

April 20, 2007
Project #4-1708.S3

Mr. Tom Beebe
REIS, LLC
125 Hampton Pines Drive
Morrisville, NC 27560

Re: **Detailed Soil/Site Evaluation** for Subsurface Wastewater Applications on Lystra Gardens
Project - Chatham County, NC

Dear Mr. Beebe:

Soil & Environmental Consultants, PA (S&EC) performed a detailed soil/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 or surface wastewater disposal. In addition to work previously completed on this project, this map and report includes additional work performed in April 2007. This additional work was performed at your request to seek out areas that may be suitable for alternative subsurface septic systems. This work was concentrated in and around the 21 "C" Lots as shown on the most recent site plan received from John R. McAdams in April 2007.

DETAILED SOIL/SITE EVALUATION FOR SUBSURFACE APPLICATIONS

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 soil conditions. From these observations, an evaluation of the site was developed, relative to subsurface disposal of wastewater. The soil/site evaluation criteria used is that contained in 15 A NCAC 18A .1900 "Laws and Rules for Sewage Treatment and Disposal Systems".

FINDINGS

This site is located in the northeast region of Chatham County. The upland soils on this tract are similar to the Wedowee, Pacolet, Rion, Louisburg, Helena, Hard Labor, Wake, and Rolesville soil series. The Wedowee, Pacolet, Rion, Louisburg, and Hard Labor soil series are generally greater than 30 inches deep to prohibitive characteristics and are generally suitable for conventional type septic systems. The Helena soils have wetness conditions and mixed clay mineralogy and are generally unsuitable for conventional type septic systems. The Wake and Rolesville soils have varying depths to rock and hard saprolite, and these soils are generally unsuitable for conventional type septic systems.

It is important to note that the majority of soils on this site have a bouldery to extremely bouldery surface. For subsurface septic systems, removal of surface boulders will be necessary prior to installation of a system. The potential exists for site disturbance to occur during the removal of these boulders. Proper care should be taken to minimize disturbance in potential drainfield areas.

The accompanying AutoCAD map indicates the areas with potential use for subsurface wastewater disposal. The **red-slashed units** indicate areas of soils which are at least 30 inches deep to prohibitive soil characteristics and these areas have potential for a conventional septic system, a modified conventional (shallow placed lines with no fill required over the disposal area) or a low pressure pipe system (LPP) and/or ultra-shallow conventional (shallow placed lines with fill required over the disposal field) system. The **purple-hatched units** indicate areas of soils which are at least 30 inches deep to prohibitive soil characteristics and have potential for the same systems mentioned above. However, these purple-hatched areas have an extremely bouldery surface in many places. Soils in these areas also have varying depths to saprolite. Opinions among local health department officials may vary regarding depth to saprolite and hardness of saprolite in some areas. The **Blue-slashed unit** indicates areas of soils that are 18 to 24 inches deep to prohibitive soil characteristics. These areas have potential for drip irrigation or LPP type systems. The **Green honey-comb hatched units** indicate areas of soils with 12 inches or more of useable material. These areas have potential for subsurface drip irrigation systems using TS-II pretreatment to achieve a vertical separation reduction. These lots will likely require KSAT studies to determine loading rates and suitability. These systems will also require a design by a Professional Engineer. Depending on the results of KSAT studies, space requirements for these systems may vary. The **Orange-hatched units** indicate areas where auger evaluation was limited due to a bouldery surface and rocky subsoil. A backhoe evaluation in these areas is recommended to determine the suitability of these soils. We feel that these areas may have potential for some of the systems mentioned above, but this needs to be confirmed with a backhoe evaluation. Unit "UNS" on the attached map indicates areas of soils that are less than 12-18 inches to prohibitive soil characteristics and are generally unsuitable for the type of systems mentioned above. However, they may be suitable for more expensive alternative septic systems, i.e. subsurface drip irrigation, pretreatment drip or spray irrigation, etc. Such systems are expensive and, if requested, S&EC can provide additional information concerning these types of systems.

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 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 health department. 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 of the proposed septic systems may be required as part of the individual lot development process.

Upon completion of a subdivision plan, S&EC recommends reviewing the plan before recording the subdivision lots. It is important to note that any preliminary certification that a subdivision plan meets does not represent approval or a permit for any site work, nor does it guarantee issuance of an improvement permit for any lot. Final site approval for issuance of improvements is based on regulations in force at the time of permitting and is dependent on satisfactory completion of individual site evaluations following application for an improvement permit detailing a specific use and siting.

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 flow from the source (120 gallons/bedroom/day in residences), and 2) the long term acceptance rate (LTAR) of the soil (based on the hydraulic conductivity of the soil, a function of the soil's

texture, mineralogy, structure, porosity, etc.). The 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 (100'), streams and ponds (50') or more depending on watershed regulations), property lines (10'), top of embankment (15'), watershed buffers, etc. (see Attachment 1).

The utility of a potential useable 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 for a three-bedroom residence is approximately 10,000 to 12,000 ft² (could be more depending on site features) or 800 to 960 linear feet of conventional line (system and repair) or 1440 linear feet of LPP line (system and repair). These estimates reference Laws and Rules for Sewage Treatment and Disposal Systems for North Carolina and use a LTAR of .3 gpd/ft² for conventional septic systems (.1955), a LTAR of .25 gpd/ft² for modified conventional (.1956) and .1 gpd/ft² for LPP septic systems (.1957a). The health department will determine the ultimate LTAR after their lot evaluation. S&EC will be glad to assist in any system layout or 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, including, but not limited to, applying for and obtaining improvement permits and approval from local/State governing authorities on that tract prior to final action.

An individual septic system permit will be required for each lot prior to obtaining a building permit. This will involve a detailed evaluation by the local health department to determine, among other things, 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.

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

Sincerely,

SEAL: _____

Robert Edwin Stott, R.S.
NC Licensed Soil Scientist

Jonathon R. Townsley
NC Soil Scientist in Training

Encl: Attachment 1
Detailed Soil Map – Subsurface Revised April 2007

Attachment 1

.1950 Location of Sanitary Sewage Systems

(c) Every sanitary sewage treatment and disposal system shall be located at least the minimum horizontal distance from the following:

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|--|-------------------------------------|
| (1) any private water supply source including a well or spring | 100 feet |
| (2) any public water supply source | 100 feet |
| (3) streams classified as WS-I | 100 feet |
| (4) water classified as S.A. | 100 feet from mean high water mark |
| (5) Other coastal waters | 50 feet from mean high water mark |
| (6) any other stream, canal, marsh, or other surface waters | 50 feet |
| (7) any Class I or Class II reservoir | 100 feet from normal pool elevation |
| (8) any permanent storm water retention pond | 50 feet from flood pool elevation |
| (9) any other lake or pond | 50 feet from normal pool elevation |
| (10) any building foundation | 5 feet |
| (11) any basement | 15 feet |
| (12) any property line | 10 feet |
| (13) top of slope of embankments or cuts of 2 feet or more vertical height | 15 feet |
| (14) any water line | 10 feet |
| (15) drainage systems: | |
| (A) Interceptor drains, foundation drains and storm water diversions | |
| (i) upslope | 10 feet |
| (ii) sideslope | 15 feet |
| (iii) downslope | 25 feet |
| (B) Groundwater lowering ditched and devices | 25 feet |
| (16) any swimming pool | 15 feet |
| (17) any other nitrification field (except repair area) | 20 feet |
| (b) Ground absorption, sewage treatment and disposal systems may be located closer than 100 feet from a private well supply, except springs and uncased wells located downslope and used as a source of drinking water, repairs, space limitations and other site-planning considerations but shall be located the maximum feasible distance and, in no case, less than 50 feet. | |
| (c) Nitrification fields and repair areas shall not be located under paved areas or areas subject to vehicular traffic. If effluent is to be conveyed under areas subject to vehicular traffic, ductile iron or its equivalent pipe shall be used. However, pipe specified in Rule .1955 (e) may be used if a minimum of 30 inches of compacted cover is provided over the pipe. | |

Note: Systems over 3000 GPD or an individual nitrification fields with a capacity of 1500 GPD or more have more restrictive setback requirements, see .1950 (a) (17) (d) for specifics.

Note: Spray applications are governed by the NC-DWQ .0200 Rules, and have different setbacks than subsurface wastewater systems.

