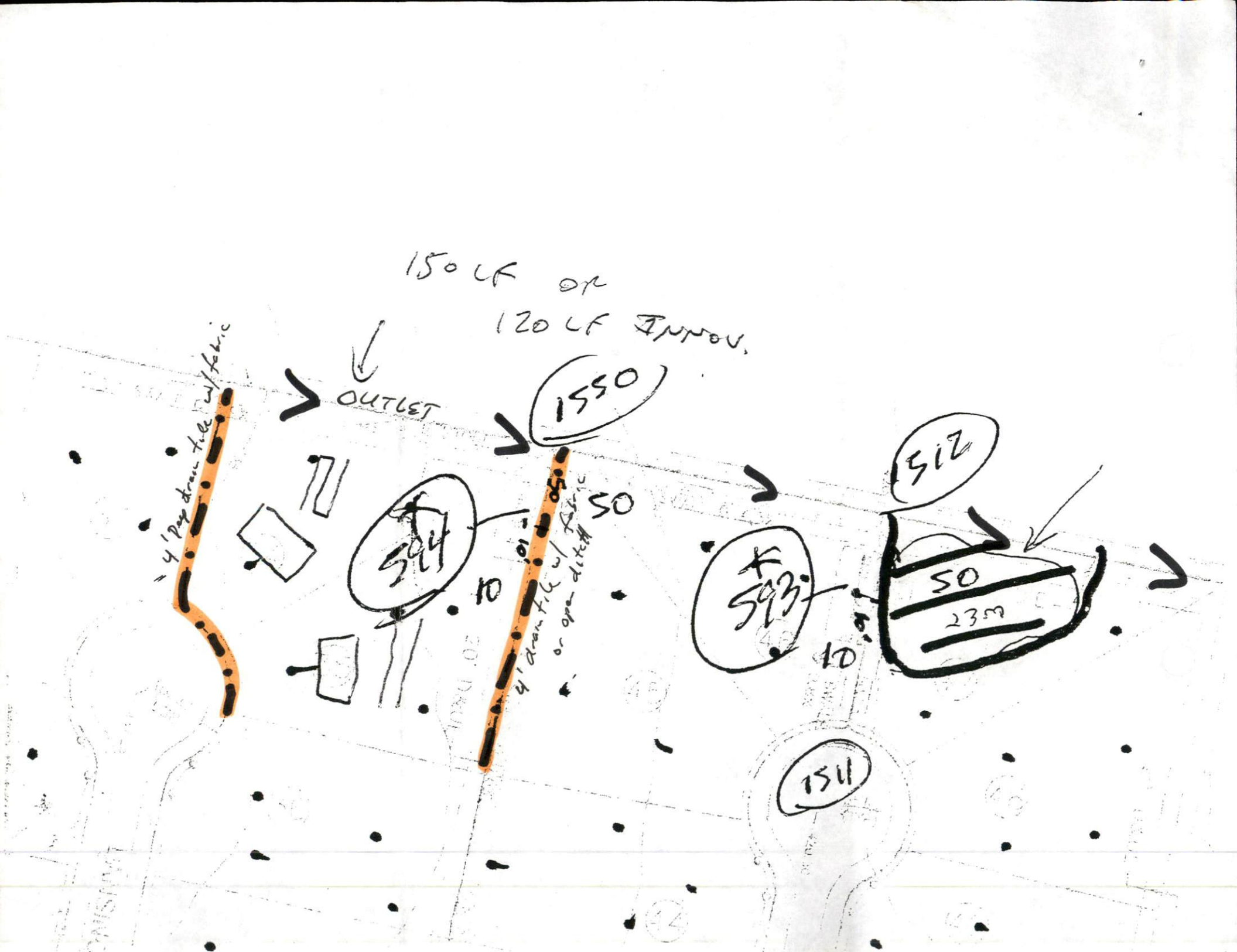
Based on this design, these soils appear to be capable of modification and reclassification for on-site waste disposal (conventional system). The design is based on the use of 4" fabric covered drain tile. It does not include a gravel envelope.

This report, of course, does not guarantee, constitute or imply any approval, or permit, as needed by the client from the local health department. Such approval is dependent on their adoption of these recommendations and issuance of the appropriate permits. Southeastern Soil and Environmental Associates, Inc. is pleased to be of service in this matter. We look forward to assisting in additional site analysis needs you may have in the future. Please feel free to call with any questions.

Sincerely,

Mike Eaker
President




150 LF OR
120 LF INFOV.
OUTLET
1550
4' Dep drain tile w/ fabric
4' drain tile w/ fabric
or open ditch
544
543
512
511
50
10
50
23m
10

DRAINAGE SYSTEM DESIGN

Robert L. Uebler, Ph.D.
Soil Specialist
N.C. Division of Health Services

Frequently it is necessary to artificially lower the water table before a septic tank soil absorption system can be installed. The objective of such drainage is to maintain the water table 1 foot below the bottom of the septic system trenches at all times of the year. Since the trenches are normally installed 18 inches or deeper in the soil, the water table must be kept 30 inches below the soil surface in order to maintain a 1 foot separation between the trench bottom and water table.

Artificial drainage systems can be designed with ditches or drain tile. Ditches should not be used in sand or loamy sand soils as they require too much maintenance. The depth of the drainage system is controlled by the available outlet. Elevations between the outlet and the proposed system must be determined to establish the possible depth of the drainage system.

The spacing between drains is determined from the Ellipse Equation:

$$S = \sqrt{\frac{4P\ (b^2 - a^2)}{Q_d}}$$

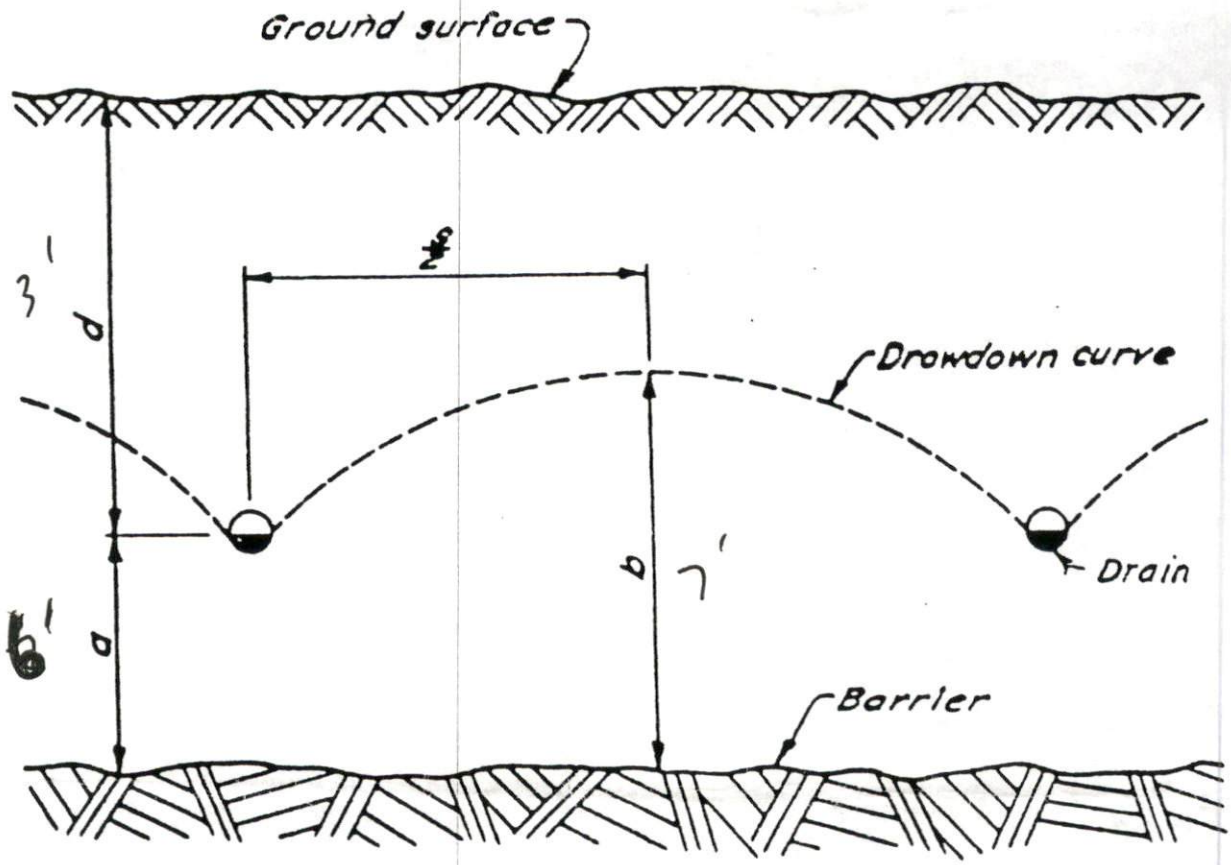
Figure 1 is presented to assist in defining the various terms of the equation:

1. S is the drain spacing in feet.

2. P is the permeability of the soil when saturated with water given in inches per hour. The permeability depends greatly on the texture and structure of the soil. Estimated permeabilities for the various textural groups are as follows:

Texture	Permeability (in/hour)
Sand	20.0
Sandy loam	2.0
Loam	1.0
Sandy clay loam	0.5
Clay loam	0.2
Clay	<0.2

FIGURE 1.



Nomenclature used in ellipse equation