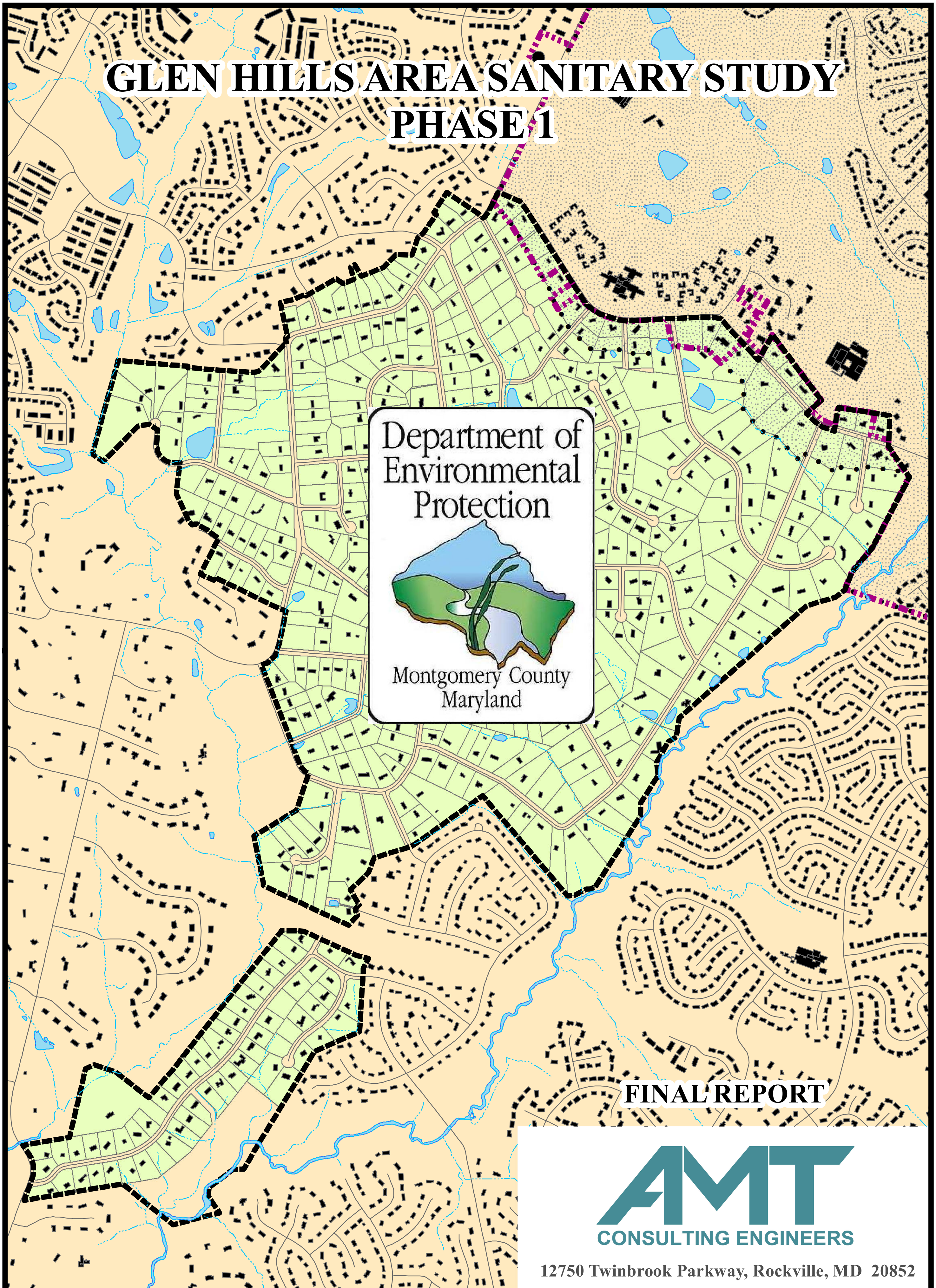
GLEN HILLS AREA SANITARY STUDY
PHASE 1



Department of Environmental Protection

Montgomery County Maryland

FINAL REPORT

AMT
CONSULTING ENGINEERS

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Table of Contents

Appendices

List of Figures

List of Tables

1. Executive Summary

The *2002 Potomac Subregion Master Plan* recommended that Montgomery County conduct a sanitary survey to evaluate the general condition of the septic systems within the study area, determine the probability of continued reliability of these facilities and, if necessary, evaluate the feasibility of extending public sanitary sewer service to portions of the study area. The Department of Permitting Services, Well and Septic Section, has periodically raised concerns with the Department of Environmental Protection about septic system failures in the study area. In some cases, subsurface conditions do not allow for septic system replacements that satisfy current regulations. The first phase of the study evaluated existing conditions that may constrain areas for future use of deep stone trench septic systems.

This report presents the finding of Phase 1, developed to consider the feasibility of the future and continued use of on-site septic systems in the Glen Hill study area as recommended in the 2002 master plan. The study area includes Glen Hills and adjacent neighborhoods and consists of 542 properties. Data was gathered from the Well and Septic Section of the Montgomery County Department of Permitting Services (MCDPS), Montgomery County Department of Environmental Protection and U.S. Department of Agriculture.

The information gathered for Phase 1 was analyzed using eight parameters of data. Each of the parameters was investigated to determine its effect on the long-term use of deep stone trench septic systems. While the use of other types of septic systems can be considered on a case-by-case basis, the deep stone trench septic system is the standard type of system used throughout the county for on-site wastewater disposal. Maps were generated depicting areas containing characteristics that have the potential to constrain the long-term use of these deep trench septic systems.

Each of the following factors has the potential to constrain the use of deep trench septic systems, but cannot alone determine areas that are not suited for septic systems. Ultimately, only regulated, on-site testing and evaluation of test results can determine the actual suitability of a specific site for septic system use.

System Age: The age of the septic treatment system on each property was determined by reviewing MCDPS record information. Older systems typically do not meet today's standards; upgrading a septic system can be very challenging due to setbacks, finding undisturbed land, etc. Approximately 35 percent of the septic systems in the Glen Hills area are outdated systems such as seepage pits and seepage lagoons. With regard to system requirements, critical date is 1975 since that is when a reserve area requirement was implemented. For the purposes of this study, systems installed after 1975 are assumed to have adequate reserve areas in which a new system could be built, should the current one fail. For systems built prior to 1975, an adequate reserve area for one or more replacement systems may not exist and those properties will be further studied to consider their suitability for long-term septic system use.

Streams and Floodplains: Stream setbacks and Federal Emergency Management Association floodplains were mapped within the study area. Current regulations preclude constructing septic fields within the FEMA-defined 100-year flood plain or a buffer associated with any stream shown on County Geographical Information System topography mapping. By regulation, areas containing streams and floodplains and their associated buffers are considered not suitable for septic system use.

Topography and Steep Slopes: Steep slope areas that would preclude construction of septic systems were mapped. Traditional trench drain fields are not permitted on slopes greater than 25 percent but, since sand mound systems are not permitted on slopes that are 12 percent or greater, a 12 percent slope was used as the limiting slope. By regulation, these steep slope areas are considered to be not suitable for septic system use.

Depth to Groundwater: MCDPS record information included groundwater levels for a limited number of properties. USDA maps include a description of the expected groundwater levels for each type of soil, and were used to obtain groundwater levels for the entire site. USDA map information is only given down to a depth of six feet. And therefore deep groundwater depths were only stated as “six feet or greater.” It is possible to install certain septic systems with groundwater depths between two and six feet. Land with groundwater depth of zero to three feet were considered as areas potentially unsuited for deep stone trench septic system use.

Percolation and Permeability Rate: The available percolation rate for each septic treatment system was determined by reviewing MCDPS record information. Not all of the study properties have records indicating the percolation rate; therefore, the USDA soil map information was used to plot permeability of soil across the entire study area. Any area categorized as “Moderately Slow” or slower was considered to have the potential to constrain deep trench septic system use.

Depth to Bedrock: MCDPS permit record information had very limited information on depth to bedrock. USDA soil surveys include depth to bedrock estimates for the entire study area. USDA soils surveys information listed various depths to bedrock with the deepest depths designated as greater than five feet. It is possible to install certain septic systems in areas with depth to bedrock of five to six feet. All areas with depth to bedrock of less than five feet were considered to have the potential to constrain deep trench septic system use.

Soils Classification on Septic Field Limitations per USDA: The USDA Montgomery County Soil Maps assign a rating of “Severe,” “Moderate,” and “Slight” for each type of soil regarding how suitable it is for septic system trench development. The predominant soil type on each property was identified using GIS mapping, and the accompanying rating was used. Areas noted as severe have the potential to severely constrain the use of deep trench septic systems.

System Failure and Replacement: Where multiple septic field failures have occurred, usable lot areas are eliminated for the needed future replacement of systems. Therefore, these lot areas were considered to be potentially constrained for septic system use.

Undeveloped lots that previously failed septic field tests and lots using public sewer due to previous septic system failures were also considered to be unsuited for future septic system replacement and therefore likely not sustainable for deep trench septic systems in the long term.

Summary: The combination of the above-mentioned parameters produced a map of the study areas that delineated areas considered potentially constrained for the use of deep trench septic systems for one or more of the preceding categories. There are numerous areas potentially constrained and they are predominantly located along low lying stream valleys. Approximately 36 percent of the study area is considered potentially constrained for deep trench septic systems.

It is recommended to proceed to Phase 2 of this study to study further and make recommendations for providing sewerage to the areas potentially constrained for deep trench septic system use. Alternatives should include both traditional and innovative septic systems and the extension of public sewer mains.

2. Introduction and Project Understanding

The *2002 Potomac Subregion Master Plan* recommended that Montgomery County conduct a sanitary survey of the Glen Hills area explaining that,

> "…the Department of Permitting Services (MCDPS) has raised concerns about the periodic septic failures which occur in the neighborhood because subsurface conditions often do not allow for replacement systems which satisfy current septic regulations. …".

The master plan also calls on the County to:

- "Develop the measures necessary to ensure the long-term sustainability of septic service," and
- "Address the need for limited sewer extensions if needed."

With these recommended goals in mind, the Department of Environmental Protection (MCDEP) conducted the Glen Hills Area Sanitary Study in two phases. The results indicated in this report on Phase 1 of the study reflect the evaluation of existing conditions that have the potential to affect the long-term sustainability of septic system use.

2.1 Phase 1 Study Goals and Objectives

The purpose of this study is to gather and assess data to determine the future reliability and sustainability of septic systems within the study area and make recommendations to proceed to Phase 2 studies, if warranted. The continued use of septic systems will be considered sustainable if the existing systems can be replaced on a lot without encountering site constraints that would potentially constrain the use of deep trench septic systems or would limit acceptability under current regulations. If previous septic failures have occurred, it is important that the lot have suitable area and characteristics for a replacement septic system otherwise referred to as a reserve area.

2.2 Study Area Description

The study area is located southwest of the City of Rockville and consists of 542 properties, most improved with single-family homes, nine properties of which fall within the Rockville municipal city limits. Many of the properties in the study area have wells and septic systems built 30 to 60 years ago. The area is zoned residential for single family homes with almost all of the lots exceeding the minimum zoning standard of 40,000 square feet. Of the improved properties, approximately 68 percent have been developed with various combinations of water and septic systems as indicated in Table 2.1.

These neighborhoods were constructed mostly before the advent of modern, more stringent well and septic system testing and permitting requirements than those in effect in the 1940s through the early 1970s. Some of the septic systems in the neighborhoods have failed, and limited sewer service was extended to address these failures. Some additional sewer service extensions were provided to existing and new development in the study area in the 1980s.

The *2002 Potomac Subregion Master Plan* recommends performing this study to develop a policy, "…outlining the measure needed to ensure the long-term sustainability of septic service for new home construction and existing home renovations, minimizing the need for future sewer service extensions." Please see Appendix 2 for a longer excerpt of the plan regarding Glen Hills.

The study area includes all or part of the following neighborhoods as shown on Figure 2.1: Lakewood Estates, Lakewood Glen, Glen Park, Hollinridge, Glen Hills, North Glen Hills, and Potomac Highlands. A breakdown of the water and sewage disposal methods of the properties in the study area is shown in Table 2.1 and also indicated in Figures 2.2 and 2.3.

The neighborhoods were selected because of a long-standing history of septic issues. The neighborhoods have comparable environmental, site conditions and lot sizes.

Table 2.1 – Study Area Properties

Description	**# of Lots**	**Percent of Total**
Developed properties with septic & well	183	34
Developed properties with septic & public water	187	34
Subtotal Lots on Septic	370	**68**
Developed properties with public sewer & water	35	6
Developed properties with public sewer & well	68	13
Subtotal lots on public sewer	103	**19**
Undeveloped properties	69	**13**
Total	**542**	**100**

There are about 1 % of the total study area properties which are approved for public sewer but not presently connected to the public system. For the purposes of this report, these lots are considered to have public sewer.

The Glen Hills study area falls within the Watts Branch Watershed and drains to two Watts Branch subwatersheds: the Piney Branch tributary and the Upper and Middle Watts Branch main stem. Both are shown in Figure 2.1.

As part of the *2002 Potomac Subregion Master Plan*, environmental conditions including existing stream quality of Watts and Piney Branch were provided. The study measured various chemical and physical water quality parameters. A study conducted in 1996-1997 by Biohabitats characterizes the condition of both subwatersheds as good. A second study conducted by the Audubon Naturalist Society in 1997 characterizes the Piney Branch stream as good and the Upper Watts stream as fair.

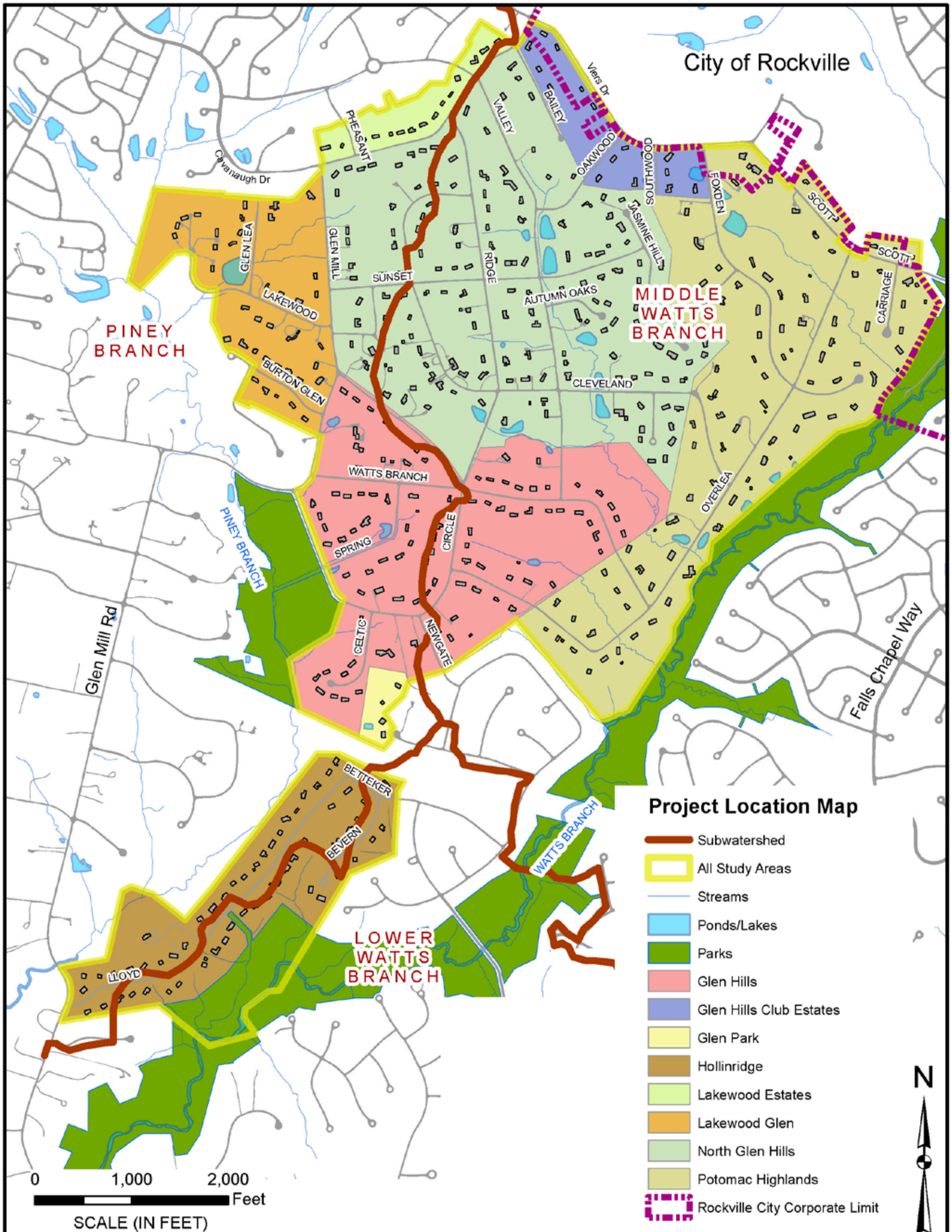

Figure 2.1 – Project Location Map

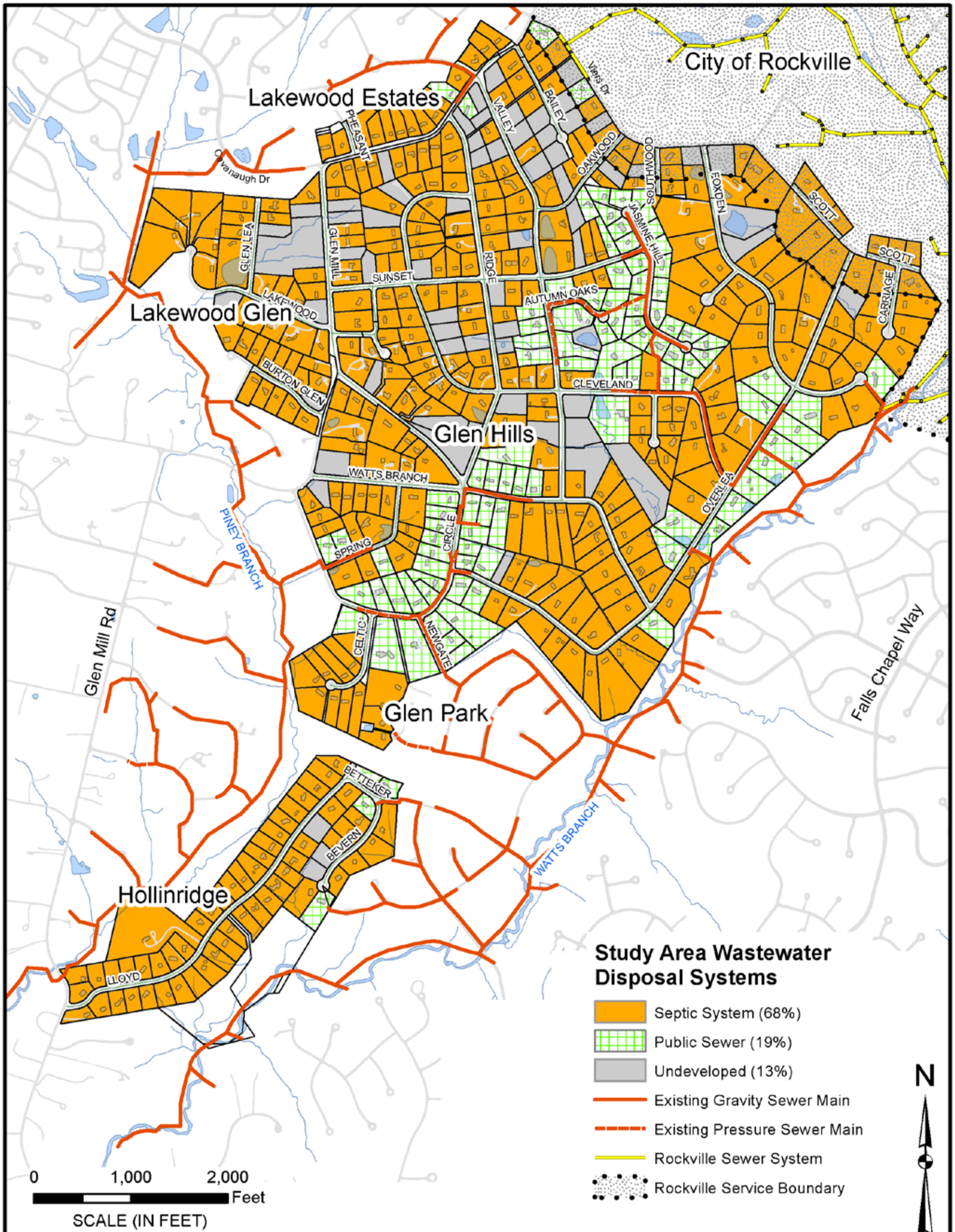

Figure 2.2 – Study Area Wastewater Disposal Systems

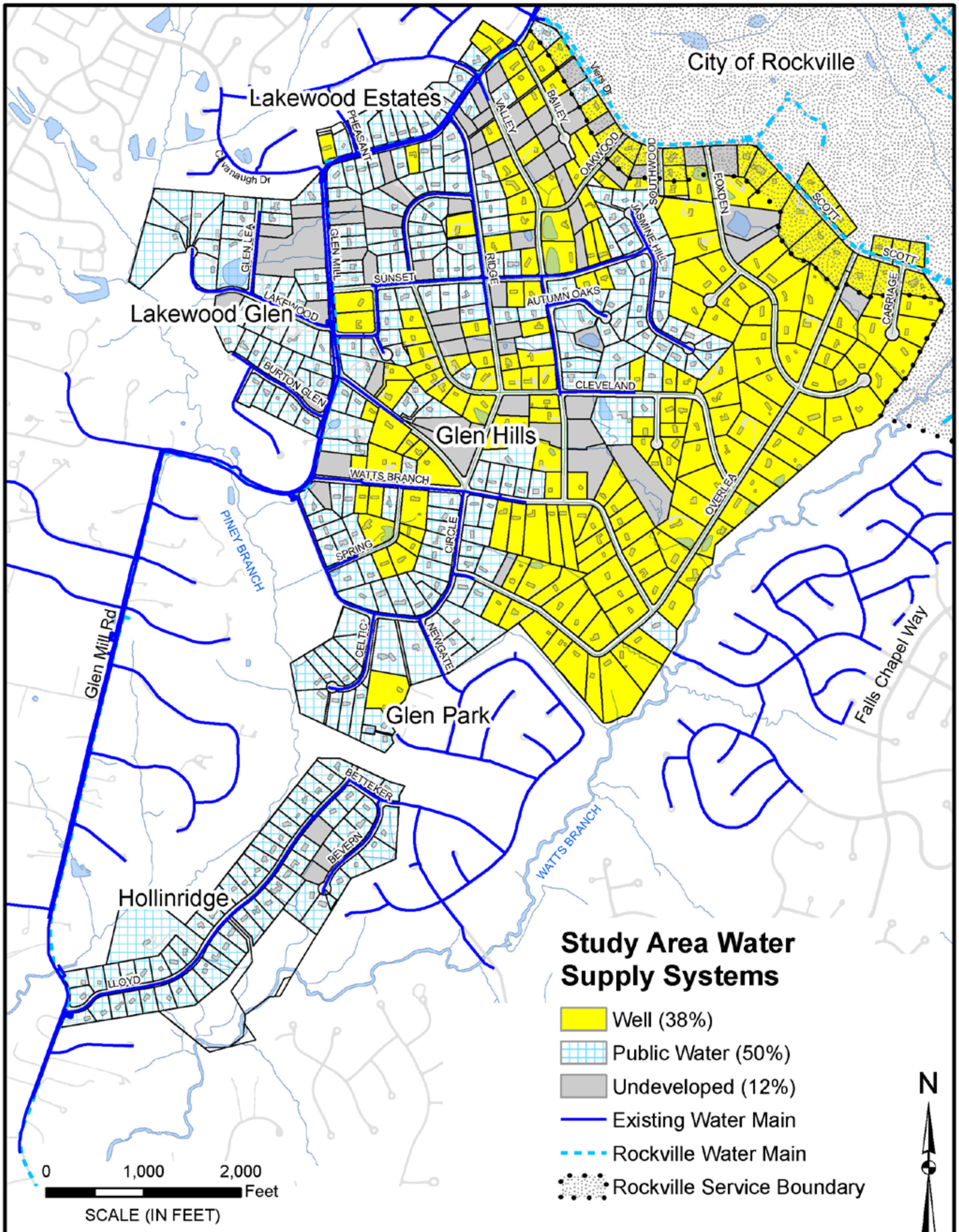

Figure 2.3 – Study Area Water Supply Systems

3. Data Collection

3.1. Well and Septic Permit Records Research

The first phase of the data collection process involved accessing existing on-site system permit records kept by the Montgomery County Department of Permitting Services (MCDPS) Well and Septic Section. The records typically included the original permit for a property's well and septic system, a new permit if a change occurred with the on-site systems or structure and percolation test results. Some of the well and septic permit files also included communication between the property owner and the MCDPS staff regarding failed systems, odors from adjacent properties, failed percolation tests, proposed site plans, or requests for public sewer.

Permit records existed and were collected for approximately 77 percent of the properties in the study area. The remaining 23 percent of properties for which permit records did not exist consisted predominately of some of the properties connected to public sewer and some of the undeveloped lots. The level of detail found from each permit file varied. The permit record information was inventoried in a spreadsheet listing each property's address, year of construction, number of bedrooms, soil percolation rate of the soil, public or well water, type of septic system, whether a failure had occurred, whether the property had a high ground water table and any notes regarding the site. A scanned copy of each well and septic permit was obtained for the purposes of this study.

Any time a change to the well or septic system occurred on a property, MCDPS issued a new permit. These changes were typically attributed to a failing septic system, or a septic system replacement due to an addition to the house or a change in property ownership. Unless the permit record specifically stated that a septic system had failed, researchers recorded the property's septic system as a replacement only, not a replacement due to a septic system failure. Replacements due to bedroom additions were discovered by comparing the number of bedrooms on the new permit with the number on the original. Although not always recorded as such, a septic system replacement occurring with a change in property ownership appeared to be attributable to a new owner replacing an outdated septic system with one in compliance with current permit standards.

Information concerning public water and sewer services was determined by examining existing files from MCDPS, which showed an existing septic system converted to a public sewer, and by conducting research from the Washington Suburban Sanitary Commission's Geographical Information Systems data records, which showed public sewer connections and customer property information.

3.2. GIS Data

The data collected from the permit records research coupled with the GIS data provided by Montgomery County and the U.S. Department of Agriculture provided the basis for both area-wide and property-specific analyses within the study area.

The MCDEP provided the following GIS data on the study area:

- Property information including addresses, zip codes, lot sizes and year built
- Aerial orthophotography
- WSSC grid
- Buildings

- Parks
- Public sewerage systems (including both gravity and pressure mains) owned and operated by both the WSSC and the City of Rockville
- Public water supply systems owned and operated by both WSSC and the City of Rockville
- Rockville's corporate and public water and sewer service area limits
- Roads, road centerlines, parking lots and sidewalks
- Two-foot elevation contours
- Wetlands, streams, lakes, culverts, and storm water facilities
- Soils
- Water and sewer service categories
- Zoning
- Election districts, legislative districts and other jurisdictional boundaries

In addition, the latest data available on the soils in the study area were downloaded from the soil survey posted on the USDA Natural Resources Conservation Service website.

Once the records research was completed and recorded, the researchers generated a spreadsheet that contained all of the properties within the study area, including developed and undeveloped properties, properties using both well, and septic, properties using public water and septic, and properties on public water and sewer. The data collected from the records research coupled with the GIS data provided by Montgomery County and USDA soils information served as the basis for evaluating each property within the study area.

For the undeveloped properties, two separate columns were created: one for properties that had attempted to obtain a septic system permit but were denied by MCDPS, and one for properties whose owners never made a recorded attempt to obtain a septic system permit. The permit denials were typically due to poor soil because of failing percolation rates, or high ground water. Those owners never making the attempt to develop their property typically owned properties adjacent to their homes.

With the available information for all properties recorded, the GIS software ArcMap was used to map, evaluate and compare data. USDA soils data were used to look for correlations between failing systems and poor soil conditions. Contour information was added to indicate steep slope areas which are detrimental to proper septic system treatment. Ground water depths were also researched and added to the database which to determine areas with high ground water tables.

Descriptions of the data collected and methods of evaluation will be discussed in sections 4 and 5.

3.3. Field Visits

After the information was collected and added to the GIS data, topographic maps of the study area were reviewed. Drive-through visits were performed as a part of this phase to verify the data collected and to confirm the general topography of the study area. The site visits were not for lot-specific information verification, but for confirmation of contours, streams and pond locations. Site visits to individual properties may be performed in Phase 2, if needed, when considering options for septic design modifications and possible sewer system extensions.

3.4. Community Outreach

Community outreach was provided to communicate with and solicit feedback from members of the study area through property owner's surveys, public meetings, and a citizens' advisory committee.

Property Owner Survey: In February 2012, MCDEP mailed a survey to property owners requesting information regarding their existing septic systems. These surveys were also handed out at the first public meeting regarding the study which was held on February 21, 2012. There was a good community response to the survey. Owners returned surveys for 194 of 542 properties, or 36 percent of the study area properties. The survey questionnaire asked property owners for information that would enhance the information collected by the previously described data collection methods, including, duration of ownership, condition of well (if applicable), septic system condition, problems, and maintenance practices.

Approximately 76 percent of the respondents noted that they have a septic system, a figure which correlates well with the 75 percent of properties in the total study area that have septic systems. Eighty-four percent of the responses indicated that their systems were in good condition which also correlates well with the response that 73 percent have had their septic tank pumped within the last five years and 13 percent more who have had their tanks pumped within the last six to 10 years. Sixty-three percent of the responding owners' systems were more than 25 years old which correlates well with 68 percent of the study area based upon permit records. Thirty-two percent of respondents noted system repairs, but the type of repair was usually not specified so a comparison between survey response and permit data was not made.

Public Meetings: The purpose of public meetings is to inform and consult with community residents and owners to obtain community feedback. A public meeting planned for Phase 1 was held at Lakewood Elementary School in Rockville. The meeting introduced the purpose and proposed scope of the study and was well attended with more than 100 attendees. The second meeting was held in early June to present the results of the draft report. The final report will reflect and address the input of the community as expressed at this meeting.

Citizen Advisory Committee: The MCDEP formed a 13-member citizen advisory committee chosen from more than 31 volunteers. In general, committee members were selected who:

- Belonged to local civic associations within the study area
- Residents that represent a broad distribution of the neighborhoods in the study area
- Were owners of septic systems and some with alternative technology septic systems, if known (innovative systems, sand mounds, holding tanks)
- Represent a variety of house ages and residence time
- Are a mix of water and well users
- Are respondents to the owner's survey
- Have applied for a category change.

The purpose of the committee is to obtain input from a cross section of the neighborhood which may have differing views as well as specific neighborhood knowledge. Information is provided and shared between members regarding the study methods goals and objectives. The committee met in April, May, and July 2012, and starting in September will continue to meet generally once a month during the remainder of the study process.

3.5. Staff Interviews

The data collection process also included discussions with MCDPS Well and Septic Section staff members given their extensive knowledge and experience with the existing well and septic systems within the Glen Hills area. MCDPS staff members gave a detailed history of changes to Montgomery County regulations through the years,

MCDPS had stated that testing for septic systems constructed prior to 1960 were not performed by the county, and were mainly completed by the contractor or a third party. After 1960, the County Health Department performed percolation tests and required a percolation rate of less than 40 minutes per inch. The MCDPS staff members stated that in 1975 the requirement for at least two additional reserve areas beyond the initial absorption area was established per property and the maximum allowable percolation rate for new construction was lowered to the current standard of 30 minutes per inch. Table 3.1contains a summary of the regulation history that Permitting Services staff provided. While the information in the table was gathered from the MCDPS staff, more of the details are presented in the following section.

Table 3.1 – Septic Regulation History

Description	Before 1940	1940 to 1960	1960 to 1965	1965 to 1975	1975 to 1980	1980 to Present
Building permit and subdivision requirements						
Permit needed to install a new septic system	No	Yes	Yes	Yes	Yes	Yes
Passing percolation test required to establish a building lot	No	No	No	Yes	Yes	Yes
Testing responsibility						
Testing performed by property owner	Yes	Yes	No	No	No	No
Testing performed by Health Department	No	No	Yes	No	No	No
Testing performed by property owner with county inspection/verification	No	No	No	Yes	Yes	Yes
Testing criteria						
Maximum Percolation Rate Allowed (minutes/inch)	40	40	40	40	30*	30*
Reserve areas required	No	No	No	No	Yes	Yes
Water table testing required	No	No	No	No	Yes	Yes
Shallow and deep hole testing required	No	No	No	No	Yes	Yes
Rock testing and four feet of separation between groundwater and rock required	No	No	No	No	No	Yes
Green shading indicates standards consistent with current regulations.						
*Some exceptions to the 30-minute/inch maximum limit are allowed.						

MCDPS also provided history of septic system issues and failures in the Glen Hills study area. MCDPS pointed out problematic areas along Bailey Drive, Valley Drive, and Spring Drive where septic systems have had a history of failures or properties could not be developed due failed percolation tests, high groundwater, or bedrock encountered.

4. Summaries and Evaluation of Data

4.1. Septic System Construction Background in Glen Hills Study Area

Construction on the Glen Hills neighborhood originally started in the 1940s. The homes built in the area between 1945 and 1965 comprise about 30 percent of the homes on septic systems in the area. Most of these residences obtained water from wells. During this time, seepage pits were the typical septic system design (see Section 4.2 Septic Systems). Between about 1950 and 1965, Montgomery County only required that a percolation test showed a rate of less than 40 minutes per inch. Additionally, before 1965, the creation of a recorded building lot did not require a passing septic system test. This has resulted in the presence of some vacant, recorded lots in the study area that cannot pass modern septic testing requirements. See Section 4.5 on page 28 for discussion of testing requirements.

In about 1975 on-site system regulations and criteria were changed at the state level to require reserve areas for the septic systems. Effectively designed reserve areas extend the expected life of any given system. The state also began requiring groundwater table testing at this time.

In 1980, the *Potomac Subregion Master Plan* allowed for the consideration of public water and sewer for the Glen Hills area, yet strong community opposition limited the construction of sewer lines. Starting in 1987, select areas of Glen Hills including Jasmine Hill Terrace, parts of Valley Road, Autumn Court, and parts of Glen Mill Road had Washington Suburban Sanitary Commission water and sewer lines constructed for new development. Development using public water and sewer was not subject to the limitations imposed by the use of wells and septic systems.

In April of 2002, the Montgomery County Council approved and adopted guidance in the *Potomac Subregion Master Plan* which recommended, "….restricting further sewer extensions in Glen Hills to those needed to relieve documented public health problems resulting from failed septic systems."

Connecting to public sewer service allows house construction and expansion in areas that are potentially constrained for deep trench septic system use and that would not otherwise allow such development. Because of the concern that the extension of public sewer would increase development within Glen Hills, the county *Water and Sewer Plan's* abutting mains policy was also deferred subject to the results of this study. The abutting main policy qualifies a property for a single sewer hookup, under limited circumstances, if a sewer line abuts the applicant's property. The Glen Hills Recommendation from the *2002 Potomac Subregion Master Plan* is contained in Appendix 2.

Table 4.2 on page 22, Age of Systems, lists the existing septic systems by year of construction. As the data shows, currently 52 percent of the existing septic systems were built prior to the present standards adopted in 1975. Modern regulations have prevented development on lots that, due to constraining factors such as high water tables and shallow rock, cannot properly support a septic system meeting current regulatory standards. Regulation changes have also extended the life expectancy of septic systems by planning and testing for reserve areas. These requirements are shown and further discussed in sections 4.2 and 4.3.

4.2. Septic Systems

Septic System Components: A typical septic system has three main components: a septic tank connected to the house by a pipe, a distribution system, and a drain field. Each of the components has a specific function, as discussed in the following paragraphs.

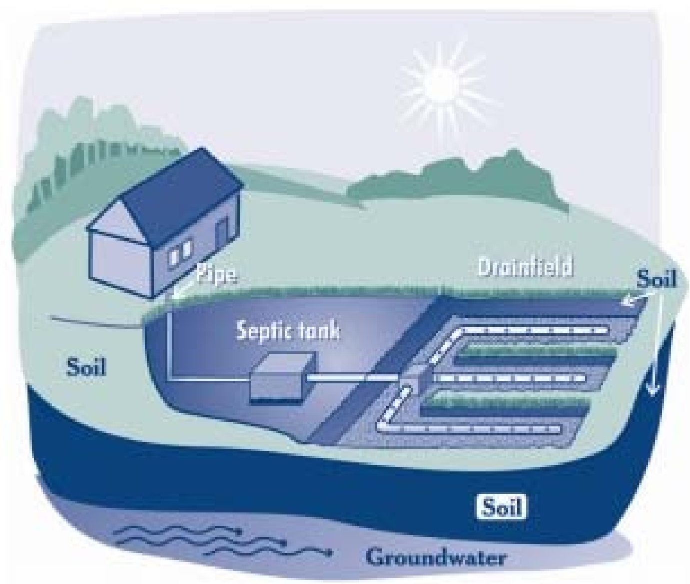

Illustration courtesy of MCDEP

Figure 4.1 - Typical Septic System (Stone Trench)

As illustrated in Figure 4.1, the typical modern septic system conveys all the waste water from the home through a pipe to the septic tank.

<u>Septic System Components - Septic Tank:</u> The septic tank is a buried watertight container typically made of concrete. It holds the wastewater long enough to allow solids to settle out (forming sludge) and oil and grease to float to the surface (as scum). The tanks are intended to be periodically cleaned or pumped out, typically every three to five years depending on use. The pumped wastes are transferred to the public sewer system to be treated at a wastewater treatment plant or septage treatment facility.

The county's current regulations require two-chamber septic tanks (see Figure 4.2) that hold up to twice the daily maximum flow from the user's house. The two compartments more effectively collect solids and thereby reduce the amount of sludge which can find its way into the drain field where it leads to drain field clogging, reducing its life possibly causing system failure.

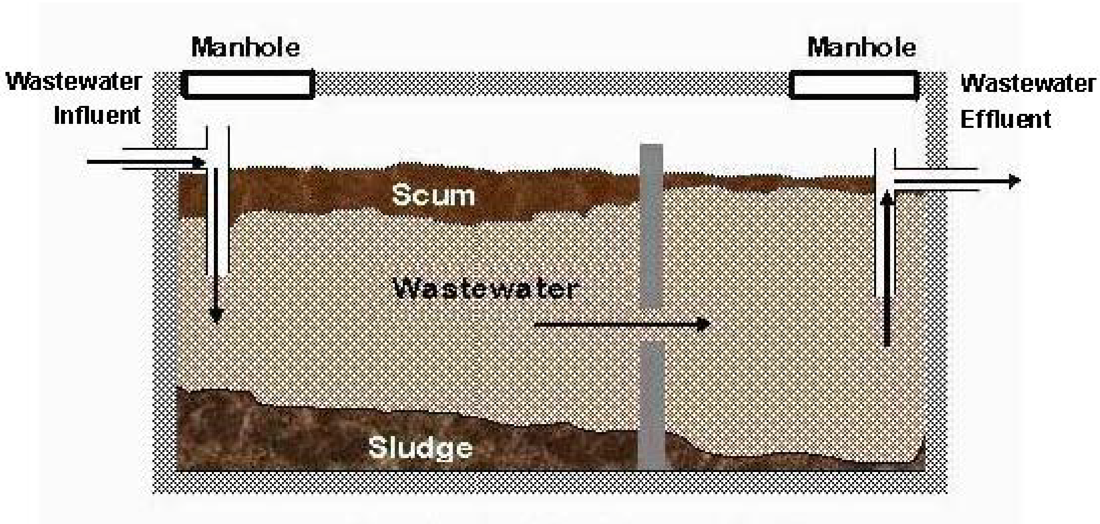

Figure 1a. Illustration by Thomas H. Miller

Figure 4.2 -Two Compartment Septic Tank (Modern Standard)

Septic System Components – Distribution System: The partially treated wastewater is pushed from the septic tank and distributed to the drain field for further treatment every time new wastewater enters the tank. To prevent overloading the drain field, distribution boxes and other means such as pumps can be employed to properly distribute wastewater among sections of the field to properly dose the soil.

Septic System Components – Drain Field: The drain field discharges the wastewater for further treatment by the soil beneath the drain field. Together with information on the amount of wastewater produced, the soil depth and permeability are used to design the form and size of the trench drain field. The drain field, also known as a soil absorption field, consists of a solid pipe which carries the effluent to into one or more perforated pipes in trenches of gravel. In Montgomery County the trenches are required to be separated by 10 feet, center to center, unless otherwise authorized. The trenches are commonly two feet wide and four to 11 feet deep with a minimum of one foot of soil covering the trench. Shallow trench or tile systems installed 3 to 6 feet deep are also common. In a properly operating septic system, the wastewater flows through the drain field; it percolates into the soil beneath the drain field, which provides final treatment.

Soil: The following section on soils is based on information prepared by Michael T. Hoover, North Carolina Extension Soil Science Specialist, in 1997.

The septic system uses soil beneath the drain field to treat effluent. The soil filters bacteria from effluent including some smaller germs and viruses. If the soil is unable to adsorb germs, bacteria such as e-coli will be present in the soil and can increase risk of disease. Septic systems require that soil be able to adequately absorb and purify effluent. Areas with rock close to the surface or soil layers that restrict the downward flow of water are not desirable because they restrict the ability of the soil to treat effluent.

The soil needs to have a good ratio of sand versus clay to allow liquid to flow in such a way to allow treatment. Sites with gradual or no slopes, good percolation rates, and deep water tables are the least susceptible to failure.

If failure occurs, toilets and sinks may not drain properly or sewage may contaminate the soil above the drain field or the groundwater. These contaminants pose risks to human and environmental health. The role of soil is to remove contaminants by natural physical, chemical and biological processes that are active in healthy soil. Suitable soil is necessary to ensure long term sustainability of deep stone trench septic system use.

Types of Septic Systems: The design of septic systems within the study area can be categorized into three types: those which are designed and tested to current standards, innovative systems (approved on a case-by-case basis) and outdated systems (exist but cannot be replaced with the same type of system).

Current Standards for Deep Trench or Shallow Tile Systems: As previously noted, most septic systems in use in the study area are trench systems, in which drain field trenches can vary in depth and are buried a minimum of one foot under the soil surface. There are two types of trench systems deep-trench and shallow trench or tile systems. A shallow tile system may be employed when the either a layer of rock or poorly absorbing soil is found relatively close to the surface; or similarly, if groundwater is found relatively close to the existing ground surface. The shallower installation does require more area and lengths of drain fields. When planning for required reserve fields, this expansion area may not be available given the site constraints. There must be at least four vertical feet of useable unconsolidated, unsaturated soil buffer between the bottom of a disposal trench and bedrock or ground water to ensure proper effluent treatment.

Current Standards for Sand Mound Systems: An alternative to the deep-trench system is the sand-mound system, in which the drain field is built on a sand mound above the natural soil surface to overcome a shallow water table or a marginal percolation rate in deeper soils. A gravel filled bed is constructed in the sand fill where effluent from a pump chamber is pumped. A conventional sand mound septic system can be constructed in an area that meets all site restrictions and where percolation test rates are within the range of five to sixty minutes per inch compared to a standard time of five to thirty minutes per inch.

Under the county's current on-site system regulations, new construction (a new structure or a significant addition of an existing structure) may use only in-ground trench or sand-mound septic systems.

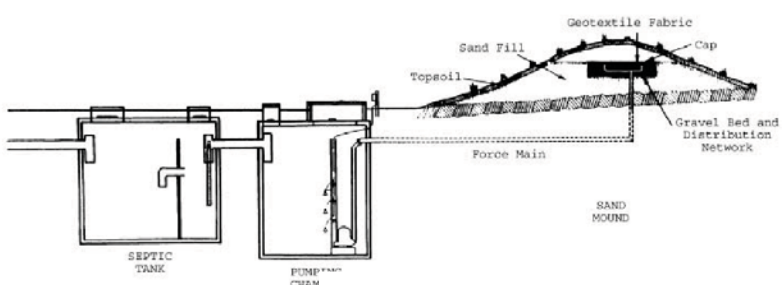

Illustration courtesy of MCDEP

Figure 4.3 -Typical Sand Mound System

Innovative systems: The County has approved drip systems within the last six years on a limited case-by-case basis when a system has failed and the lot can no longer support a current standard system. Two percent of the systems within the study area are drip disposal. Drip systems have been used as replacement systems for failed septic systems. A drip system is similar to a sand mound system in that both normally require a pumping chamber, but the effluent is discharged to the soil slowly and uniformly from a network of narrow tubing installed below-ground. This tubing provides a function similar to the perforated pipe in a conventional drain field. As described in The Pipeline newsletter of the National Small Flows Clearinghouse, "In most systems, effluent flows to a tank or pump chamber equipped with controls where it is stored until a dosing volume is reached. All drip systems are equipped with a filtration system before effluent reaches the distribution system. This removes small suspended solid materials that can clog tubes. ….Some systems also include a disinfection step to protect public health."

Outdated Systems: Older on-site systems use several varieties of treatment methods, such as seepage lagoons, dry wells, and seepage pits. These older systems are allowed to serve only existing structures provided they continue to function adequately. While these older types of septic systems may continue to function adequately now and for some time in the future, they are not permitted for new house construction or for an addition to an existing house, which requires septic systems that satisfy all current permitting standards.

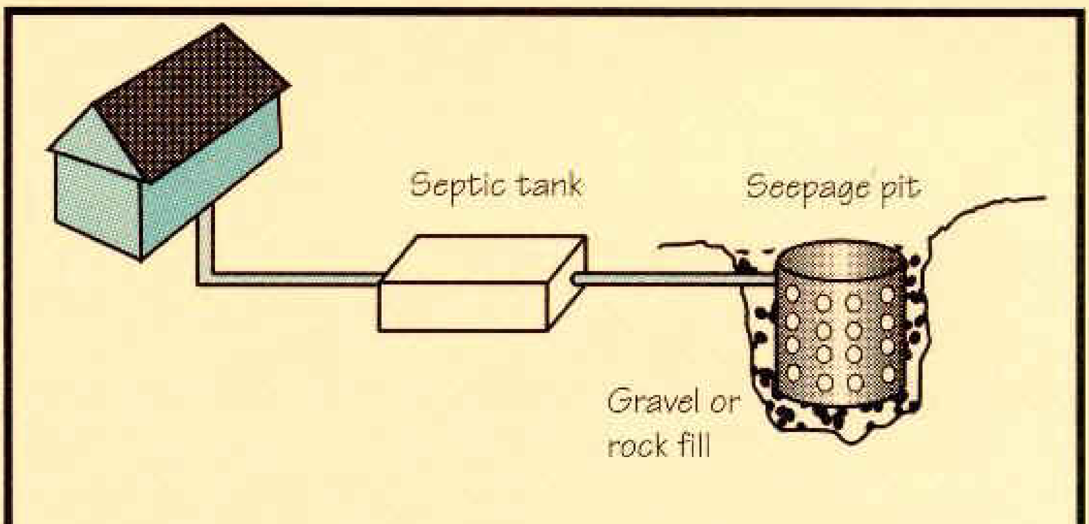

Figure 3. Illustration courtesy of the United States Environmental Protection Agency.

Figure 4.4 - Typical Seepage Pit

A seepage pit is a covered pit with a perforated or open-jointed lining through which the discharge from the septic tank infiltrates the surrounding soil. Like the absorption field, the seepage pit also must be properly sized and constructed. This type of system is no longer permitted for new construction in Montgomery County.

A lagoon system consists of two components: a septic tank and a small earthen pond with a relatively shallow uniform depth. After primary treatment in the septic tank, liquid effluent flows to the lagoon through a watertight pipe and discharges near the center of the lagoon bottom. Again, this type of system is no longer permitted for new construction in Montgomery County. Forty percent of the septic systems in the study area are considered to be outdated. They consist of 125 seepage pits and five seepage lagoons.

Holding Tanks: Holding tanks are sometimes utilized in lots where a septic tank and drain field will not work, often due to a high water table, bedrock close to the surface or very small lots with insufficient drain field area. Their use would be a last resort to provide sewerage storage for a lot with a failed septic system. Holding tanks are storage basins for sewage and do not provide treatment. The contents of the tank must be frequently pumped and transferred to a public system for treatment at a wastewater plant. There were no permit records documenting holding tanks in the Glen Hills study area.

Table 4.1 provides a breakdown of the types of systems within the study area by categories. There are 370 properties using existing on-site septic systems in the study area, of which approximately 35 percent continue to use systems that no longer satisfy current Montgomery County standards. Of the records obtained for the study, 25 did not specifically identify the type of system installed.

Table 4.1 – Types of Septic Systems in the Study Area

Description	**Number of Lots**	**Percent of Total**
Conventional Systems (Current Standards)		
Deep-Trench	185	50
Shallow-Trench	16	5
Sand Mounds	4	1
(Sub-Total)	205	**56**
Innovative Systems		
Drip Disposal	9	2
(Sub-Total)	9	**2**
Outdated Systems		
Seepage Pits	126	34
Seepage Lagoons	5	1
(Sub-Total)	131	**35**
Unknown	25	**7**
Total Septic Systems	**370**	**100**

Figure 4.5 indicates the various types of septic systems in the study area.

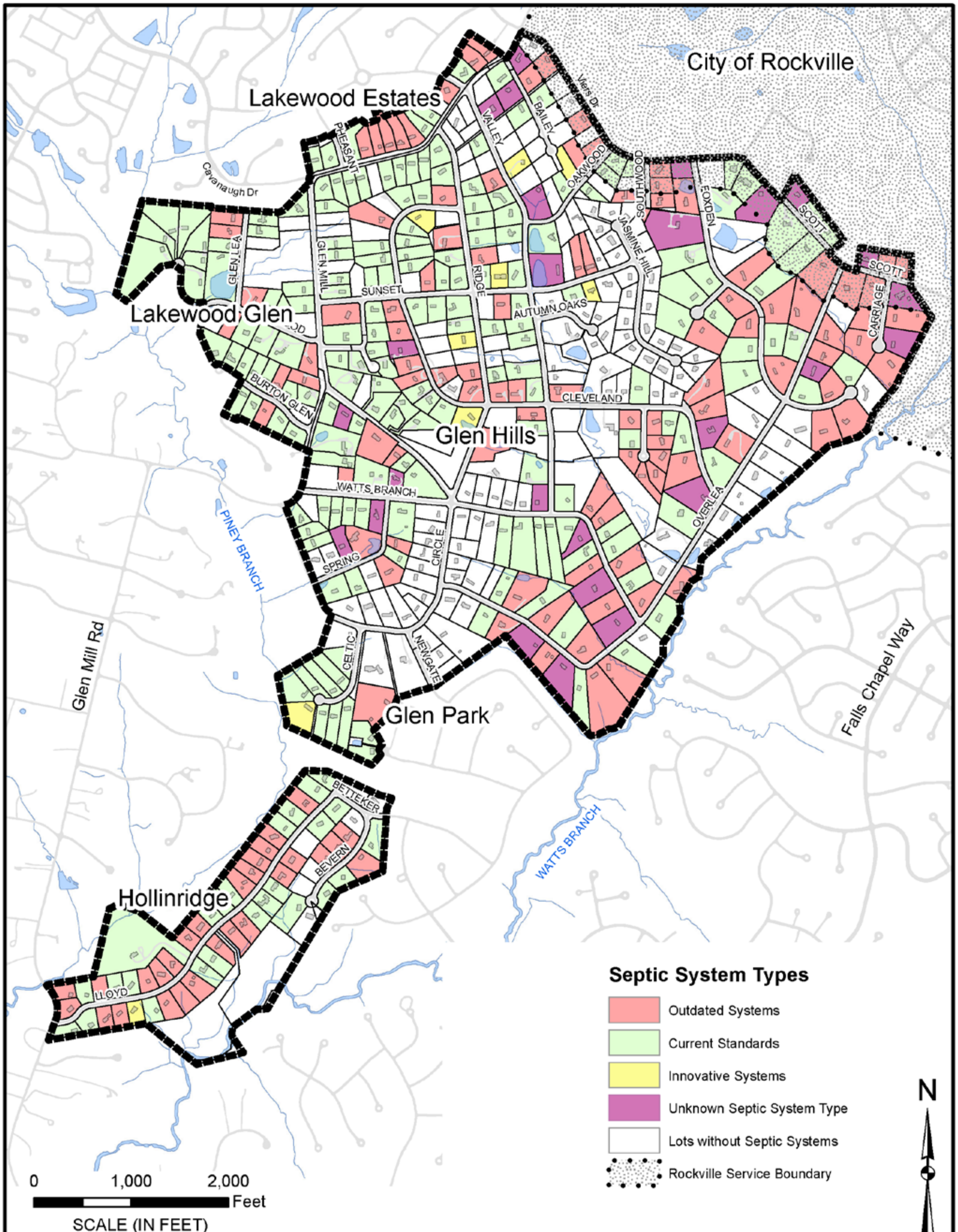

Figure 4.5 – Septic System Types

4.3. Age of Septic Systems

Well-maintained septic systems should last for 25 years or more. Many home inspection firms estimate the life spans of septic systems to be 20 to 30 years. Many properties still use the original, decades-old seepage pits in Glen Hills.

The life of a septic system depends on many factors such as:

- Maintenance – septic tank pumping frequency: Provided a functional and acceptably-designed septic system was originally constructed, the most significant step that can be taken to extend the septic system life is to have the septic tank cleaned or "pumped" on schedule, typically every five years depending on usage.
- Use – how the septic system is used: Including the wastewater-usage level and what materials are flushed into the septic system. Conserving water reduces the load on the absorption field. Avoiding flushing chemicals or items that don't biodegrade reduces the solid build-up rate in the septic tank.
- Soil Conditions – the soil percolation rate and the amount and level of ground water or surface water that affect the soil absorption area or drain field.
- Structural Integrity – quality of original concrete: A concrete septic tank can have a very long life, in excess of 40 years. Situations involving poorly-mixed concrete or acidic soils may reduce that span.

The standard for septic system maintenance is for septic tanks to be pumped out every three to five years. Although neglected systems can operate for years, a poorly maintained septic tank is no longer protecting the soil absorption field from solids. Continued neglect causes solids to more easily migrate into the drain field which can shorten the drain field life, and may result in premature system failure which can require complete replacement of the soil absorption field. In some cases where replacement drain field sites have not already been planned and permitted, site limitations may make replacing the absorption field using a conventional drain field design impossible. Available alternative systems would need to be investigated.

For this reason, modern standards require septic systems to have reserve areas. Reserve areas could extend the life expectancy of systems to 75 years or more by providing land area for future expansion or replacement of septic absorption fields.

Listed below is a breakdown of years of installation of the latest system installed for lots in the Glen Hills study area. As indicated in the chart below a large portion of the septic systems in the study area are beyond their normal anticipated life. Ranges of years of installation relate to changes in Montgomery County septic system permit requirements.

Table 4.2 – Age of Septic System

Most Recent Date of Construction of Septic System	**Age of System**[A] (years)	**Number of Lots**	**Percent of Total**
1945 – 1965	47-67	139	37
1966 – 1974	38-46	55	15
(Subtotal of systems constructed prior to modern standards)		194	**52**
1975 – 1979	33-37	44	12
1980 - 2002	10-32	92	25
2003 – 2012	0-9	25	7
(Subtotal of systems constructed under modern standards)		161	**44**
Unrecorded date of construction[B]		15	**4**
Total Septic Systems		**370**	**100**

[A] System ages are referenced to 2012.
[B] No time of construction cited on available records

As previously noted in Table 3.1 on page 13, the ranges of years relate to regulation history. About 52 percent of the systems in the Glen Hills study area were built before the requirement for reserve areas in 1975. For the systems constructed prior to 1975, there is no certainty that a sufficient reserve area is available for septic system replacement or expansion.

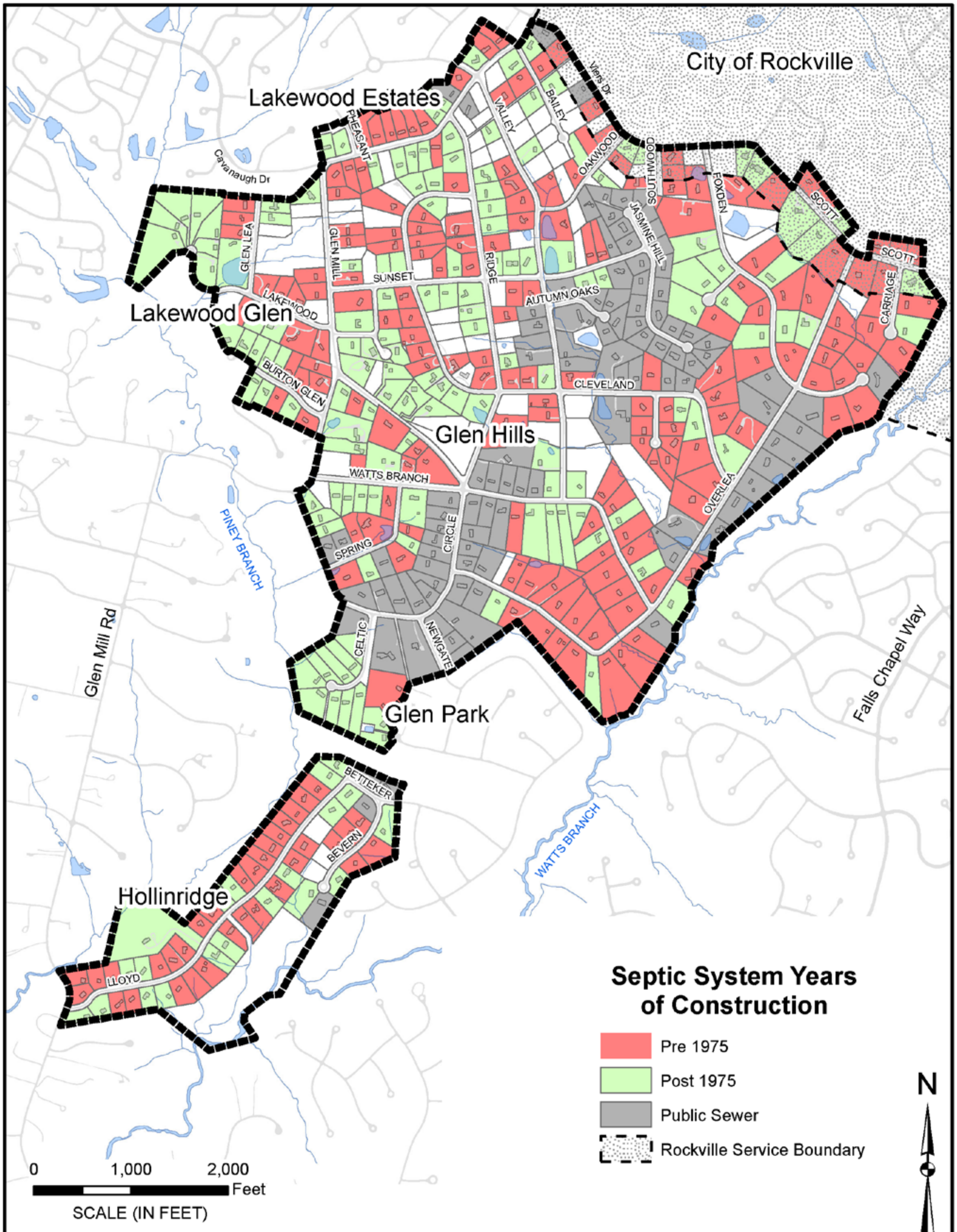

Figure 4.6 – Septic System Years of Construction

4.4. Location of Current Water and Sewer Lines

The MCDPS permit records were initially used to determine which properties were served by public water and public sewer. This information was later updated to reflect community input as well as Washington Suburban Sanitary Commission (WSSC) Permit Services record information. Figures 4.7 and 4.8 show the public water and sewerage systems providing service within the study area.

A total of 290 properties within the study area use public water and/or public sewer service as follows :

- 35 properties connected to both public water and sewer
- 68 properties using an existing well and public sewer, and
- 187 properties using public water and septic systems

Several WSSC water distribution lines run from Glen Mill Road along Circle Drive, Watts Branch Drive, Sunset Drive, Burton Glen Drive, Lakewood Drive, and parts of Ridge Drive and Cleveland Drive. In Glen Park and Hollinridge, 12-inch and 8-inch WSSC distribution lines feed properties on Celtic Court, Lloyd Road, Betteker Lane, and Bevern Lane. Most of the residences in the eastern portion of the study area in the Overlea Drive, and Foxden Drive areas have on-site wells.

Beginning in the 1960s, WSSC constructed sewers in Glen Hills. The sewer systems were extended during periods of new construction or when sewer service was requested due to a health issue such as a failed septic system. Sewer systems were installed in the 1960s along Newgate Road and Betteker Lane.

Houses located along Jasmine Hill Terrace and Autumn Oaks Court were built in the early 1990s using an 8-inch sewer line connecting through parts of Cleveland Drive and Overlea Drive to the 27-inch Watts Branch trunk sewer. Sewer service was also extended to some new houses along Watts Branch drive at this time. Failing septic systems along parts of Circle Drive, Spring Drive, and Cleveland Drive were replaced between 1989 and 2006 with public sewer service, in some cases requiring grinder pumps and low-pressure sewer mains to connect to existing sewer mains.

The City of Rockville operates its own water supply and sewage collection systems. Parts of these systems provide public service within a limited part of the study area, as designated by state law. Therefore, these mains provide public water or sewer service only to properties located within the City's municipal boundary. Under the City's policies, the provision of new public water or sewer service requires annexation into the City's municipal limits.

The City's primary 24-inch water transmission main runs along Glen Mill Road on the west side of the study area and a 12-inch water distribution line runs along Veirs Drive and Scott Drive at the north end of the study area. Sewer mains owned and operated by the City also exist at the north end of the study area along Veirs Drive.

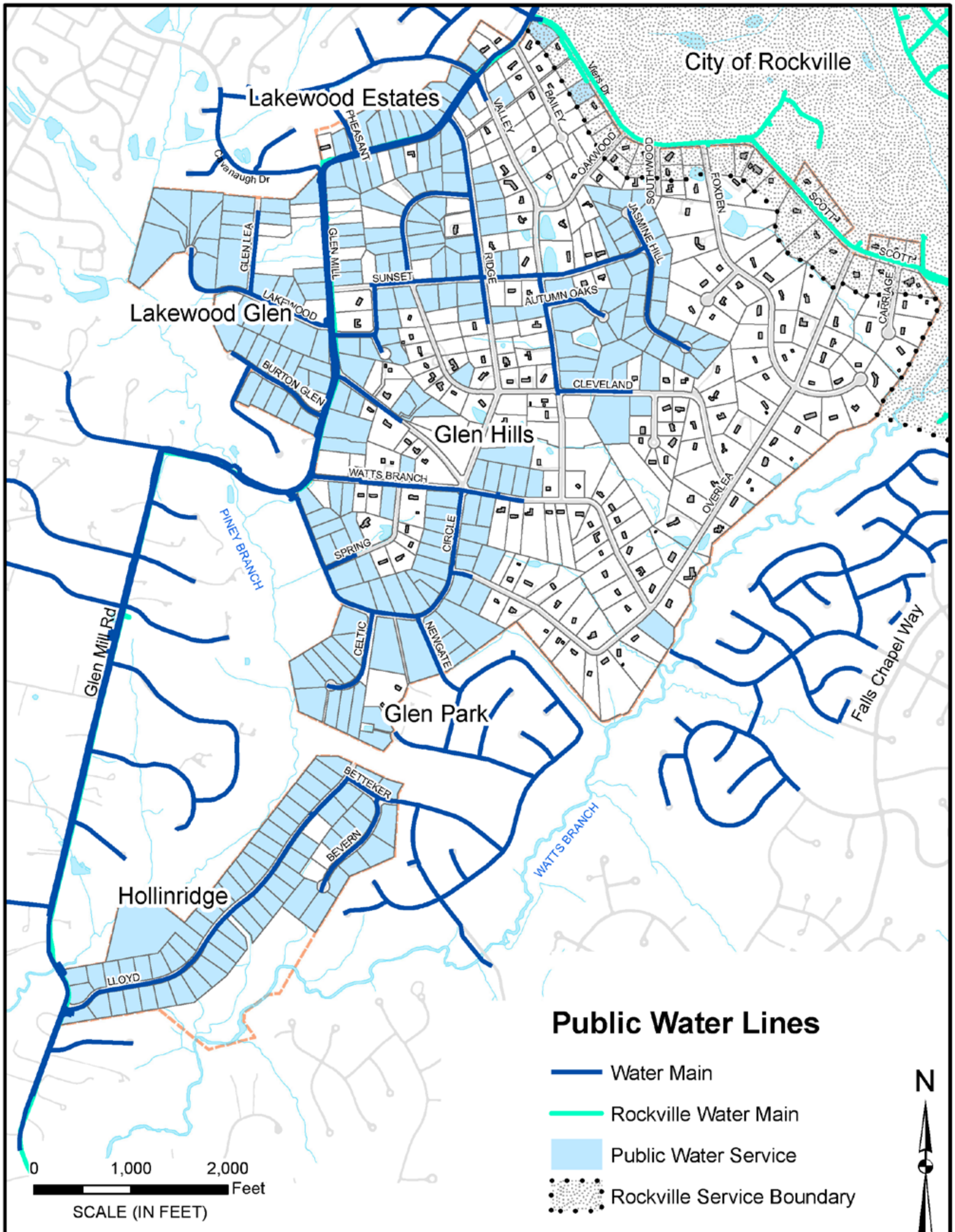

Figure 4.7 – Public Water Lines

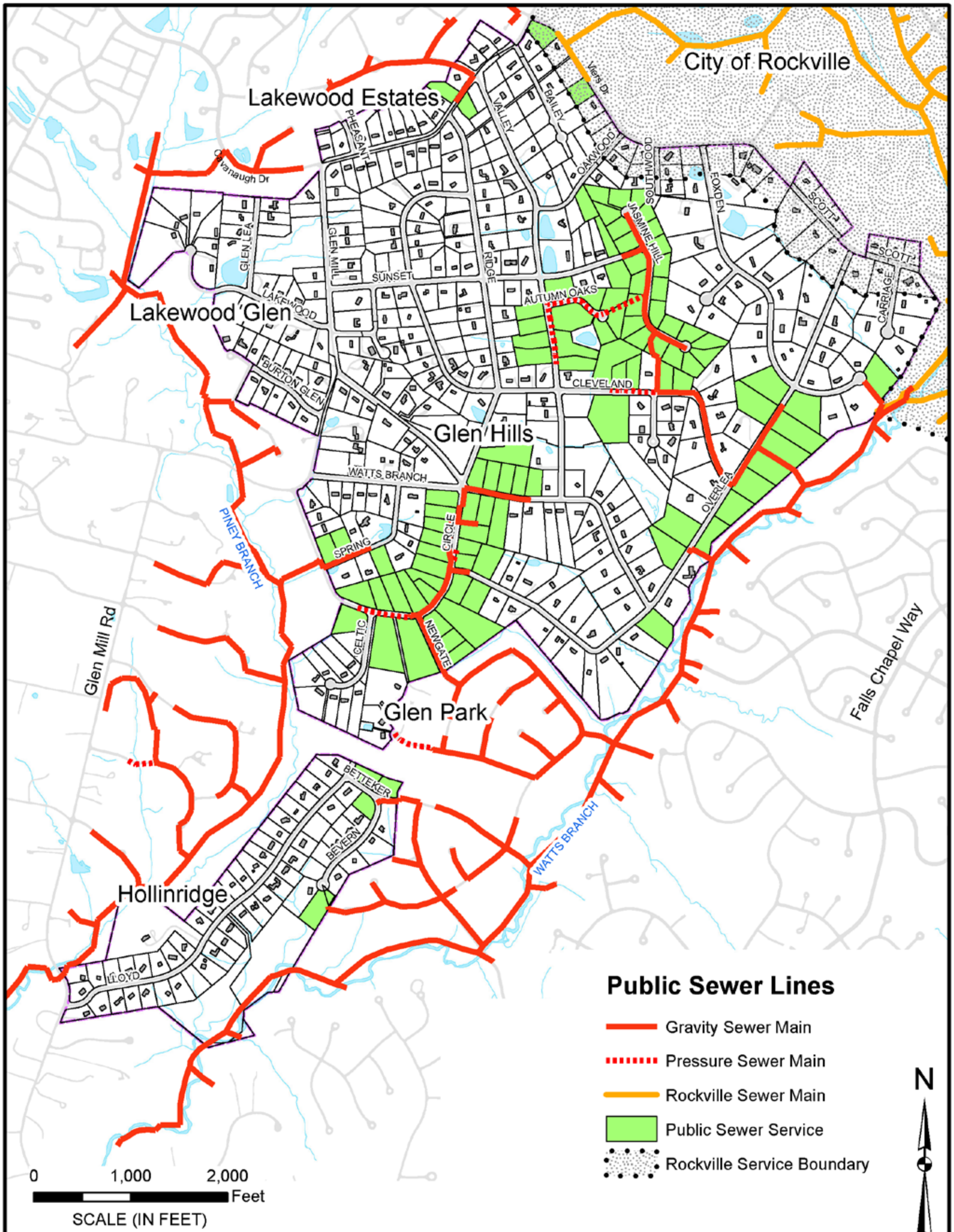

Figure 4.8 – Public Sewer Lines

4.5. Current Testing and Permit Regulations of Septic Systems

The current testing and permitting procedures for septic systems are much more stringent than earlier requirements as noted in sections 3.5 and 4.1. Before any formal testing occurs, the Montgomery County Department of Permitting Services (MCDPS) Well and Septic Section needs to review and approve a layout plan for the site showing proposed testing locations for initial and reserve fields. Following this step, testing for new septic systems occurs in two stages: first, a water table test and then a percolation test. If the water table test is not acceptable, lot development with a septic system cannot proceed. A similar result occurs if the percolation test fails.

Water Table Testing: The water table test determines the depth to the groundwater or saturated soil under the property. The unsaturated soil between the bottom of the drain field trench and the top of the water table provides area for treating the wastewater effluent. If a sufficient depth of approximately four feet between these surfaces is not maintained, untreated wastewater effluent could enter the water table and contaminate groundwater. Because the level of the water table fluctuates throughout the year, this test is conducted only in the late winter to early spring when the water table is usually at its highest level. If low rainfall conditions have occurred throughout the preceding year, the MCDPS may choose to shorten the testing period.

Percolation Testing: Once acceptable water table testing is complete, the percolation test, or “perc test,” is conducted which determines how quickly wastewater effluent will move downward through the soil. If the flow rate though the soil is too fast, the effluent will not stay in the soil long enough for adequate treatment, again allowing untreated wastewater into the ground water. If the flow rate is too slow, the soil will not absorb and distribute effluent flows from the drain field quickly enough. The septic system will either discharge to the surface of the yard or backup into the user's building. Either situation has the potential to create public health problems.

Design: The components of the septic systems sizes are linked to the number of bedrooms as a determination of the amount of flow to be treated. Tank sizing is based on two days of maximum daily flow volume. The minimum septic tank capacity is 1,000 gallons. Trench areas and the size of reserve areas increase with increased flow.

The required amount of absorption area of the drain fields is dependent upon the estimated sewage flow, percolation rate of soil, and the amount of trench sidewall available for absorption. Trenches must be installed with a uniform depth and level bottom and laid out providing setbacks from other facilities to ensure public health and safety.

Setbacks: The current submission requirements for septic system design include setbacks of

- 100 feet from all water wells
- 100 feet from all water bodies, including intermittent streams
- 25 feet from rock outcrops, drainage swales and excessive slope areas
- 20 feet from any part of a building with a foundation
- 10 feet from tennis courts, swimming pools, detached garages and sheds
- 10 feet from any utility lines or easements
- 5 feet from all lot lines and driveways

Aside from the above setbacks there are requirements for spacing between septic system components to provide for proper function and septic system life.

Reserve Areas: The general requirements for reserve areas that pertain to the Glen Hills study area consist of the following:

For lots subdivided after February 28, 1979, a septic system must have an initial drain field and enough area for three reserve areas. These back-up fields are built and put into service only as the drain field in use fails. A typical single-family house needs a minimum area of 10,000 square feet (slightly less than one quarter acre) for the initial and reserve drain fields.

For lots that were subdivided prior to March 3, 1972 and are in sewer service category 6, a septic system would require an initial field and two reserve areas or backup drain fields. This standard would affect the vacant Glen Hills area lots. For replacement of an existing failed on-site system, the new septic system must attempt, if possible, to meet current standards.

For additions to existing homes, and depending on the size of the addition, a septic system must be evaluated for adequate septic capacity and adherence to current standards including reserve area requirements.

For more detailed information regarding the reserve area criteria, see Appendix 1.

4.6. Locations of Streams and Floodplains

The Code of Montgomery County Regulations, Chapter 27A Individual Water Supply and Sewage Disposal Facilities (COMCOR), requires a 100-foot setback from any stream and requires avoiding floodplains. Streams were located by using Montgomery County's GIS stream location information and a 100-foot setback was plotted from the streams. The county recognizes any stream, whether perennial, vernal, or intermittent that is shown on its GIS topography layer as requiring the setback. There are a number of unnamed streams without associated documented floodplains bisecting the study area. Though a good portion of the streams flow through undeveloped parcels, they also run through the back yards of numerous developed lots. The 100-foot setback requirement makes portions of these lots unusable for septic fields. Areas along the following streets are affected by stream buffers: Lloyd Drive, Bevern Drive, Lakewood Drive, Spring Drive, Valley Drive, Overlea Drive, Watt Drive and Foxden Drive.

The Maryland Department of the Environment Regulation of Water Supply, Sewage Disposal, and Solid Waste Code (COMAR) requires a 25-foot buffer from any flood plain soils for septic systems. The 100-year floodplains were located using published Federal Emergency Management Agency (FEMA) flood plain maps. A 100-year floodplain is the area that would be inundated by a flood that has a one percent chance of being equaled or exceeded in any single year. FEMA identifies and maps floodplains for larger streams with potential flood impact for developed areas throughout the country. There are two designated FEMA floodplains within the project study area. The Watts Branch Floodplain is located on the southeastern border of the study area. The Piney Branch is located on the western border of the project study area. The FEMA floodplains impact a limited number of developed lots in the study area but do affect the back of the lots along Overlea, Lloyd, and Lakewood Drives.

At the permitting stage, the county will also require that no drainage channel convey storm water over a septic field. Small drainage channels such as these could not be located from the available information for the purposes of this study and were not considered in the analysis. The location of streams and FEMA-defined 100-year floodplains and their buffers within the study area are shown in Figure 4.9 Streams and Floodplains.

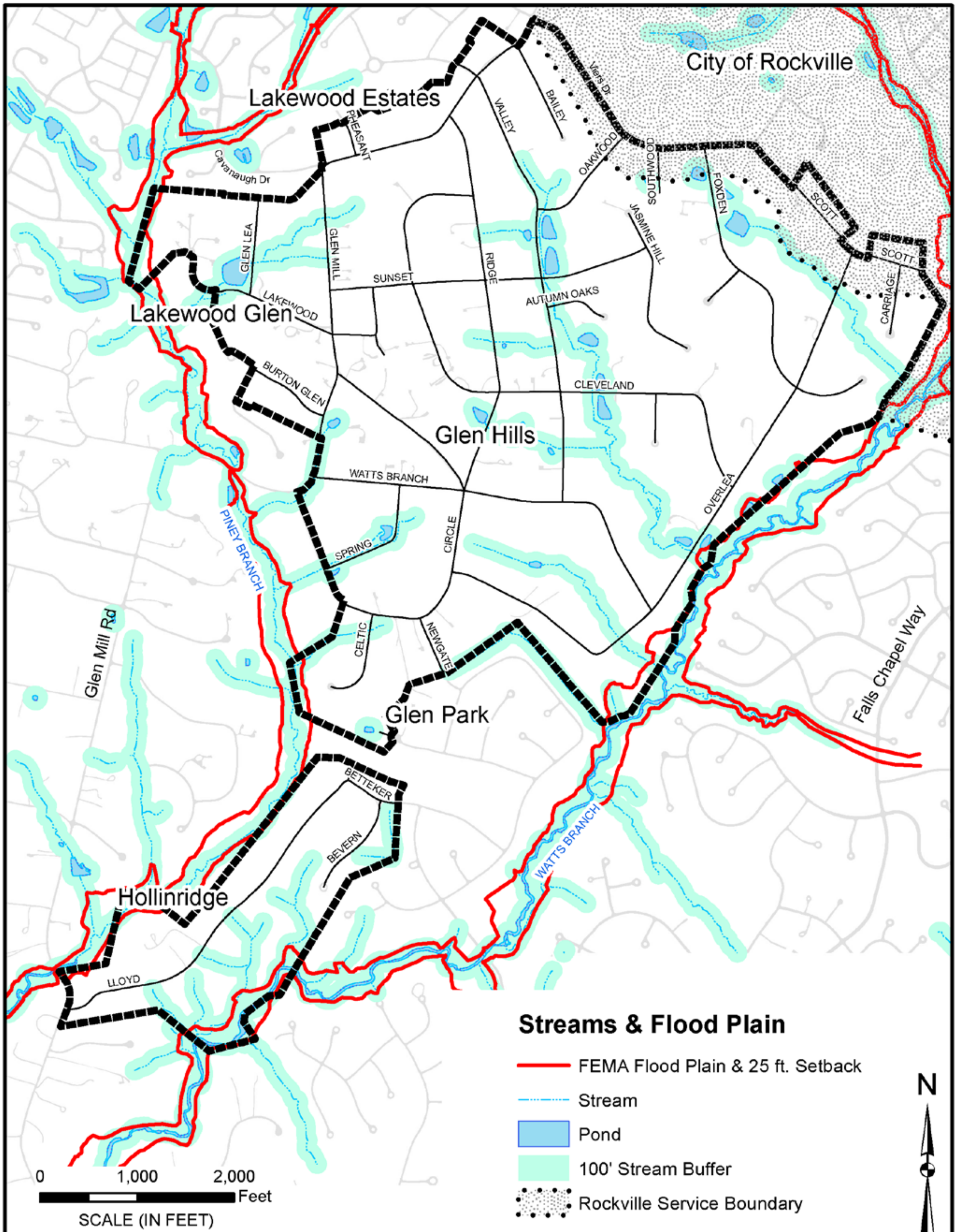

Figure 4.9 – Streams & Floods Plain

4.7. Minimum Lot Size

Lots sized less than 40,000 square feet generally will not support placement of septic systems with proper reserve areas that meet current regulations. Through the permit record data research, it was determined that almost all of the lots in the study area were 40,000 square feet and greater in size and therefore the minimum lot size category was dropped from further evaluation. Note that 40,000 square feet is the standard minimum lot size allowed under the County's RE-1 Zone, the zoning that applies throughout the study area.

4.8. Topography and Steep Slopes

Excessive slope areas must be avoided when locating septic absorption fields. Both COMCOR and COMAR require a 25-foot setback from slopes greater than 25 percent. COMCOR additionally requires that the land have no more than a 12 percent grade for sand mound septic systems. Being conservative, the 12 percent maximum slope standard was used for analysis. The Montgomery County GIS two-foot contours were used and all land with greater than 12 percent slope was delineated (Figure 4.10 Topography/Steep Slopes). The areas found were generally located along stream valleys.

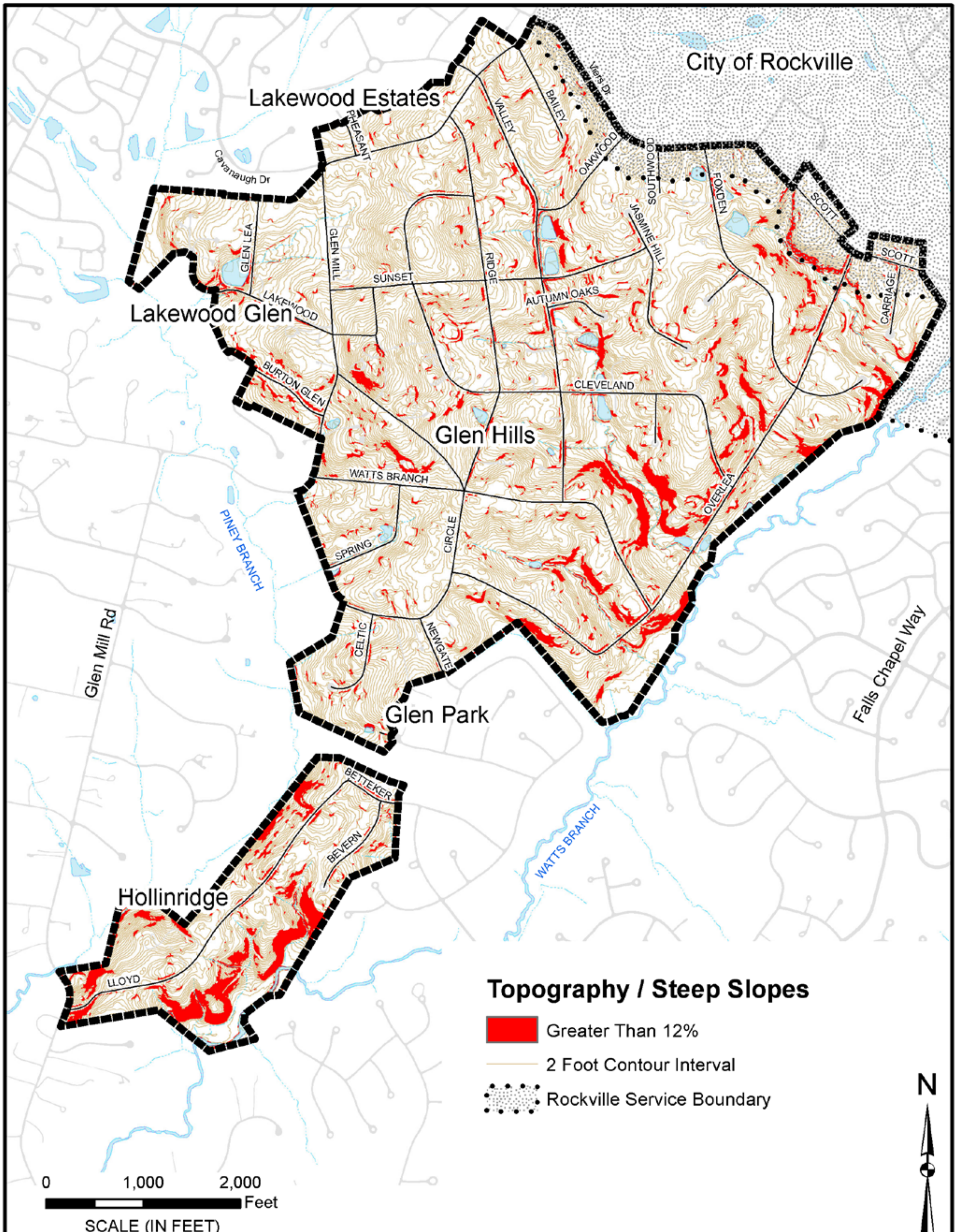

Figure 4.10 – Topography / Steep Slopes

4.9. Depth to Groundwater

Groundwater must remain more than four feet below the bottom of any septic drain field to allow for proper removal of pollutants from wastewater. Most of the drain fields are located at a depth between four and eight feet from ground surface to the bottom of the drain field to provide the necessary fall for a gravity system. This would require groundwater to be a minimum depth of between eight and 12 feet. County regulations, however, require that the shallowest septic drain field be 2 feet, 6 inches deep, measured from ground surface to bottom of trench field, and therefore would require groundwater to be at a minimum depth of 6 feet, 6 inches for shallow tile fields. Sand mound systems can be built at existing ground elevation or higher and can function in shallow groundwater areas. Groundwater for sand mound systems must be at a minimum depth of two feet.

A limited number of MCDPS records indicated actual ground water depths. These have been noted and tabulated by property for evaluation in Table 4.3. Ground water levels appeared on approximately 8 percent of the permit applications reviewed which are shown in Figure 4.11 on page 33. Groundwater observations can only be made down to the depth that the percolation test is performed. Groundwater elevation observations cannot be made if they are deeper than percolation test elevation. Permit records that included percolation rates but not groundwater depths can likely be interpreted an indication that the groundwater depth is deeper than the testing elevation. Table 4.3 displays the results of recorded groundwater depth including those with permit records information that did not note a groundwater depth and assumed these to be deep groundwater depths.

Table 4.3 – Recorded Depth to Groundwater from MCDPS Permit Records

Depth	Number of Lots	Percent of Total [A]
Less than 6 feet deep	12	29
6 feet to10 feet	19	46
Greater than 10 feet	10	24
Total	**41**	**100**
[A] Percent of 41 properties with depth to groundwater noted in permit records.		

The depth–to-groundwater elevations indicated in Figure 4.11 and are taken from the Soil Survey of Montgomery County published by the U.S. Department of Agriculture and are general indications of where ground water levels might be found. The USDA soil survey information was limited to a maximum depth of six feet, therefore it is not known how much deeper than six feet the groundwater depth may be. The USDA soil survey categorized soils at the Glen Hills study area at the following depth ranges: 0-1 foot; 0.5-3 feet and greater than 6 feet. The shallow groundwater depths were generally located along the low-lying stream valleys.

Although only 8 percent of the records contained recorded groundwater levels, these locations correlate fairly well with the USDA mapping of areas having groundwater depths less than six feet. Seven of the 12 lots with permit records showing groundwater depth of less than 6 feet have portions of lots which are in or just adjacent to USDA mapped areas with groundwater less than three feet. These areas are shown on Figure 4.11 Depth to Groundwater.

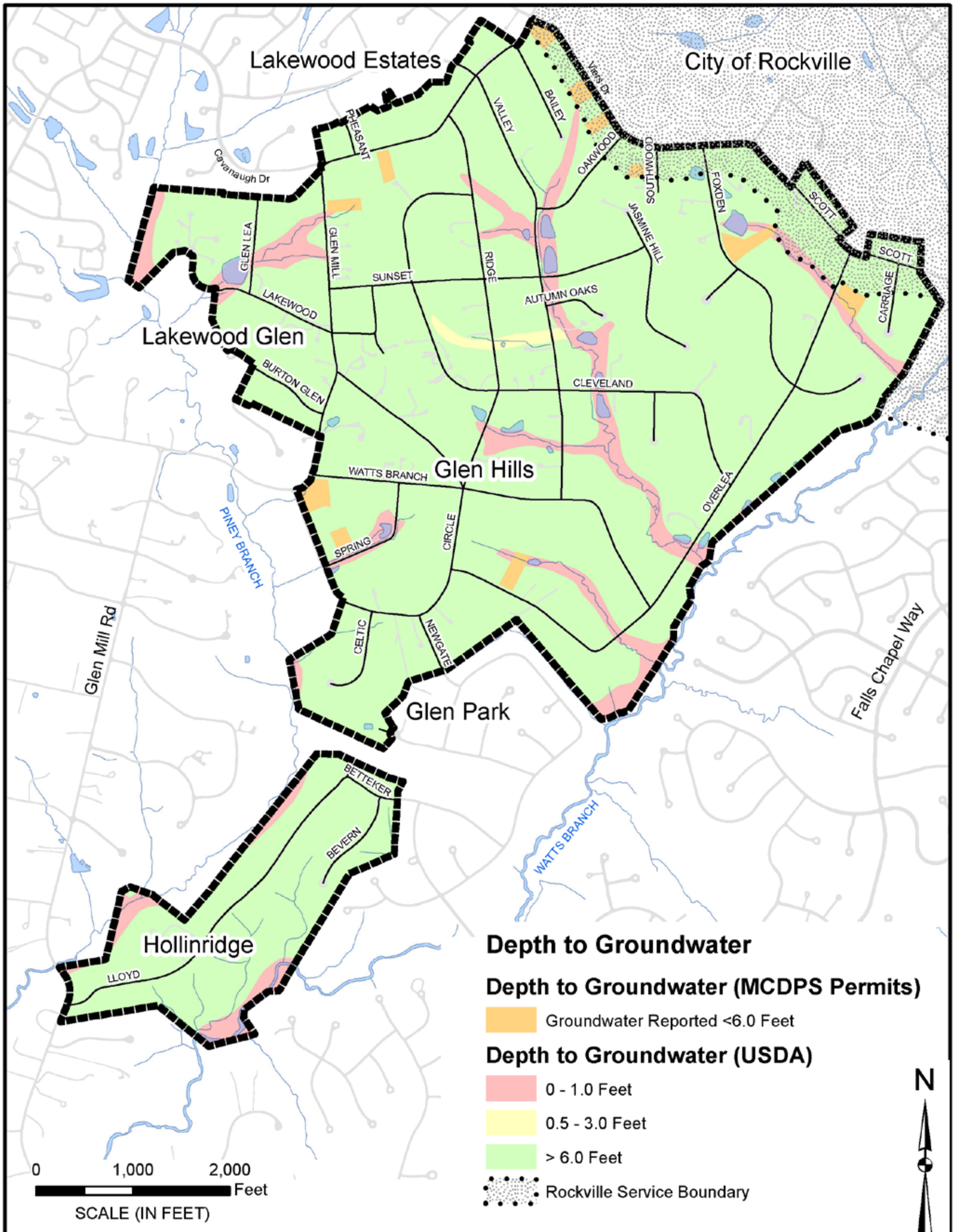

Figure 4.11 – Depth to Groundwater

4.10. Depth to Bedrock

According to Montgomery County regulations, bedrock elevations must be a minimum of 4 feet below the bottom of a septic drain field trench. This allows for the proper depth of unconsolidated and unsaturated soil buffer below the bottom of the septic drain filed trench.

Very few of the MCDPS records had bedrock depth information. This may be due to the fact that bedrock depth testing was not required for any permits applications prior to 1980 or due to the fact that at the testing depth there was no bedrock found. Of the 415 permit records only 5 had any mention of bedrock depth. The depths on these five permits ranged from 5.8 feet to 14.8 feet depths. The locations of these are shown on Figure 4.12.

The depth to bedrock elevations also were determined from the USDA soil survey and are indicated in Figure 4.12. The soil survey listed the various soils types with various depths to bedrock ranges, with the deepest depth to bedrock designated as “greater than 5 feet”. Since shallow septic trench fields or sand mounds systems could function with five- to six-feet-deep bedrock, the areas with bedrock depths greater than five feet and less than five feet were plotted.

With only five permit records providing depth-to-bedrock information, a significant correlation between permit records and USDA soils maps could not be made,. However, the limited depth-to-bedrock information for the five available permit records matched USDA information.

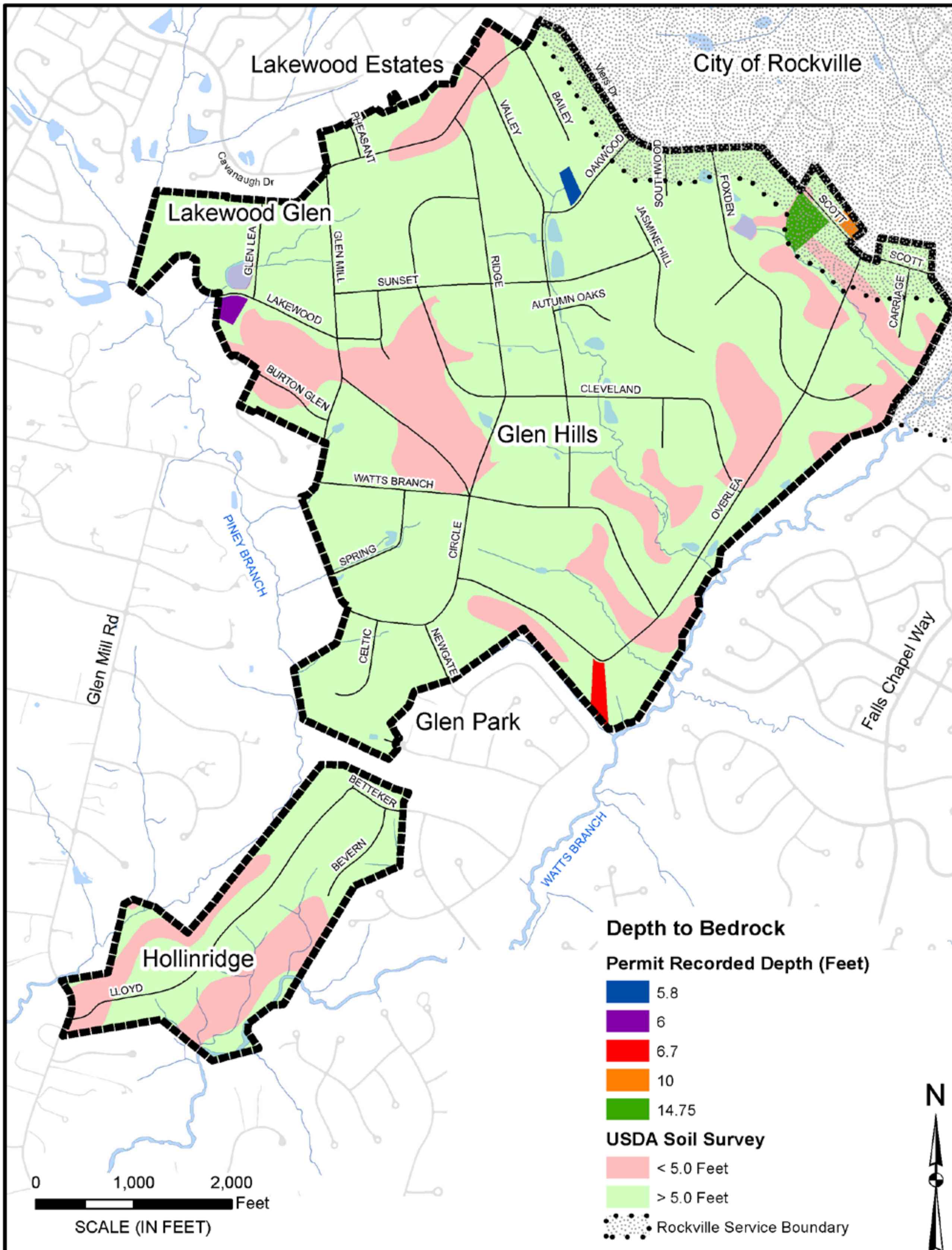

Figure 4.12 – Depth to Bedrock

4.11. Permeability and Percolation Rates

The slowest acceptable percolation rate according to Montgomery County code is one inch in 30 minutes or 30 minutes per inch. The county code also states that a rapid percolation rate of less than two minutes is not acceptable. Percolation rates of less than two minutes per inch are too fast to allow adequate filtering. Rates between three and 30 minutes per inch are acceptable for allowing development to occur. Properties tested and passed with a faster percolation rate will require less septic trench to be built than those with a slower rate. For existing systems that fail with a percolation rate (per today's testing standards) between 31 and 60 minutes per inch, alternative systems such a drip system may be used.

Percolation rates were obtained from the permit records research and are displayed in Table 4.6 below. Permit recorded percolation rates were available for 307 of the existing septic systems and other recorded tests on properties in the study area.

Table 4.4 – Percolation Rates According to Permit Records

Description	Number of Lots	Percent of Total
<30 minutes per inch	296	96%
>30 minutes per inch	11	4%
Total	307	100%

Since percolation rates were not available on all of the permit records in the study area, the USDA Soils Maps were used to map permeability rate areas which are displayed in Figure 4.10.

Permeability rates reflect the rate that water flows down through the soil medium and is given in inches per hour. The USDA has taken these permeability rates and assigned a permeability soil property classification of "Very Rapid," "Rapid," "Moderately Rapid," "Moderate," "Moderately Slow," "Slow," or "Very Slow." The USDA Soil Survey does not cite the methods by which it determined the permeability rate. The permeability rate can be correlated to a percolation rate by mathematically translating the units of time. Since percolation rates are determined in the field and include various specific steps such as pre-wetting the test holes for 24 hours prior to performing the test, conversions cannot be verified as exact. The USDA permeability rates given to specific soil categories had very wide ranges in rates but, in general, when converting to a percolation rate soils categorized as "Moderately Slow" or slower fell outside of the county acceptable percolation rate range. Additionally, the specific soil types that were rated for suitability to construct septic tank absorption fields (see following Section 4.12) used permeability as one of its ratings criteria. When investigating which soils were given a "severe" rating and listed "percs slowly" as a criteria, those soils had a "Moderately Slow" or slower permeability rate in the USDA soil survey.

Percolation rates obtained from the permit records were also plotted against the USDA mapped information. On an area basis, approximately 87 percent of the recorded permit records with percolation rates of less than 30 min per inch also occupied areas with USDA mapped permeability which was "Moderate". Also of the 11 lots with permit records showing percolation rates greater than 30 minutes per inch, six had portions of lots in or adjacent to areas USDA mapped with permeability rates of "Moderately Slow" or slower. The results are shown in Figure 4.13.

Table 4.5 – Permeability

Soil Name	Soil Permeability	Permeability in/hr	Converted Perc Rate Min/inch
Gaila	Moderate	2.0 - 6.0	30-10
Glenelg	Moderate	0.6 - 6.0	100-10
Elioak	Moderate	0.4 - 6.0	150-10
Glenville	Slow	0.2 - 0.6	300-100
Baile	Slow	0.06 - 0.6	1000-100
Gaila	Moderate	2.0 - 6.0	30-10
Brinklow	Moderately Slow	0.0 - 0.1	600
Occoquan	Moderate	2.0 - 6.0	30-10
Legore	Moderate	0.6 - 6.0	100-10
Watchung	Slow	0.2 - 2.0	300-30
Jackland	Very Slow	0.6 - 2.0	100-30
Chrome	Moderate	0.6 - 2.0	100-30
Conowingo	Moderate	0.2 - 2.0	300-30
Travilah	Moderate/Slow	0.2 - 0.6	300-100
Condurus	Moderately Slow	0.2 - 0.6	300-100
Hatboro	Moderate	0.2 - 2.0	300-30
Wheaton	Moderate	0.6 - 2.0	100-30
Blocktown	Moderate	0.6 -2.0	100-30

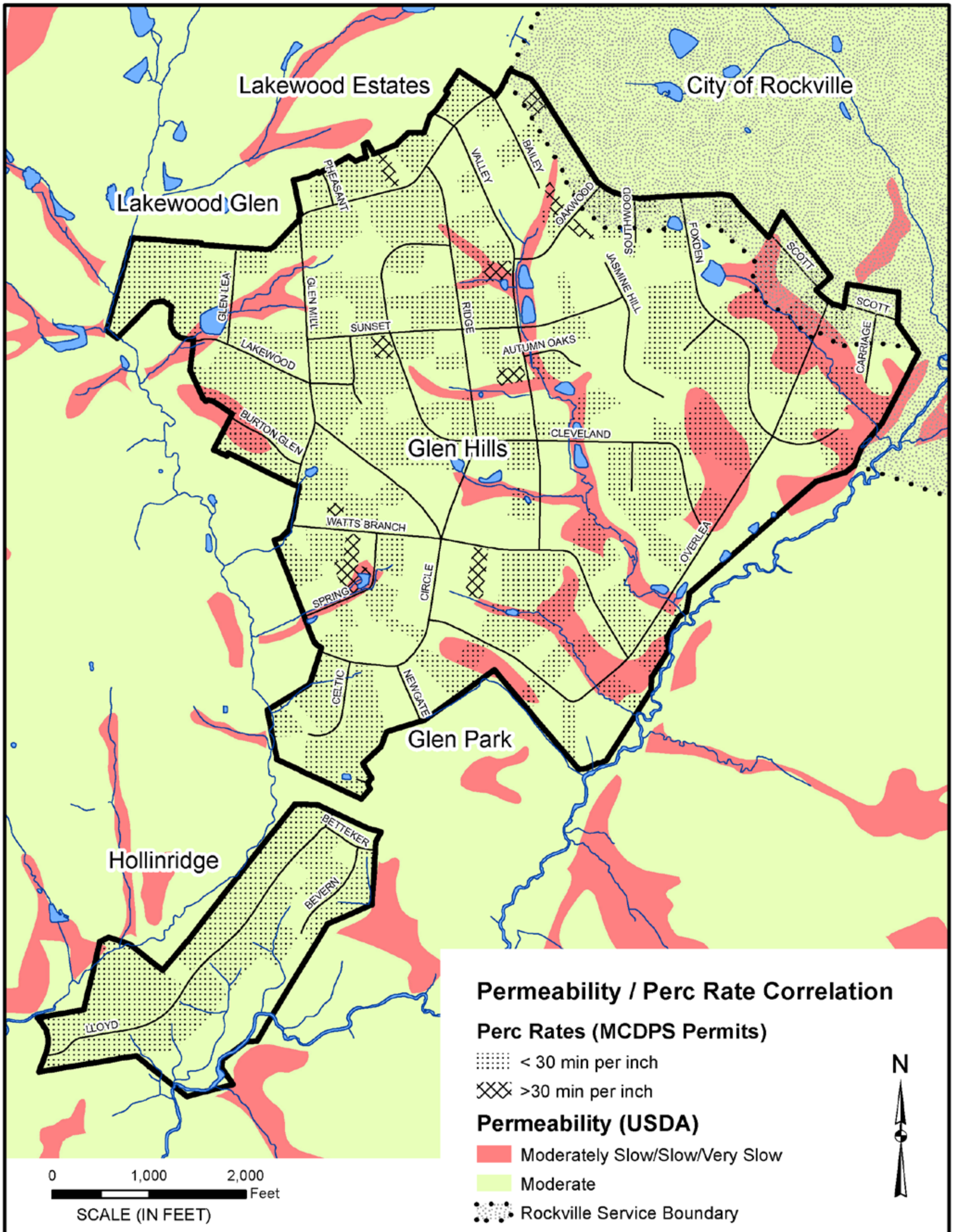

Figure 4.13 – Permeability / Perc Rate Correlation

4.12. USDA Soil Classification

Since many of the natural processes required to treat wastewater depend on adequate aeration, unsaturated soil is essential for wastewater treatment. Hence the soil must be sufficiently permeable for water to move through and beyond the soil profile. The soil profile reflects the extent and type of soils which exist around the drain field trenches. An adequate depth of unsaturated soil ensures that the wastewater is in contact with soil for a sufficient period of time for treatment to take place. Information on the depth of soil and the ability of the soil to accept and transmit water (permeability) provides the basis for assessment of a soil's suitability to treat wastewater.

USDA Soil Surveys provide ratings of soil for their suitability to construct septic tank absorption fields. Only that part of the soil between depth of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, observed performance of the soils, permeability, high water table, depth to bedrock and flooding that affect absorption of the effluent.

Ground water can be polluted if highly permeable soil gravel or fractured bedrock is less than four feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface.

Figure 4.13 shows the soils categorized into four classifications which are defined in the USDA Soil Survey as:

- **Severe (SEV)**: If soil properties or site features are so unfavorable that special design or increased drain field failures or reduced life expectancy is anticipated.
- **Moderate (MOD)**: If soil properties or site features are not favorable for the indicated use and special design such as longer areas of drain fields than normal may be required
- **Slight (SLT)**: If soil properties or site features are generally favorable for use as septic absorption fields.
- **Unusable (USU)**: If the site is unusable such as a quarry or a body of water.

There are a number of ponds in the study area, but only two were large enough to warrent a "UDU" designation. These are the ponds near the intersection of Glenlea and Lakewood and east of Foxden and south of Scott Drive. The areas of the two ponds are excluded from the calculations in Table 4.6, but do not represent a significant percentage of the study area involved.

Table 4.6 – Soil Suitability for Septic Absorption

Soil Name	Restrictive Soil Features for Septic Tank Absorption Fields	Soil Suitability	Percent of Total Study Area
Glenville	Severe: wetness, percs slowly	SEV	
Baile	Severe: wetness, percs slowly	SEV	
Brinklow	Severe: depth to rock, percs slowly, slope	SEV	
Watchung	Severe: wetness, percs slowly	SEV	
Jackland	Severe: wetness, percs slowly	SEV	
Chrome	Severe: depth to rock	SEV	
Conowingo	Severe: wetness, percs slowly	SEV	
Travilah	Severe: wetness, percs slowly,	SEV	
Condurus	Severe: flooding, wetness, poor filter	SEV	
Hatboro	Severe: flooding, wetness	SEV	
Blocktown	Severe: depth to rock	SEV	
	Subtotal Severe	-	**18**
Gaila	Moderate: slope	MOD	
Glenelg	Moderate: percs slowly	MOD	
Elioak	Moderate: percs slowly	MOD	
Gaila	Moderate: slope	MOD	
Occoquan	Moderate: depth to rock	MOD	
Legore	Moderate: percs slowly	MOD	
Wheaton	Moderate: percs slowly	MOD	
	Subtotal Moderate	-	**74**
Gaila	Slight	SLT	
	Subtotal Slight		**8**
	Total Area		**100**

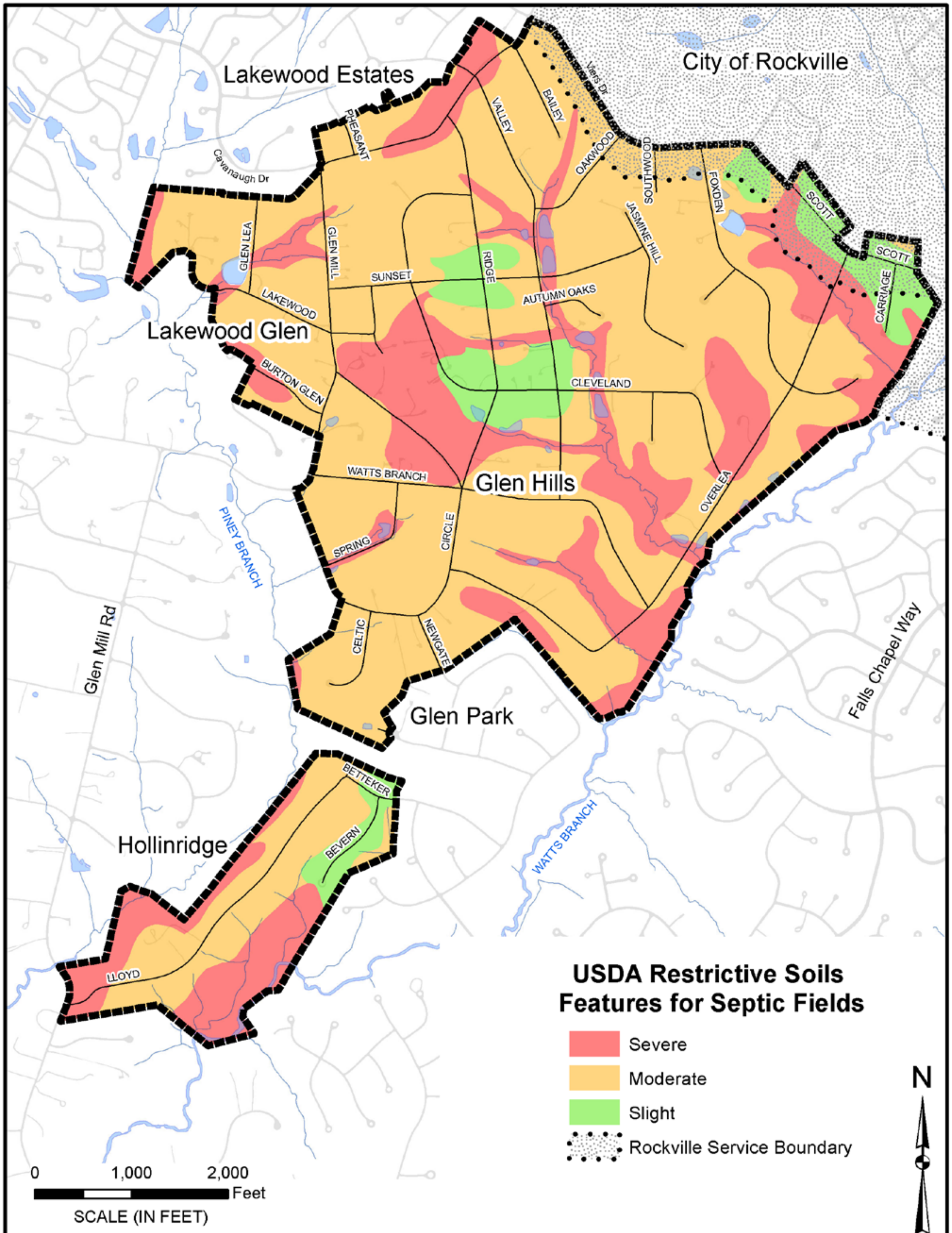

Figure 4.14 – USDA Restrictive Soils

4.13. Failed Septic and Replacement Systems and Undeveloped Lots

Properties with documented failed septic systems were determined by reviewing the MCDPS files. Information in the permit files for these failed systems included letters from the county, letters from the homeowner, and permit information. There are 52 known failed systems in Glen Hills. Of these, 19 have failed once and been replaced with new septic systems, eight have failed more than once, but are still using septic systems, 16 have converted to public sewer and 9 systems are currently failing. There were also numerous properties with septic systems that were replaced with no documented failures. The location of the failures and replacements were also analyzed to determine if geography or soil types could be a potential reason for failure.

Locations of Failed Septic Systems: The 52 known failed systems locations were found to be spread across the entire study area with two-thirds of these concentrated in four locations.

- Six–properties (12 percent of 52) are concentrated in the Scott Drive, Viers Drive and Oakwood Drive areas. Bailey Drive would have been included as part of the concentrated area, but most of the lots on Bailey Drive were originally unable to pass percolation tests or had high groundwater, and therefore could not obtain a permit and remain undeveloped properties. The types of systems that failed in this area were generally older seepage pits and seepage lagoons.

- A second concentration of seven properties (13 percent) was found in the vicinity of Sunset Drive, Ridge Drive, and Cleveland Drive. As stated above, poor soils and high groundwater were the reasons for failure. The failures found in this area were unique because multiple failures occurred as the original seepage pits were replaced with stone trenches, which then also failed and needed replacement. As stated above, there are also undeveloped lots in this vicinity that could not be built on.

- A third area of concentration of known failed systems included the Circle Drive and Spring Drive areas with 14 properties (27 percent). Nine of the failed system properties in this vicinity have been converted to public sewer, but of the properties remaining on septic in this area, five have a history of failure, and have had the septic system replaced. Seepage pits failed most often in this area.

- A fourth area of known failed systems is along Overlea Drive totaling eight properties ~~or~~ (15 percent). There is an existing public sewer running along Overlea Drive, and accounts for three of the current public sewer properties once having a septic system. This general area is adjacent to the Watts Branch 100-year flood plain and poor soil condition contributes to the known failures.

The remaining 17 properties (33 percent) of the known failures are spread across the Glen Hills area. See Figure 4.15 on page 45 for the Failed Septic and Replacement Systems map.

Recorded Failure – One System Replacement: There were 19 total documented failures within the Glen Hills study area with one system replacement. The reasons given in the permit documents included poor percolation, high groundwater, and poor soil types. If the failure occurred due to the field or pit demonstrating poor drainage, the replacement field or pit was installed in the designated reserve area. A failed septic system location cannot be utilized again for a new septic system.

Recorded Failure – System Component: There were an additional 33 properties with documented failed components of the system (i.e. tank or a pipe replacement), but did not require relocation of the septic field or seepage pits. Twenty four of the documented failed systems were replaced only once. The remaining 9 documented failures were currently unresolved at the end of 2012, and are discussed below in further detail.

Since many of these lots contain initial dedicated reserve areas for two fields, are of adequate size to accommodate additional septic field construction, or are located well outside areas that have any documented site issues that affect sustainability, an additional septic field beyond the replacement likely would be possible.

Multiple Septic System Replacements: Eight of the existing septic systems have been replaced more than once. In most cases sand mound or innovative systems were used to replace the failed systems. Replacement septic systems cannot be built in an area of a previously failed septic system. Multiple failures and replacements eliminate useable lot area for future septic field replacements and make sustaining a septic system difficult.

Previous Septic System or Fail Testing to Public Sewer: There are currently 16 properties within Glen Hills in the Spring Drive and Circle Drive area connected to public sewer that had a previously failed septic system. Public sewer was either available in this area or a system extension was constructed.

Undeveloped Properties with Documented Failed Testing: The study area contains 36 undeveloped properties which have permit records documenting failures and/or unsuitability for septic use. The properties consist of environmentally sensitive outlots that are unbuildable on septic systems, and properties for which lots were unable to pass required county tests for well and septic system construction including percolation tests and testing for groundwater and bedrock.

The undeveloped properties are scattered throughout Glen Hills with a concentration in the Bailey Drive, Valley Drive, and Cleveland Drive near the Valley Drive and Ridge Drive intersections. Please refer to Figure 2.2 on page 8 for the locations of the undeveloped lots.

As a part of this study, the undeveloped properties that attempted to obtain a permit, but failed due to the reasons listed above, would be considered as potentially unsuited for deep trench septic systems in the evaluation section of this report.

Current Failing Septic Systems: There are currently 9 documented failures that have not been resolved. The documentation stated a system is failing and is in need of new testing of the soil. There are no new permits approved for these properties. MCDPS has on-going investigations with the homeowner to determine the cause of the failure, and a remedy for repair. The majority of the failures are located in the Spring Drive area, while others are located near Oakwood Drive and Viers Drive.

MCDPS has worked, with the assistance of the Department of Environmental Protection and the Washington Suburban Sanitary Commission, to seek the provision of public sewer service in some cases of septic system failures, typically:

- Where on-site septic system replacement options are limited or non-existent, and
- Where the provision of public sewer service presents a reasonable relief measure.

No Recorded Failure – One System Replacement: There were 55 system replacements without information in the file documenting failure. Because the reasons for replacements were not documented in the permit records, these cases were not considered as failures. It could be assumed replacement at these properties was due to failure, changes of ownership or the owner's desire to upgrade the system. A majority of such properties were old seepage pits from the early 1960s and were replaced in the mid-1970s with stone trenches meeting MCDPS current standards. Most of the 55 system replacements were completed within 10-15 years of the original system construction with no documented failures of these properties. There was no new construction or expansion of housing associated with system replacements.

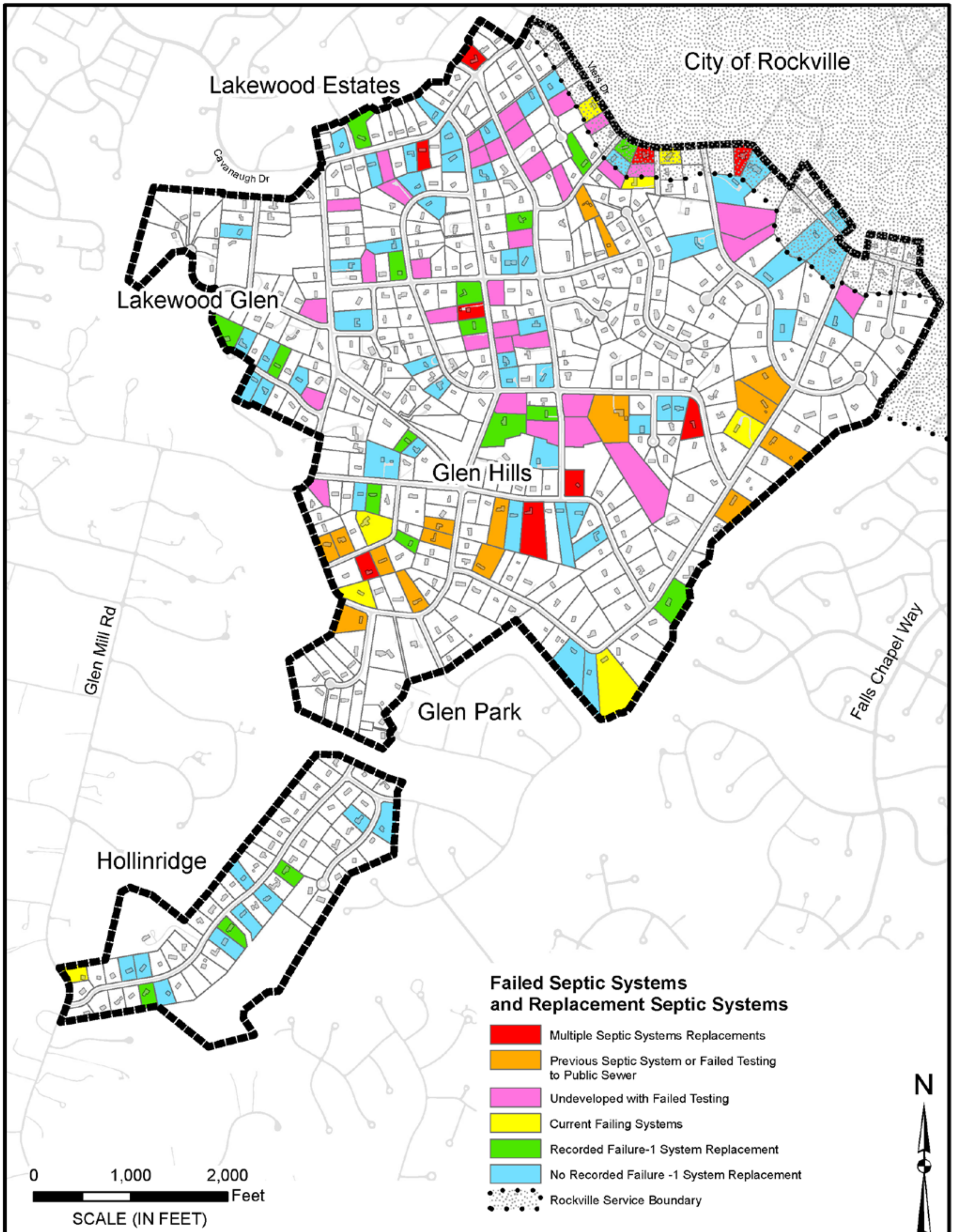

Figure 4.15 – Failed Septic Systems & Replacement Septic Systems

5. Conclusions about Long-Term Septic System Use

Data obtained from county and federal sources were collected and analyzed using eight parameters of data. Each of the parameters was investigated to determine how it affects the potential for the suitability of the study area for the use of deep trench septic systems. The parameters were investigated based on available information. This information included record permit information that included field testing at individual lots but this record permit information did not cover the entire study area and, for some of the parameters, covered only very limited portions of study area. Some of this study's evaluations are based on available USDA soil maps which do cover the entire study area. These soils maps provide information to a planning level only. To validate the USDA soils information on a property-by-property basis, proper field testing should be done. Only with actual field testing can there be certainty regarding the suitability of soil conditions for deep trench septic systems. Each of the eight parameters are listed with results of the analysis below:

5.1. System Age

The age of the septic treatment system was determined by reviewing Montgomery County Department of Permitting Services (MCDPS) on-site systems permit record information. Older systems typically do not meet today's standards and upgrading the system can be very challenging due to constraints such as setbacks, finding suitable undisturbed soil, etc. The critical regulatory date is 1975 since that is when a reserve area requirement was implemented. For the purposes of this study, systems installed after 1975 are assumed to have adequate reserve areas where a new system should be able to be built should the existing one fail. For systems built prior to 1975, an adequate reserve area may not have been planned to provide for cases of drain field failure. Approximately 52% of the study area lots were estimated to be permitted prior to 1975 and potentially constrained by lack of adequate reserve area. These properties should be further studied to evaluate their ability to support septic system use.

5.2. Streams and Floodplains

The 100-foot stream setbacks and Federal Emergency Management Agency (FEMA) floodplains with 25-foot setbacks were mapped within the study area. The FEMA floodplains of Watts Branch and Piney Branch impacted some lots along Overlea Drive, Lloyd Drive and Lakewood Drive backing onto these streams. The 100-foot setback buffers of several unnamed streams traversing the center of the project area are predominantly located on undeveloped lots, but do affect developed lots as well. The areas with streams and floodplains and their associated buffers potentially constrain about 21% of the study area from installation of septic systems..

5.3. Topography and Steep Slopes

Steep slope areas that would preclude construction of all types of septic systems were mapped. Since sand mound septic systems are not allowed on steeper than 12 percent slopes, 12 percent was used as the limiting grade. Areas with slopes greater than 12 percent potentially constrain about 7% of the overall study area from installation of septic systems.

5.4. Depth to Groundwater

MCDPS record information also included documented groundwater levels for a limited number of properties. USDA maps which include a description of the expected groundwater levels for each type of soil were used to supplement MCDPS permit records to develop groundwater depths across the study area. USDA map information is only given down to a depth of six feet. Therefore deep groundwater depths were only stated as "six feet or greater." The USDA soil survey categorized soils at the Glen Hills study area at the following depth ranges: 0-2 feet; 0.5-3 feet and greater than 6 feet. It is possible to install sand mound septic systems with ground water at a minimum of two feet and shallow septic drain fields with a minimum six foot, six inch ground water depth. Groundwater depths in the 0-2 feet and 0.5-3 feet ranges were considered potentially unsuited for deep trench septic system use. These areas comprise approximately 9% of the study area.

5.5. Depth to Bedrock

Montgomery County DPS permit record information for depth to bedrock was only available for five lots. The U. S. Department of Agriculture soils maps included a range of depths to bedrock for each soil type in the study area and were used to map bedrock depths. Bedrock depths were categorized as less than five feet depth or greater than five feet depth. Since shallow septic trench fields or sand mounds systems could function with five to six feet depth to bedrock, the areas with bedrock depths greater than 5 feet and less than 5 feet were plotted. Areas with bedrock depths less than five feet were considered to have the potential to constrain deep trench septic system use. These areas comprise approximately 9% of the study area.

5.6. Percolation and Permeability Rate

The percolation rate for each septic treatment system was determined by reviewing Montgomery County MCDPS record information. Since most but not all of the study properties have records indicating the percolation rate, the USDA soil map information was used to supplement MCDPS permit records to develop permeability of soil across the entire study area. Any area categorized as "Moderately Slow" or slower are considered to have the potential to constrain deep trench septic system use. These areas comprise approximately 13% of the study area.

5.7. Soils Classification on Septic Field Limitations per USDA

USDA and Montgomery County Soil Maps assign a rating of "Severe," "Moderate," and "Slight" for each type of soil for septic trench development. Using GIS mapping, the predominant soil type on each property was identified and the accompanying rating was used. Areas noted as "Severe" are considered to have the potential to constrain deep trench septic system use. These areas comprise approximately 18% of the study area.

5.8. System Failures and Replacements

MCDPS record information included documented failures, replacement to septic systems, and records of failed septic field testing. A history of previous septic field failures is an indication of future failures and multiple failures and replacements eliminate useable lot area for future septic field replacements.

Lot areas that were in the following categories are considered to be potentially constrained for deep trench septic system use and represent 10 % of the study area.

- Multiple septic systems replacement
- Public sewer - Previous septic system failed

- Undeveloped Lot - Test failed

5.9. Summary of Potential Limitations for Deep Stone Trench Septic Systems

Septic systems fail for a wide variety of reasons with the most common reasons being system age, site conditions and maintenance. All systems will eventually fail. This study investigated:

- Past history of system types and failures as an indicator of future constraints
- What areas have soil conditions which have potential to support long term septic use
- How do existing regulations affect future septic system use
- The potential for replacement of septic systems

The eight parameters above were investigated, each of which has the potential to limit-permitting and long-term use of a deep stone trench septic system according to current regulations. By combining the areas potentially affected by each parameter; a map was compiled to consider parts of the study area that may eventually need options other than the use of deep stone trench septic systems (see Figure 5.1, page 50). The map displayed several areas, predominantly located along stream valleys, where soil conditions and regulatory requirements may constrain deep stone trench septic system use. These parts of the study area are identified on Figure 5.1 as "Review Areas" (RAs).

Overall, approximately 36 percent of the study area (by acreage) was included in a Review Area; determined to have at least one characteristic that could make the long-term use of traditional, deep stone trench septic systems questionable. Portions of the study area located outside of those described above, or approximately 64 percent, lack any of these unfavorable characteristics, which could then generally favor the long-term use of deep trench systems.

The generalized nature of some of the data used to compile the review areas (RAs) shown in Figure 5.1 means that not every area within the RAs included is completely incapable of supporting a septic system. Conversely, not every area shown outside the RAs shown is guaranteed to be capable of long-term service using deep trench septic systems.

The results of this phase of the study indicate a need to proceed with Phase 2 of this study, which is intended to evaluate options for addressing relief measures for parts of the study area that may be unsuited for the long-term use of traditional deep trench septic systems. These areas need to be investigated further to determine the feasibility of other on-site system alternatives and the feasibility of extending public sewer service. Evaluating the technical feasibility of these alternatives will need to be coordinated with the MCDPS and the Washington Suburban Sanitary Commission.

Ultimately, this study is intended to provide the County Council with information on which to formulate sewer and septic service policies in the Glen Hills area. Narrowing the focus of the study to areas needing further study for potential wastewater disposal service alternatives is an important step in that process. Review Areas for further Phase 2 investigations include (see Figure 5.1):

- Areas along Glen Mill Drive Road from Pheasant Drive to Bailey Drive
- Areas along Valley Drive, Cleveland Drive and, Watts Branch Drive associated with an unnamed stream

- Area bounded by Glen Mill Road, Ridge Drive, Cleveland Drive
- Stream area along Foxden Drive and crossing Overlea Drive
- Area at Cleveland Drive and Overlea Drive intersection
- Area associated with stream area south of Watts Branch Drive and crossing Overlea Drive
- Area along the southern end of Overlea Drive
- Areas along Lloyd Drive, Burton Glen Drive and Lakewood Drive.

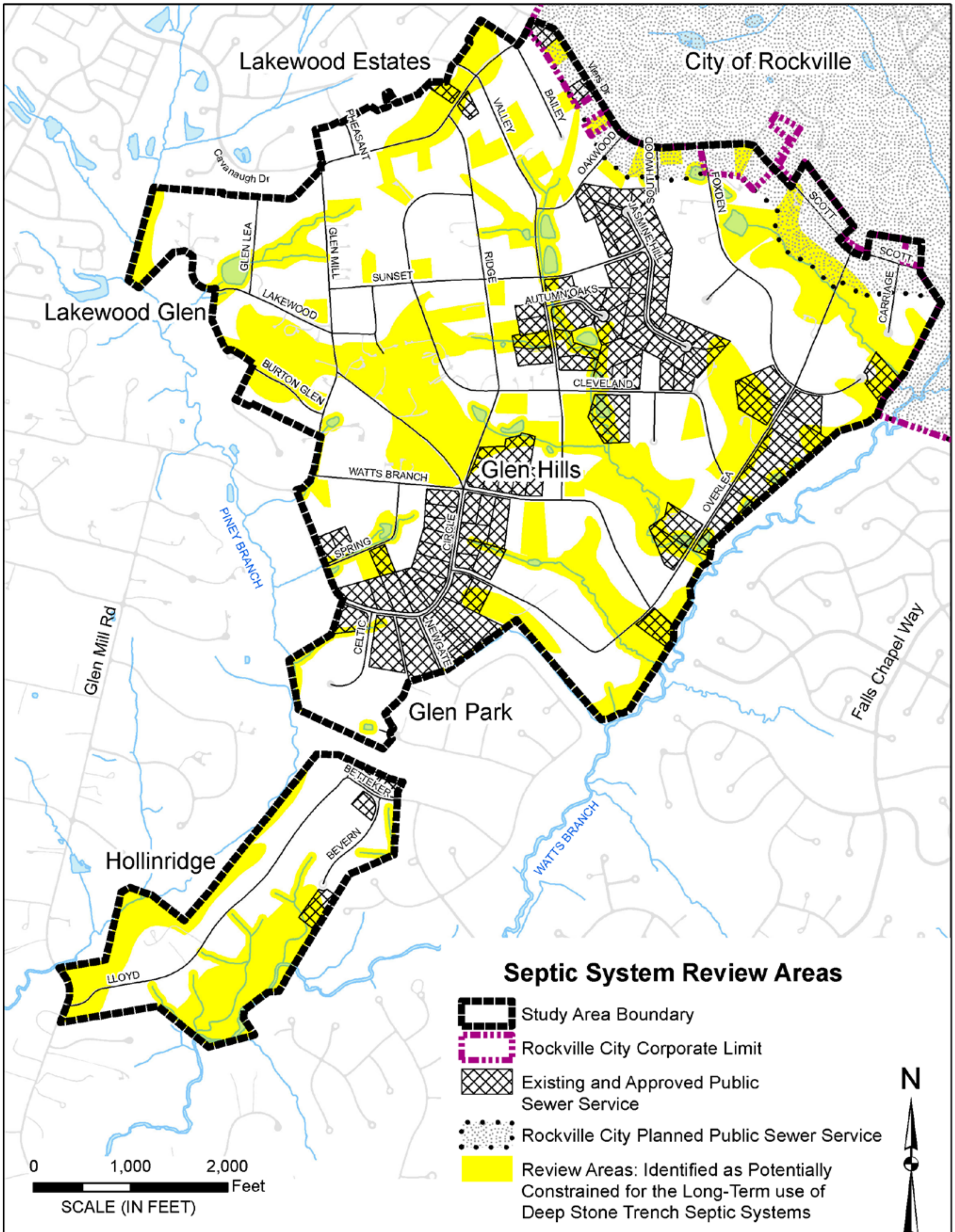

Figure 5.1 – Septic System Review Areas (RAs)

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APPENDIX 1

Reserve Area Criteria

Excerpted From Chapter 27a. Individual Water Supply And Sewage Disposal Facilities – Regulations COMCOR 27A00.01.03 And 27A.00.01.05

From 27A.00.01.03 Applications and Permits

L. The following criteria will be applied when reviewing building permit applications for improvements to or replacement of existing structures:

1. Major additions of three bedrooms or more or to inside living quarters constituting 50 percent or more of the habitable square footage of the existing structure require that current regulations must be met to include confirmation of an absorption field of not less than 10,000 square feet of useable absorption area to provide for an initial and two replacement absorption trenches. Additional sewage treatment and/or disposal system may have to be added to the existing system to adequately service the proposed addition, and the location of the septic tank confirmed by uncovering it. All septic tanks must be accurately located if the addition requires extension of the foundation or pier footing.

2. Approval of an addition of two bedrooms or less than 50 percent but more than 25 percent of the habitable square footage of the existing living quarters of the structure will depend on one of the following:

a. The existence of a previous permit that indicates adequate initial and recovery absorption areas, accurate location of the septic tank and satisfactory percolation tests. Further testing and proof of adequate absorption area may be required prior to approval of the addition when the Approving Authority determines the information on the permit does not provide a basis for approval, e.g. questionable percolation rates, poor soils, lack of water table information, problems with well water quality in the general area, or other reason that raises an issue of possible ground water contamination.

b. In the absence of an approved permit on file, satisfactory water table and percolation tests, location and approval of existing septic tank, inspection of absorption area for evidence of failure, and the confirmation of an initial and two recovery absorption areas are required.

3. An addition of not more than one bedroom or less than 25 percent of the habitable square footage of the existing structure not involving encroachment on the sewage disposal reserve area may be approved if an approved permit for the existing system is on file or may require testing if there are questions about adequacy of the system and possible ground water contamination.

4. Reconstruction of a failed system must attempt to meet current standards. The Approving Authority must approve the best system that can be provided without endangering the public health.

5. Systems for replacement of occupied housing which are condemned for human occupancy or destroyed by fire or similar disaster must attempt to meet current standards.

6. When a dwelling which was destroyed by fire or condemned for human habitation is to be replaced on a different lot all requirements of these regulations pertaining to new dwellings must be met.

7. Guest house, bedroom or other habitable space in separate and detached buildings require separate on-site sewage disposal and on-site water supply systems.

8. Pool houses (changing room, showers, toilet, lavatory) may be connected to an existing system if the system meets standards for the dwelling, or it may need to be served by its own system of one initial and two recovery areas as determined by the Approving Authority if bedrooms or rooms that could serve as bedroom and kitchen facilities are involved.

From 27.A00.01.05 On-Site Sewage Disposal System Site Criteria

F. Each building site utilizing on-site sewage disposal must meet one of the following requirements:

1. Existing parcels of land without change in lot configuration since March 3, 1972 and subdivided lots recorded prior to March 3, 1972, on which percolation tests have not been approved by the Approving Authority, must have sufficient area for the initial absorption area and at least 2 recovery absorption areas. The total absorption area or mound disposal area, which includes the initial mound system and 2 replacements, must not be less than 10,000 square feet of useable area.

2. Existing parcels of land without change in lot configuration since March 3, 1972, with deeds dated prior to March 3, 1972, and subdivided lots recorded prior to March 3, 1972, on which percolation tests have been approved by the Approving Authority must have a total absorption area equal to one of the requirements listed in a. and b. below.

Additional percolation testing may be required due to insufficient number of sites tested, inadequate depths tested, tests performed in the wrong period of year for highest water table confirmation, and history of failures of disposal systems in adjacent areas.

a. Recorded subdivision lots having approved preliminary plans must have a useable 10,000 square feet total absorption area or mound disposal area or must comply with the absorption area requirements delineated on such plans, whichever is the greater.

b. Other subdivided lots and existing parcels of land must have sufficient area for the initial absorption area and at least 2 recovery absorption areas. The total absorption area or mound disposal area, which includes the initial mound system and 3 replacements, must not be less than 10,000 square feet of useable area.

3. All lots subdivided after February 28, 1979 must have sufficient absorption area to comply with the sewerage service category of the County Plan to which the lot is assigned as follows:

a. Lots in Sewerage Service Categories 1 through 5 must have sufficient area for the initial absorption area and at least 2 recovery absorption areas. The total absorption area or mound disposal area, which includes the initial mound system and 2 replacements, must not be less than 10,000 square feet of useable area.

b. Lots in Sewage Service Category 6 must have sufficient area for the initial absorption area and at least 3 recovery absorption areas. The total absorption area or mound disposal area, which includes the initial mound system and 2 replacements, must not be less than 10,000 square feet of useable area.

APPENDIX 2

Glen Hills Recommendation from

2002 Potomac Subregion Master Plan

- **Acquire the Miller & Smith (Pepco) property (258 acres) as conservation park land.**

- **Acquire by dedication significant portions of the Tipton tributary properties in the lower Greenbriar Branch as conservation park land. These properties include the Tipton, Piney Grove, Weihe, and Semmes properties. Priorities include the Greenbriar Branch mainstem riparian areas along with the forested area west of the gas line easement.**

- **Acquire by dedication portions of the Hanson Farm along the border of Muddy Branch Stream Valley Park, including the northern corner where a trail connection is desirable and where the mainstem is close to the property line.**

- **Protect the riparian area along the Turkey Foot tributary of Muddy Branch through acquisition, dedication or conservation easement.**

- **Acquire forested property (parcel 170) adjacent to Muddy Branch Stream Valley Park land at the end of Cervantes Avenue and with access from Esworthy Road.**

- **Acquire property south of Esworthy Road (parcel 121), surrounded by the Muddy Branch Stream Valley Park.**

- **Acquire the surplus school site located inside the bend on Brickyard Road to protect scarce forested land in this densely developed area.**

- **Designate the 97-acre Callithea Farm (Figure 3) bordering Blockhouse Point and the Chesapeake & Ohio Canal National Historical Park as park land that will include a publicly owned horse farm.**

- **Explore designation of part of Gokturk Woods, on Berryville Road in Seneca Village, as a neighborhood conservation area.**

Sewer Service Policies

A critical policy related to water quality is the provision of community sewer service. Providing community sewer service to relieve failed septic systems minimizes groundwater contamination. However, the provision of community sewer service can damage the environment and water resources by facilitating development to the maximum zoning density. Extensions along stream valleys can also create habitat disturbance, threatening species survival, and can adversely affect the natural hydrologic system due to wetland fragmentation. Once sewer lines are in place, their structural integrity may deteriorate over time, resulting in sewage leaks and further disturbance to the ecosystem. This is particularly troublesome where eroding or shifting stream channels expose sewer mains and manholes, leaving them more susceptible to damage.

In general, the County's water and sewer policies allow the provision of sewer service only to those areas zoned for moderate to dense development (i.e., greater than or equal to one unit per 20,000 square feet). However, at the recommendation of the 1980 Master Plan, sewer service has been provided to some areas zoned for one- and two-acre lots, creating both a policy dilemma and, in some cases, environmental damage. Typically, low zoning densities (such as RE-1 and RE-2) are used to protect the natural environment by minimizing development impacts. Low and, in some cases medium, density areas (such as R-200) are dependent on septic suitability, often resulting in actual development yields well below the maximum allowed by zoning. Extending sewer lines into these areas has the potential to allow development density at or near the zoned maximum, to disrupt the environment and to provide rationale for further extensions and greater density. One of the greatest challenges facing the Potomac Subregion and this Master Plan has been to develop compatible land use and sewer service recommendations which protect the Subregion's environmental quality. The section addressing sewerage systems provides detailed recommendations regarding these sewer service issues.

Community sewer service in the Subregion is provided through trunk lines which parallel most of the major tributaries. These trunk mains drain to the Potomac Interceptor, a large sewer line that parallels the Potomac River and conveys sewage to the Blue Plains Treatment Plant in the District of Columbia.

The County's policies on the provision of community sewer service are governed by the *Water and Sewer Plan*, the County's *General Plan*, master plans, the State's Smart Growth policies, and other policy documents. Master plans recommend where sewer service is to be provided, generally in areas of dense development, consistent with *Water and Sewer Plan* policies. The *1980 Potomac Subregion Master Plan* is one of the County's few master plans recommending sewer service for zones such as RE-1 and RE-2, an exception to the general policies for sewer extension. The County Council has asked that as part of the Potomac master plan update, the Planning Board study the effects of sewer service in these areas on land use, infrastructure, the environment, and budget.

Low-Density Areas

In part, the 1980 Potomac Master Plan's intent was to use community sewer service to take maximum advantage of the allowed density in lower-density zones such RE-1 and RE-2 where it was appropriate. Much of the undeveloped area zoned RE-1 and RE-2 was placed in master plan sewer stage IV where the provision of community sewer service was evaluated case-by-case on the basis of logical, economical, and environmentally acceptable service. Twenty years later, a comprehensive evaluation indicates that providing community sewer service to areas zoned for one-and two-acre development, and contrary to smart growth policies, has undermined the environmental emphasis of zoning areas for low-density development, especially where septic suitability is marginal. With increasing demand for homes and recent development and redevelopment trends, especially where sewer service is provided, this exception to the general sewer service policy is no longer effective. Much of the remaining undeveloped RE-1 and RE-2 land is beset by environmental constraints limiting development potential without sewer.

Under the prior master plan, the Subregion has experienced substantial provision of community sewer service to lower-density areas. Because of this, and because the County considered the approvals for much of this service on a case-by-case basis, the current Potomac community sewer envelope is irregular, established by demand rather than by plan. Voids within the envelope and irregular boundaries along its perimeter abound. Although this Master Plan generally recommends against the continued provision of community sewer service to low-density (RE-1 and RE-2) areas, it does support limited approvals for community sewer service for the low-density areas within the envelope and along its currently-established edge. The focus of this limited service and expansion should be on properties which already abut existing or proposed mains and on properties which can be served by sewer extensions within public rights-of-way. Main extensions that would disrupt streams and their undisturbed buffer areas should be avoided. Any approvals granted along the currently-established edge should not be cited as justification for expanding the sewer service envelope beyond the limits recommended in this Plan.

Sewer Service Recommendations

- **Provide community sewer service in the Subregion generally in conformance with *Water and Sewer Plan* service policies. This will generally exclude areas zoned for low-density development (RE-1, RE-2, and RC) not already approved for service from further extension of community service.**

- **Allow for the limited provision of community sewer service for areas zoned RE-1 and RE-2 within and at the periphery of the proposed sewer service envelope. (See Foldout Map D.) Exclude from this peripheral service policy properties adjacent to and in the vicinity of the Palatine subdivision and the lower Greenbriar Branch properties, and all properties within the Piney Branch Subwatershed, the Darnestown Triangle, and the Glen Hills Area (until completion of the study described on page 24, which will evaluate whether this exclusion should continue in the future). Emphasize the construction of sewer extensions, if needed, along roads rather than through stream valleys.**

- **Help to protect water quality in the Stoney Creek subwatershed of Watts Branch by requiring that sewer main extensions to serve the few properties approved for community service be located along River and Stoney Creek Roads, rather than along the stream valley.**

- **Deny the provision of community sewer service to the areas zoned R-200 near the intersection of River and Seneca Roads.**

Glen Hills Area

The Glen Hills area consists of several established subdivisions with lots generally at least one acre in size. Most of the lots were established in the 1950's and 60's using septic systems. At that time, septic standards did not include septic buffers, water table testing, multiple depth testing, and the consideration of fractured rock. The Department of Permitting Services (MCDPS) has raised concerns about the periodic septic failures which occur in the neighborhood because subsurface conditions often do not allow for replacement systems which satisfy current septic regulations. This Plan supports a study of the septic failures in Glen Hills to develop the measures necessary to ensure the long-term sustainability of septic service for new home construction and existing home renovations, and to address the need for limited sewer extensions if needed. This study, conducted in conjunction with the citizens of this area and the appropriate public agencies, shall include the following elements:

- Delineation and possible reasons for known septic failures.
- Groundwater testing if needed.
- Preparation of a logical and systematic plan for providing community sewer service if needed.
- Emphasis on extension of sewer mains within public right-of-way rather than within stream valleys.
- An evaluation and recommendation of the abutting mains policy for this area.
- Exclusion of properties that are environmentally sensitive and cannot be developed in conformance with established environmental guidelines.

This Plan recommends restricting further sewer extensions in Glen Hills to those needed to relieve documented public health problems resulting from failed septic systems. New sewer main extensions needed to relieve public health problems will be evaluated on a case-by-case basis for logical, economical, and environmentally sensitive extensions of service, with an emphasis on locating main extensions along public right-of-way, rather than stream valleys. Because of the concern that the sewer envelope will expand inappropriately, the abutting mains policy should be deferred subject to the results of the Glen Hills study.

Glen Hills Recommendation

- **Conduct a study described above of the Glen Hills area. Based on the results of that study develop a policy outlining the measures needed to ensure the long-term sustainability of septic service for new home construction and existing home renovations, minimizing the need for future sewer service extensions. Under this policy the sole basis for providing new sewer service would be well-documented septic failures where extension could be provided consistent with results of the study and in a logical, economical, and environmentally acceptable manner. Until a policy is developed, restrict further sewer service extensions in Glen Hills to properties with documented public health problems resulting from septic system failures.**

Piney Branch Subwatershed

The Piney Branch subwatershed presents a specific sewer service issue. Shallow bedrock and poor percolation rates severely limit development potential in the Piney Branch, Sandy Branch, and Greenbriar Branch basins unless sewer service is provided. However, these areas tend to have fragile or rare plant and animal communities as well as good water quality. The Piney Branch Trunk Sewer was constructed to serve development generated by TDRs in the upper subwatershed in North Potomac. Concerned over the potential environmental damage that could result from increased development density due to the availability of community sewer service along the rest of Piney Branch, the Council adopted a restricted sewer access policy for the subwatershed. This restricted