WASTEWATER SERVICE EVALUATION
HALES FORD BRIDGE TO WESTLAKE AREA
FRANKLIN COUNTY, VIRGINIA

JANUARY 10, 2006

Prepared for:

Franklin County Board of Supervisors
W. Wayne Angell, Chairman
Charles D. Wagner, Vice-Chairman
David A. Hurt
Russell P. Johnson
W. Leland Mitchell
Charles D. Poindexter
Hubert L. Quinn

QA/QC________

Anderson & Associates, Inc.
Professional Design Services
Blacksburg, Virginia
JN 23652

TABLE OF CONTENTS

EXECUTIVE SUMMARY

At the request of the Franklin County Board of Supervisors, Anderson & Associates, Inc. has prepared a Wastewater Service Evaluation for the Hales Ford Bridge to Westlake Area of the County. This area of the County lies along the Route 122, Booker T. Washington Highway, a major transportation corridor and the only road to cross Smith Mountain Lake. The Smith Mountain Lake area is a very rapidly growing area within the County. The Lake is a major economic hub for the County.

The rapid growth in the Lake area has spurred the need for utility systems to support the development that is occurring. The County just completed the first phase of the countywide water system this past summer. The new water system follows the Route 122 corridor from Hales Ford Bridge to Westlake, and it currently has a capacity of 400,000 gpd. The availability of a reliable public water supply is likely to increase the need for reliable wastewater disposal system in the area. In response to the perceived need for wastewater service in the area, the Franklin County Board of Supervisors authorized this study to assess the needs in the area, evaluate the options for the County to meet those needs, and consider the issues related to public, private, and public-private ownership.

Existing residential and commercial facilities are served by privately owned onsite wastewater systems. These systems range from single family septic systems with conventional drainfields to large mass drainfield systems providing secondary treatment of the wastewater prior to disposal. Existing onsite wastewater systems provide approximately 120,000 gpd of capacity. In the next five years, it is anticipated that the wastewater need will increase to 440,000 gpd, and within another five years double to 880,000 gpd. Within 20 years, the wastewater needs could increase to approximately 1,580,000 gpd, and at build out, it is possible for the wastewater to reach over 2,600,000 gpd. During the first five year period, the biggest wastewater needs will be in the areas around Hales Ford Bridge/Bridgewater, Lakewatch and Westlake.

There are two primary options for handling the wastewater needs. The first option is to provide a centralized wastewater facility that discharges to a nearby tributary of Smith Mountain Lake or large mass drainfield. The second option is to pursue a decentralized system, or more appropriately called cluster system, that provides secondary treatment systems near the areas of need and disposes of the treated wastewater into individual or large central off site mass drainfields. Financially both systems are essentially the same cost to develop a 2.6 million gallon per day system, approximately $51 million. However, there are many unknowns associated with the discharge option. DEQ cannot determine a set of discharge limits until a permit application is filed. It is assumed that tertiary limits will be required. Actual treatment costs can be significantly impacted by the degree of treatment required. Public perception of a discharge into a tributary of Smith Mountain Lake will also be a difficult hurdle to overcome and will require education of the public.

The Westlake Overlay District's wastewater needs will ultimately exceed the capacity of the suitable soils within the district if it is allowed to develop to its maximum density at which time it will be necessary to locate suitable soils outside the District. Preliminary reviews of the soils mapping in the study area indicate that there are likely to be tracts of suitable soil just outside the district for wastewater disposal. The remainder of the study area has the ability to balance its wastewater needs with its available soils.

The development of wastewater treatment system to meet the needs within the Westlake Overlay District is therefore a higher priority. The cost to develop a wastewater system to serve the core area of the District and meet its immediate needs by providing approximately 400,000 gpd in treatment capacity using onsite methods would be approximately $13,700,000 and using a centralized system would be approximately $11,800,000. A major factor in the higher cost of the onsite system is the cost of the land needed for the drainfield system.

There are several alternatives available to the County for involvement in the development of wastewater infrastructure. The do nothing alternative allows things to continue as they currently do through the zoning and special use permit process, but the County would maintain little control and have minimal input into the development of these systems. Another alternative is to develop a minimal amount of control by the County through the development of standards and monitoring requirements for wastewater facilities and allow the wastewater systems to continue to be privately owned and operated. The County has already taken steps to move into this alternative by developing a sewer standards committee to advise the County on how to improve Chapter 22. A third option goes to the other extreme where the County takes maximum control of the wastewater issues by taking responsibility for the development, operations and maintenance of the facilities. This option would require additional County staffing and require a large financial commitment by the County. Another alternative for the County may be to develop a partnership with the development community to achieve a mutually beneficial wastewater system should the costs and benefits be advantageous to the public. However before any public-private partnership could be considered, the County must adopt the necessary procurement guidelines.

The first and foremost step the County should take is the development of its wastewater facilities standards and monitoring requirements. These standards and monitoring requirements should be incorporated into Chapter 22. The policies must address the design, operation and maintenance of treatment facilities and its related appurtenances. These standards should be developed so they supplement the existing standards of DEQ and VDH. The second important step would be for the County to review its current land use plan for the study area and make any changes to its zoning, code, and Comprehensive Plan to reflect the type of development and its density that is desirable. Subsequent steps by the County should look at its long term involvement in the wastewater infrastructure of the study area. The County may elect not to take an active role in the development, operation and maintenance of wastewater facilities, but the County may elect to take a more active regulatory or development role based on its assessment of unmet wastewater needs.

A. INTRODUCTION

1. Purpose

State Route 122, Booker T. Washington Highway, is a major transportation corridor and provides the only highway crossing of Smith Mountain Lake at Hales Ford Bridge. Route 122 provides a major access to the lake area and Route 834, Brooks Mill Road, provides perimeter access to the lake area within Franklin County. These two major access routes are joined by Route 616, Scruggs Road, at the Westlake village, an unincorporated community. Westlake, primarily because of its convenient location, has become a service and commercial hub for seasonal and permanent residents of the lake area. The demand for services has spurred rapid development along the four mile Route 122 corridor, primarily concentrated at Westlake and Hales Ford Bridge. Additional development is occurring and has been planned in these two areas as well as along the corridor connecting them.

With the existing and anticipated development has come a need for utility services. A County owned public water system has been completed to serve this area and sized for extension to central County. The County's water system extends from Hales Ford Bridge to Westlake and south along Scruggs Road a short distance. The County has purchased capacity in the Bedford County PSA distribution system and by agreement has a current allocation of 400,000 gallons per day. The County is also working with the PSA to evaluate the feasibility of additional water withdraws from the lake to meet the areas future potable water needs. Also there are numerous small privately owned water systems serving developments and commercial establishments. In addition to the other systems, there are numerous privately owned wells. The need for a means of addressing wastewater disposal within the area is apparent, and with the completion of the County's public water system, the need is likely to become more pressing as growth continues in the area. The type of growth, residential versus commercial, low density versus high density, in the area will dictate the extent of the sewer need.

The Franklin County Board of Supervisors requested this study to assess wastewater needs and to evaluate the options for County involvement in meeting those needs. The goals of the study are summarized as follows:

a. Project the consequences of no County involvement in addressing wastewater needs.

b. Develop a plan that defines the County's role in addressing both short term and long term needs. The plan should address immediate implementation and be sustainable for the long term.

c. Without any detailed study of other areas, consider how elements of the plan might be applied to other areas of Franklin County.

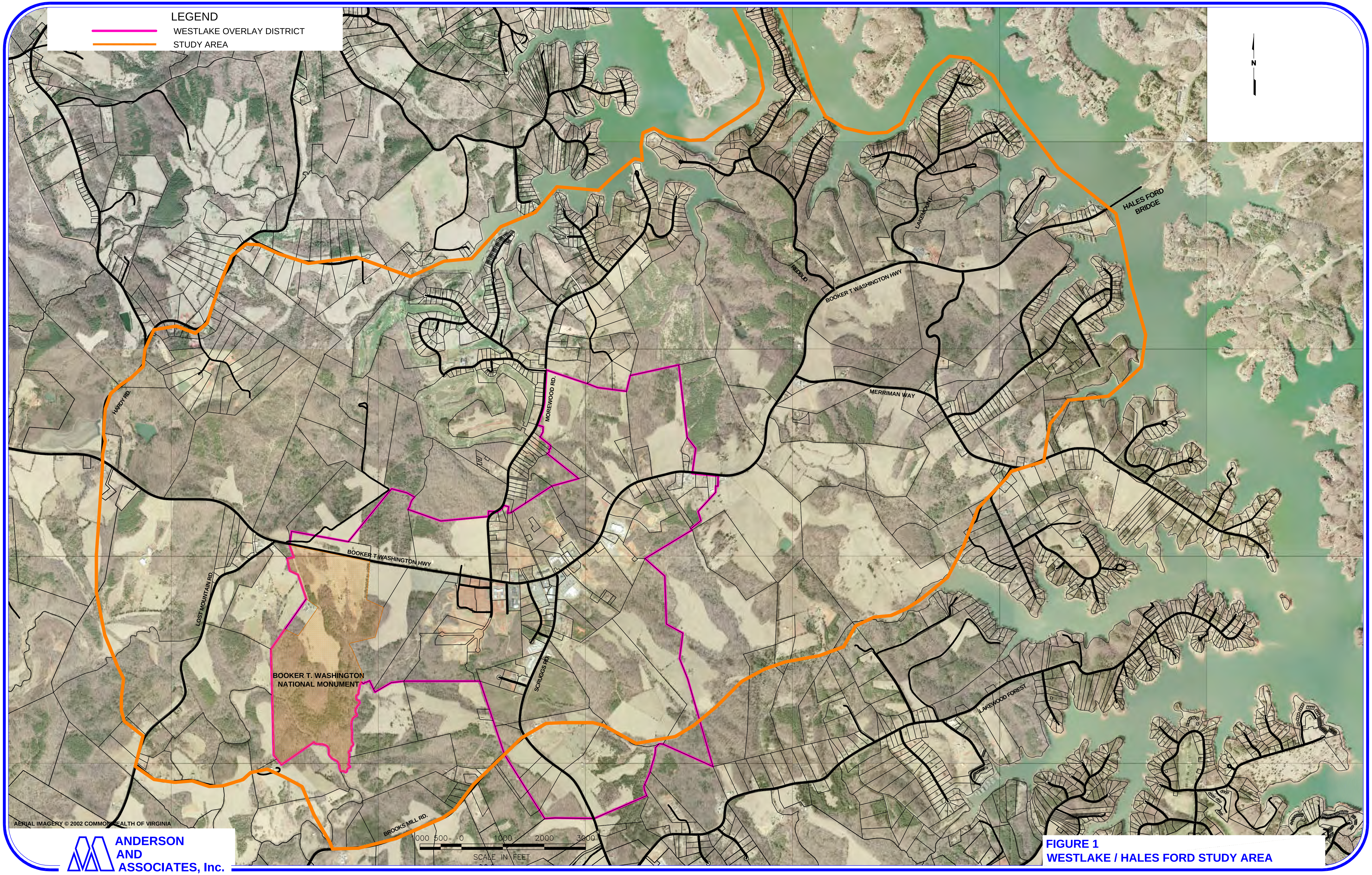
2. Study Area

The study area was selected to include the rural village center and growth areas of Westlake and Hales Ford and encompass the surrounding environs. The proposed study area extends from Hales Ford Bridge at Smith Mountain Lake west along the Route 122, Booker T. Washington Highway, through Westlake to Route 636, Hardy Road. On the north side, the study area follows Smith Mountain Lake and Indian Creek. On the south side, the study area extends from the Lake along Bettys Creek and Brooks Mill Road. Figure 1 shows the proposed study area.

3. Background

In 1991, the County had a Water and Sewer Facility Plan prepared by Dewberry and Davis. The study examined the water and sewer needs of the entire County. A portion of the study looked extensively at the area around Smith Mountain Lake and noted concerns that existed about possible septic system failures and that effluent could end up having a negative impact on the water quality of the Lake. At the time of the study, the Lake area was the fastest growing area in the County. The study looked at both a centralized wastewater treatment facility around the Lake and on site disposal systems. The study concluded that generally the best alternative in the Lake area was to continue wastewater disposal through the use of subsurface disposal systems that are installed to minimum County standards and subject to a comprehensive operation and maintenance program.

The County's 1995 Comprehensive Plan is in the process of being updated. In the 1995 plan, one environmental goal that was identified was to coordinate with VDH to ensure all new building lots that depend on sewage disposal systems have adequate service and reserve areas. Specifically around the Lake area the plan sets an objective to develop in increments a centralized sanitary sewer system. An underlying theme in the plan is the protection of water quality at the Lake. The plan does identify that a centralized sewage system should be considered if: a) continued use of septic systems and drainfields are found impractical in controlling pollutants, b) engineering feasibility studies show that an area wide system is cost effective, c) the County is willing to accept the increased development pressure a centralized system is likely to create, and d) the County is willing to accept the high tax burden of developing a centralized system.



ANDERSON AND ASSOCIATES, Inc.

FIGURE 1
WESTLAKE / HALES FORD STUDY AREA

4. Acknowledgements

Anderson & Associates would like to thank the following agencies and individuals for volunteering their time and invaluable help and input during the preparation of this study:

Franklin County
- Public Works Department
- Planning Department

Virginia Department of Health

Department of Environmental Quality

Development Community
- Joe Altadonna, Bill Berry, Phil Floyd, Jim McKelvey, Jack Mergner, Trey Park, Eric Plyer, Tim Thielecke, Ed Waters, Ron Willard Jr., Ron Willard Sr.

Consultants
- Bill Berkley, Dan Early, Phil Nester, Dean Stone

Contractors
- David Conner, David Falwell

B. EXISTING CONDITIONS

1. Topography and Physical Setting

The study area is a gently rolling piedmont area in the eastern end of the County. The land is generally sloped at 5% or less except in areas dropping steeply to drainage ways. Rock outcropping is minimal. The land is a mix of open pasture and woodland. The eastern end of the study area is bound by Smith Mountain Lake. The primary roads in the study area follow the ridge tops with the land on the sides sloping away to drainage areas.

2. Drainage

Rt. 122 and Scruggs Road follow the ridge top and divide the area into primary drainage basins. Each of these areas is further broken up into smaller “sub-basins” that range in size from a few dozen acres to several hundred acres. The entire study area falls within the drainage basin for Smith Mountain Lake.

3. Soils

The United States Department of Agriculture (USDA) has developed soils mapping of Franklin County. USDA prepared these maps from soil samples to a depth of typically less than four feet deep. Soils in the area typically vary from a sandy loam to clay loam with fragmented rock intrusions. See soils map in Figure 2.

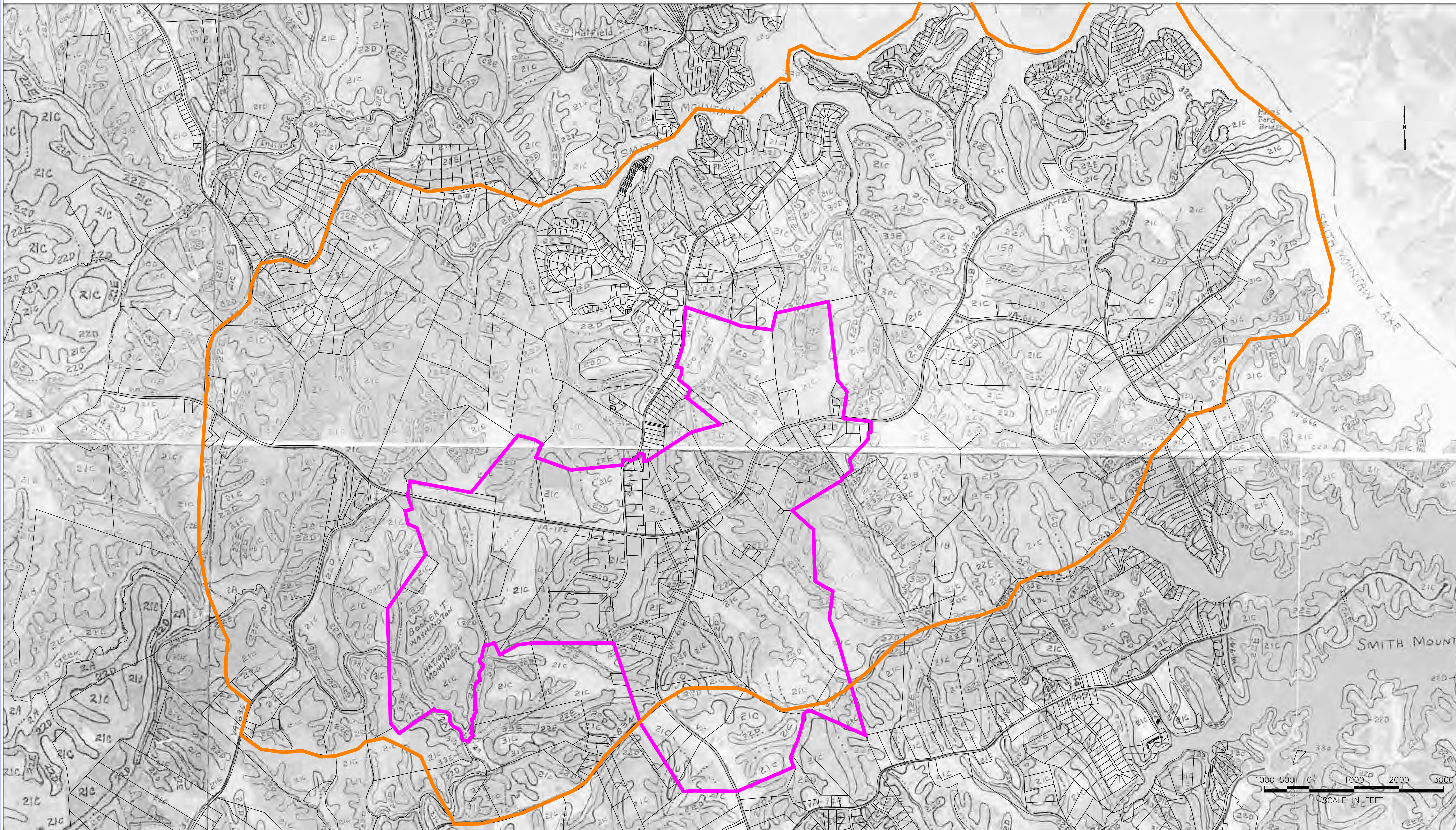
To determine if the soils are suitable for wastewater disposal additional investigations are often necessary. In general, the soils labeled in the USDA field mapping as 21C, Clifford sandy loam, appear to have the most favorable characteristics for wastewater disposal. A sandy loam would typically have a percolation rate in the range of 25 to 40 minutes per inch, and in accordance with the VDH regulations loading rates would range from 1.6 square feet per gallon to 2.1 square feet per gallon, respectively.

In order to handle large mass drainfields, local soil scientists have found large expanses of sapprolite lying under the sandy loam along ridge tops. Sapprolite is a very granular material, much like very coarse sand with no fines that has an exceptionally high permeability rate, 0 to 10 minutes per inch. The soil scientists often use the USDA soils map in conjunction with available topographic mapping to determine the most probable areas to find the sapprolite. Often the sapprolite is found at depths greater than six feet with estimated depths as great as fifty feet.

LEGEND

WESTLAKE OVERLAY DISTRICT

STUDY AREA



ANDERSON AND ASSOCIATES, Inc.

FIGURE 2
STUDY AREA SOILS MAPPING

4. Population and Development

The Westlake – Hales Ford area of Franklin County is one of the most rapidly growing areas in Franklin County. Since the County preformed the 1991 Water and Sewer Facilities Plan, the project area has developed a commercial district around Westlake and the area along the 122 corridor and Hales Ford Bridge has begun to explode with development. The County has recently approved large development projects at Bridgewater Point, Lakewatch, Westlake Village. These three large scale projects include high density residential condominiums, single and multi family homes, and commercial development.

5. Wastewater Disposal

The existing residences and businesses in the study area are served by individual septic systems and drainfields. A few of the larger facilities that serve more than one business use mass drainfields for wastewater disposal. A mass drainfield is any subsurface wastewater disposal system that discharges more than 1,200 gallons per day per acre. Facilities that were constructed after July 2000 and serve any food establishments (restaurants and grocery stores) also have a secondary treatment system prior to disposal by drainfields. These small treatment facilities provide biological reduction of the wastewater prior to disposal.

However recently, several large development projects that include residential and commercial development have elected to construct large private wastewater collection, treatment, and disposal systems to meet their wastewater needs. An example of this type of system is the Bridgewater Pointe project that includes high-density residential condominiums along the waterfront in addition to commercial development. The Lakewatch project will also have a privately owned wastewater system in order to meet their development plan.

C. WASTEWATER REGULATION

1. Existing County Regulation

Franklin County administers water and sewer systems under Chapter 22 of the County Code. The standard specifications for water and sewer systems were adopted by the Board of Supervisors in November 1996 and codified. This section of code is primarily geared towards the specifications related to the design, materials, and construction of wastewater collection and conveyance systems. It does not set any specific requirements for the design, materials, construction, operation and maintenance of sewage treatment systems and the effluent disposal. The County has set aside various sections within this section of code to allow future incorporation of wastewater standards. The County intends to develop code that will set standards for the design, operation and maintenance of wastewater treatment facilities. They have currently developed a sewer standards study committee to help guide them through the process. The committee is made up of representatives of the County, local and state regulatory agencies, private wastewater contractors and consulting engineers.

Under Chapter 25 – Zoning Ordinance, the County sets forth general requirements for off site mass drainfields. In order for an off site mass drainfield to be approved by the County in zoned areas, a special use permit must be applied for by the developer. A preliminary soils evaluation must be included with the application. The drainfield system must also include a 100% reserve area. The special use permit is limited to only the principle use explicitly described in the permit application and any additional parcels or tracts of land cannot be connected to the system unless the special use permit is modified. The code also requires that applicant/owner agrees to connect to a public utility should one become available. Any off site mass drainfield is required to meet the standards as set forth in Chapter 22.

2. Existing State Regulations

Wastewater treatment and disposal systems are governed by two different agencies in the state. Systems that discharge treated wastewater to a surface water (drainage ditch, stream, river, or lake) fall under the jurisdiction of the Department of Environmental Quality (DEQ). Systems that discharge wastewater into the soil fall under the jurisdiction of the Virginia Department of Health(VDH).

In July 2000, the Virginia Department of Health Sewage Handling and Disposal Regulations were amended. As part of the amendment, pretreatment systems were required for facilities that produced wastewater with strengths in excess of domestic sewage. These treatment facilities provided biological treatment prior to disposal. This change in regulation affects most any facility that processes food such as grocery stores and restaurants. The amendments to the regulations also required that nitrogen loadings from facilities using mass drainfields for disposal reduce the nitrogen in the effluent to less than 5 mg/l. In order to meet the nitrogen regulation, facilities must provide a wastewater treatment plant capable of meeting the nitrogen requirement.

The Department of Environmental Quality uses the Sewage Collection and Treatment (SCAT) Regulations to govern the design, operation and maintenance of wastewater treatment systems that discharge to state waters, directly or indirectly. DEQ also uses the Virginia Pollution Discharge Elimination System (VPDES) permit to set forth effluent quality limits for treated wastewater and monitoring procedures. These requirements are set on a case-by-case basis to reflect the size and complexity of the treatment facility, volume of the receiving waters, and antidegredation of the receiving waters. To determine potential discharge limits to a receiving waters, DEQ will give an anticipated set of limits, but actual limits can not be determined until a VPDES permit is applied for a given discharge location.

3. Future Trends

In recent years, the VDH has seen a trend to performance-based criteria for large mass drainfield systems. These large systems provide secondary treatment similar to a conventional treatment plant that would discharge to surface water. These systems would provide secondary treatment and reduce the nitrogen concentration to less than 5 mg/l. They are monitored on a routine basis to ensure proper performance and effluent quality. Monitoring is done at the treatment facility and in a shallow groundwater monitoring well. The VDH is in the process of updating their regulations. They are currently working with a group and an independent consultant to make recommended changes to the regulations. It is unlikely that the regulation changes will be finalized before the end of 2006. At the time of this report, there are no specific changes to the regulations proposed, but the County should anticipate some changes in the near future.

In recent months the Department of Environmental Quality has been holding public hearings regarding the adoption of new water quality standards for surface waters. DEQ anticipates more stringent limits for phosphorus (P) and total nitrogen in the future. These limits will have a significant impact on many treatment facilities in the Commonwealth. However these stringent standards will likely be implemented over a long period of time allow municipalities time to determine what process changes if any are necessary to meet the new standards.

D. WASTEWATER NEEDS

1. General

In order to project the wastewater needs of the study area, a multi-tiered approach was developed. The first tier considered was the wastewater needs of the existing facilities. The second tier consisted of evaluating the wastewater needs of projects that are currently in the planning, design or construction phase, and the third tier considered covers undeveloped areas where no specific plans have been considered at the time of this report.

In order to determine the needs of the community, the County held three public meetings. The first meeting was held with the development community to determine their short and long term needs. Figure 3 shows the various areas of existing, proposed, and future development areas in the study area along with non-developable or non-buildable areas. The second meeting was held with the regulatory agencies, DEQ and VDH representatives, to determine existing issues and concerns, as well as future trends and plans in regulations. A third meeting was held with the general public for the community to learn what the County was studying, express their wastewater needs, and voice their opinions.

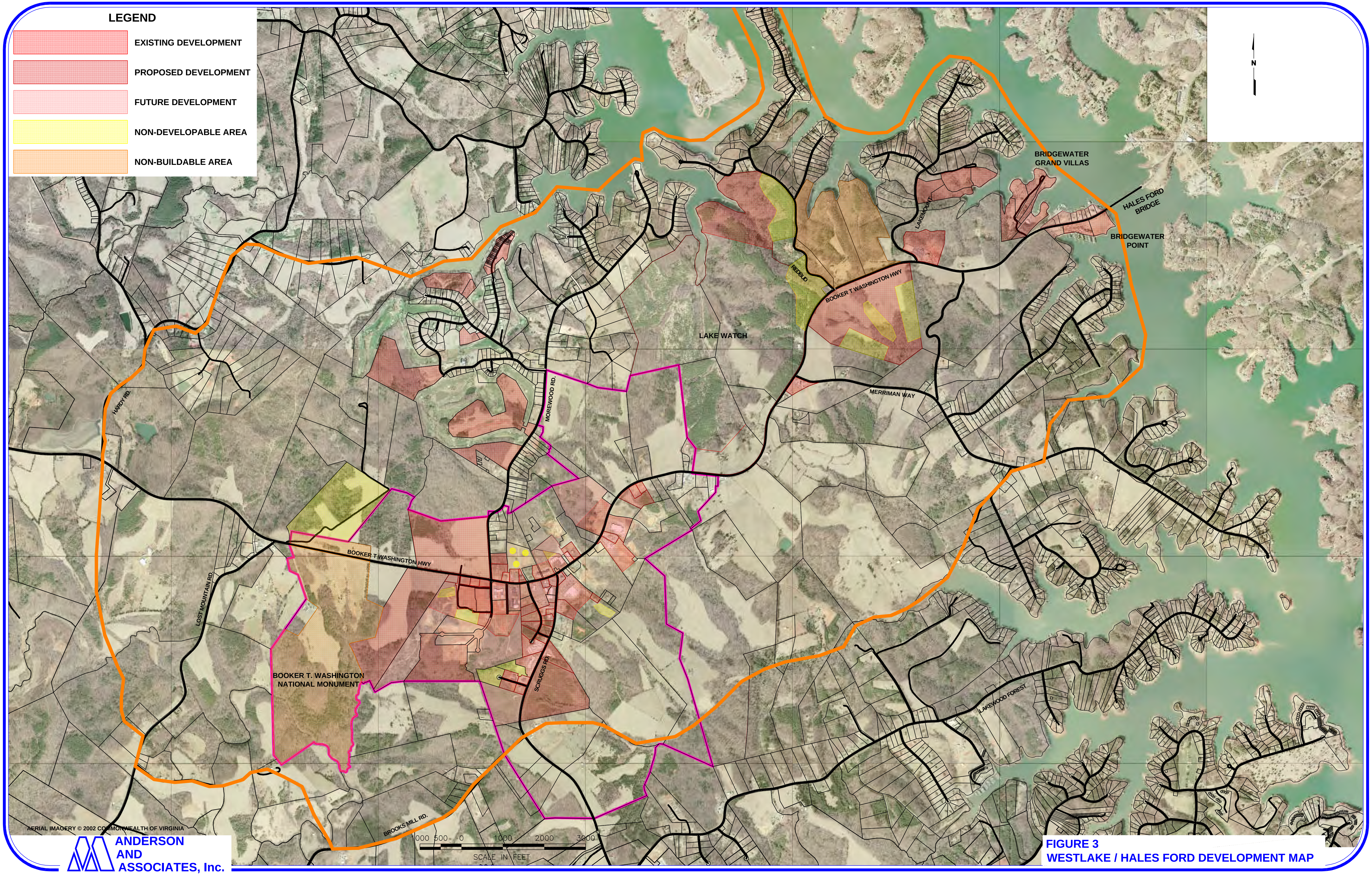
After documenting the needs within the study area, a service area for the wastewater system must be defined. The service area has to be defined as the area having the highest probability of need for wastewater service. Flow projections within the service area were made based on “sewer sheds”. Sewer sheds are made up of discreet drainage areas where all the wastewater can be brought to a single point for collection.

Using the information gathered from developers, community members, and the County staff, flow projections were prepared. The availability of public water and sewer will have a direct impact on the capacity needed in the long term needs of the study area. Detailed breakdown of the wastewater projections by sewer shed is included in Appendix A.

In considering facility sizing to meet the wastewater needs, it is important to understand that a treatment facility must be sized to meet the peak daily demand. The area around the lake is recreational oriented, and therefore it sees a very high seasonal fluctuation in flows. Annual average wastewater flows could be only 45 percent of the design flow during the off season periods which could possibly run from early fall until late spring.

2. Existing Wastewater Service

Existing residential and commercial facilities are served by privately owned onsite wastewater disposal systems. These systems range from single family systems to larger mass drainfield systems serving commercial facilities. Mass drainfield systems constructed prior to the adoption of the current VDH Sewage Handling and Disposal Regulations in July 2000, provide only primary treatment in septic tanks prior to subsurface disposal. Mass drainfields permitted and constructed after July 2000 provide secondary treatment of the wastewater prior to disposal.



ANDERSON
AND
ASSOCIATES, Inc.

FIGURE 3
WESTLAKE / HALES FORD DEVELOPMENT MAP

Existing onsite wastewater systems in the study area provide approximately 120,000 gpd in capacity not including the Bridgewater project's facilities described below. Most of these systems are relatively small, under 10,000 gpd, and the ones that provide secondary treatment use a package system referred to as a FAST system.

Based on discussions with the local Health Department, developers and engineers, these existing wastewater disposal systems are working properly for the most part. A few systems have had some problems, and repairs have been performed as necessary. With proper maintenance and operation, these facilities should continue to function. However, based on prior experience, it should be anticipated that some facilities will have occurrences of failure and need repair. In most cases these repairs will be minor, but in other cases it may require replacement of the treatment equipment or drainfield.

3. Documented Needs

There are numerous planned developments within the study area. Some of these developments are in the construction process, others are in the design phase, and others are still in the planning stages. These development projects account for the fastest growing wastewater need in the community. These projects have a dramatic range in size from only a few thousand gallons of wastewater generated daily to several hundred thousand gallons per day.

The County has recently approved several very large development projects that will have a significant wastewater demand. The Bridgewater project has recently completed the construction of its first phase of wastewater facilities. The system includes a pump station and collection system at Hales Ford Bridge. The treatment facility and drainfield are currently sized for 50,000 gpd, but they have been approved by the County for expansion up to 250,000 gpd. The current phase is sized to meet the needs of the existing Bridgewater Plaza and the proposed Bridgewater Pointe condominiums. Future phases of this project included the commercial and residential development of Bridgewater Grand Villas.

The recently approved Lakewatch project will have an ultimate wastewater capacity of 300,000 gpd. The first phase of this project is currently under construction and consists of 65 residential homes. These homes will pump to a centrally located treatment facility with off site drainfields. The design of the treatment facility and its disposal fields has been submitted to the County and VDH for review. Future phases of the development will include more residential development and commercial facilities.

A third large development project was recently approved by the Board of Supervisors adjacent to the Booker T. Washington National Monument. The details of this project have not been finalized and is still in the planning and design phase. It will serve a mix of residential and commercial development. Its developers are also in the process of developing the Westlake Village Business Park on the north side of Route 122. In order to meet their wastewater needs, the developers have secured an offsite parcel for the location of the mass drainfields. The developer has had the soils evaluated and anticipates having a disposal capacity of 200,000 gpd. The developer has not determined if it will need the full capacity of their site.

Based on discussions with the development community and the County, we anticipate that in the next ten years the wastewater demand in the study area will reach approximately 880,000 gpd. This figure includes a portion of the three large proposed developments, approximately two thirds, but also includes flows from other developments that are currently in the planning stage, but have not yet been submitted to the County for consideration. If the three large developments reach build out within ten years, this estimated flow would increase to over 1,000,000 gpd.

4. Anticipated Needs

The growth in the study area is anticipated to continue as the area develops. The extent of the growth will largely be determined by the land use approved by the County and the availability of publicly and privately owned water and sewer systems. Within 20 years the demand for wastewater is expected to increase to 1,580,000 gpd.

Consideration must also be given to the septage and solids generated from the numerous septic systems, mass drainfields, and privately owned wastewater systems. These existing and proposed systems will generate septage and solids that must be disposed of properly.

5. Ultimate Needs

To determine the “build out” or ultimate wastewater needs of the service area, the undeveloped portions of land need to be considered. The undeveloped areas were looked at based on their current zoning and their residential or commercial aspect. To determine the estimated commercial flows, the projects currently approved by the County were used to determine a flow per acre for light commercial (offices, banks and retail space) and moderate commercial (restaurants and grocery stores). This figure was also compared to the potential flows generated by the current zoning of the undeveloped parcels.

There is an uncertainty to the “build out” wastewater needs because it is directly impacted by the development of a given parcel. Much of the land outside of the Westlake overlay district and Hales Ford Bridge area has been zoned A-1, agricultural. Recently the County has received several requests to have tracts of land rezoned to allow for increased density of residential development and commercial development. The change in land use can often lead to a significant change in projected wastewater flows.

6. Service Area

In order to determine the service area within the study area, it is important to look at the area where the wastewater will be generated and what areas have the highest need for wastewater service. There are currently three areas, or regions, of intense development that will act as hubs for wastewater generation. The first area is the Bridgewater/Hales Ford Bridge area where development is currently underway and approved by the County. The second area is midway along the Rt. 122 corridor around the Lakewatch project. This area is just beginning construction of its first residential phase, and its conceptual plan for future phases of development have been approved by the County. The third area is the Westlake Overlay District where the County has designated an area of commercial growth. These three areas of intense development define the service area. Where possible, the service area follows natural breaks in drainage, water ways, roads, and areas of proposed future development.

Flow projections within the service area were made based on “sewer sheds”. Sewer sheds are made up of discreet drainage areas where all the wastewater can be brought to a single point for collection, see Figure 4. The service area can be broken up into 15 sewer sheds to help show the needs by area.

Existing wastewater needs within the proposed service area is approximately 120,000 gpd as previously mentioned. During the next five years, it is expected that this will increase to over 440,000 gpd, and double in another five years to 880,000 gpd. Within 20 years, the wastewater need could increase even further to approximately 1,580,000 gpd, and at build out, it is possible for the wastewater need to reach over 2,600,000 gpd.

During the first 5 years, the biggest increase in wastewater needs will be in the areas around Bridgewater/Hales Ford, Lakewatch, and Westlake areas. These three areas will continue with rapid growth and increased wastewater need through year 10. After this period, these developments will be near build out, and the other sewer sheds will begin development. These areas that are not planned to be served by the large private wastewater systems have a high potential for development, but the type of development and its density will ultimately be determined by the availability of wastewater facilities to serve them.

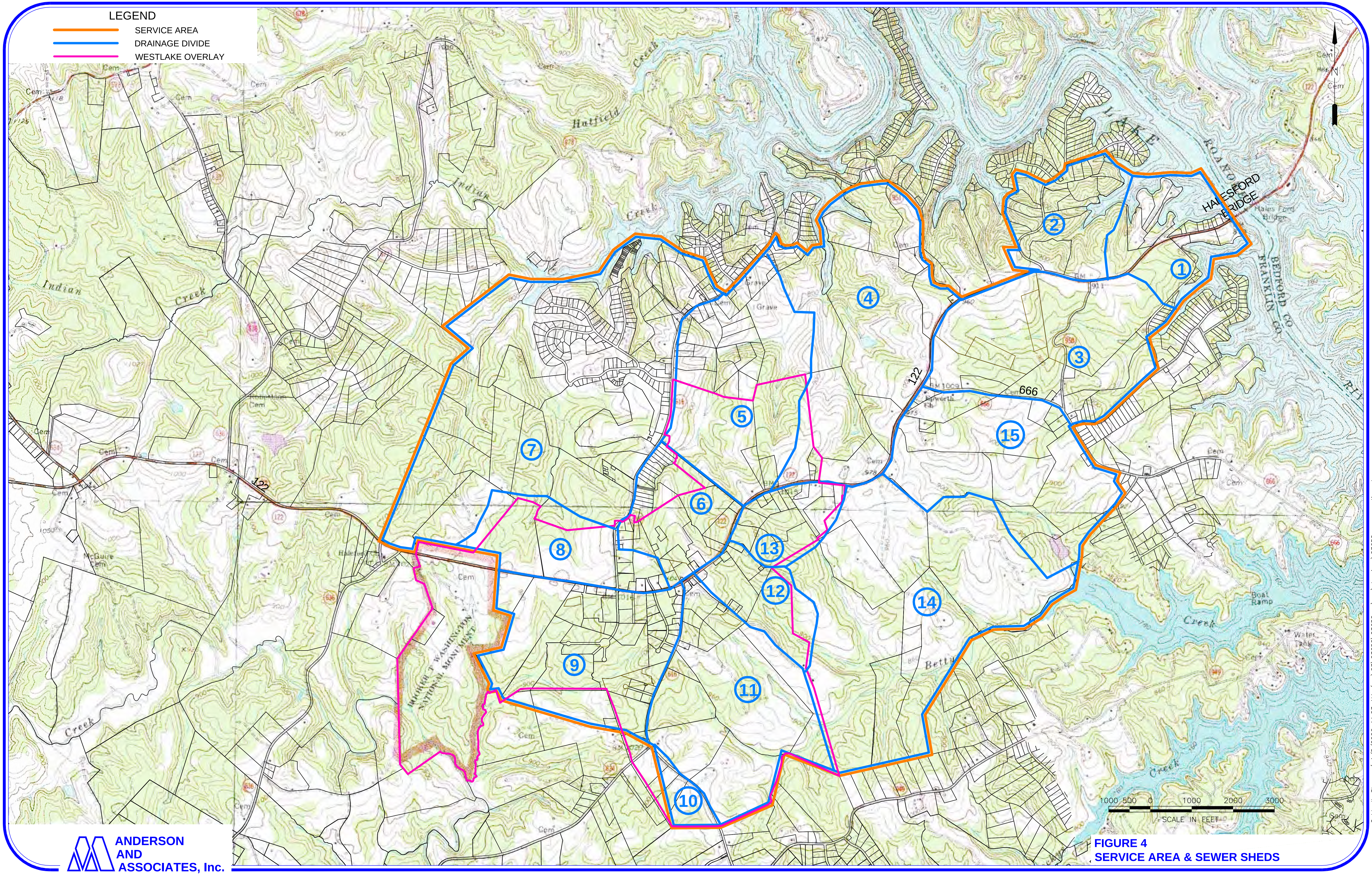


FIGURE 4
SERVICE AREA & SEWER SHEDS

E. WASTEWATER DISPOSAL ALTERNATIVES

1. General

In order to handle the volume of wastewater generated in the area, there will be a need to provide treatment and a viable means of disposal of the treated wastewater. Depending on the disposal method, the degree of treatment will vary. Facilities that discharge into the ground typically have a lower treatment requirement than facilities that discharge to surface waters.

2. Treatment

There are three types of treatment of wastewater, primary, secondary, and tertiary. Primary treatment is limited to the removal of coarse solids and minimal biological reduction of the wastewater. Primary treatment is typically limited to very small systems, under 1200 gpd, and are often found on single or multi-family residences. Secondary treatment involves biologically treating the wastewater and reducing the organic matter and nitrogen in the wastewater prior to disposal. There are various methods to achieve biological treatment and each treatment process has its own advantages and disadvantages. Secondary treatment is generally capable of producing effluent qualities less than 15 mg/l of biochemical oxygen demand (BOD) and total suspended solids (TSS), and nitrogen under 5 mg/l. Tertiary treatment involves an even higher degree of treatment and often involves chemical process to facilitate nutrient reduction and filtration for polishing. Tertiary treatment is typically provided when a high degree of treatment is necessary prior to the treated wastewater being discharged to a sensitive receiving water body.

It is beyond the scope of this study to review and evaluate the various wastewater treatment methods that may be applicable to meeting the needs of treatment within the study area. Currently though, there appear to be two primary types of treatment facilities in use or planned in the project area. The smaller systems that serve only a few thousand gallons per day or less use a FAST system, and the larger facilities are using a BioWheel. Both of these types of treatment facilities provide secondary treatment of the wastewater prior to disposal.

Regardless of the method of wastewater treatment, it will be important to take into consideration the control of odors. It will be necessary for any wastewater facility, treatment or pump station, to provide adequate odor control and screening buffer to help reduce the potential odor concerns.

3. Discharge Options

Any discharge of treated wastewater from the study area would require a permit from the Department of Environmental Quality. Gills Creek is the only all weather stream within reasonable proximity to the study area that could support a wastewater discharge. In consultation with the DEQ, it was determined that any discharge into Gills Creek should be located at least 5 miles upstream of the Lake's backwaters. Therefore the first feasible discharge point into Gills Creek would be slightly upstream and west of Booker T. Washington National Monument.

DEQ cannot provide discharge limits for a site until an application has been filed with DEQ for the discharge location. However with the anticipated adoption of the nutrient standards for surface waters, DEQ feels that a permit could be issued, but the limits will be stringent and the controlling parameters will likely be nitrogen and phosphorous. Even though it may be feasible to obtain a discharge permit, DEQ is concerned that there would be significant public opposition to any discharge of treated wastewater that would ultimately enter the Lake. The technology is available to meet the stringent water quality standards, but the public perception is not something that can be overlooked. Also, the high capital and operating costs associated with meeting stringent limits and the ever-changing discharge limits for surface waters cannot be overlooked.

An additional item that must be noted about a potential discharge into a tributary of the Lake may be a concern to the Department of Health because the lake is a designated public water supply. Currently the Bedford County PSA withdraws water from the lake downstream of Hales Ford Bridge. Any discharge to a tributary of the lake needs to be located downstream from any existing or future water intake site. The County and Bedford PSA continue to investigate their options for using the lake as a water supply. It is anticipated that the existing Bedford PSA water intake will be expanded in the future and the County is currently working on a permit for an intake on the Blackwater reach of the Lake.

4. On-site Options

The use of conventional drainfields for disposal of small amounts of wastewater from individual residences, small multi-family homes or small businesses will continue to be feasible in the study area. However as the density and size of developments increase, it will be necessary for large mass drainfields to be utilized. As previously mentioned, the study area has large areas of sapprolite that can be used for wastewater disposal. Even though sapprolite has an extremely high permeability rate, its hydraulic conductivity is not limitless.

For developers to design and construct their projects, they have had to balance the amount of wastewater produced with the availability of soils suitable for wastewater disposal. The developers have worked with local soil scientist to determine the suitable areas and set these areas aside for drainfields and reserve fields in the event the primary field fails. These areas are often used as green space, and need to be protected from any impact to the existing soil structure.

With the use of on site systems, there will be a point at which the availability of soils suitable for drainfields will be come limited, and thereby limit future development. The point at which available land within the service area is no longer available for drainfields is hard to determine. It appears that there are numerous large tracts outside the Westlake Overlay District that will be suitable for drainfields and reserve areas, but within the Westlake Overlay District the areas of suitable soil are more limited and are likely going to be consumed in part by development. In order to meet the wastewater disposal need within the Westlake Overlay District it will be necessary at some point to go outside the District and locate suitable disposal sites. Figure 5 shows the potential areas of suitable soil within the Overlay District.

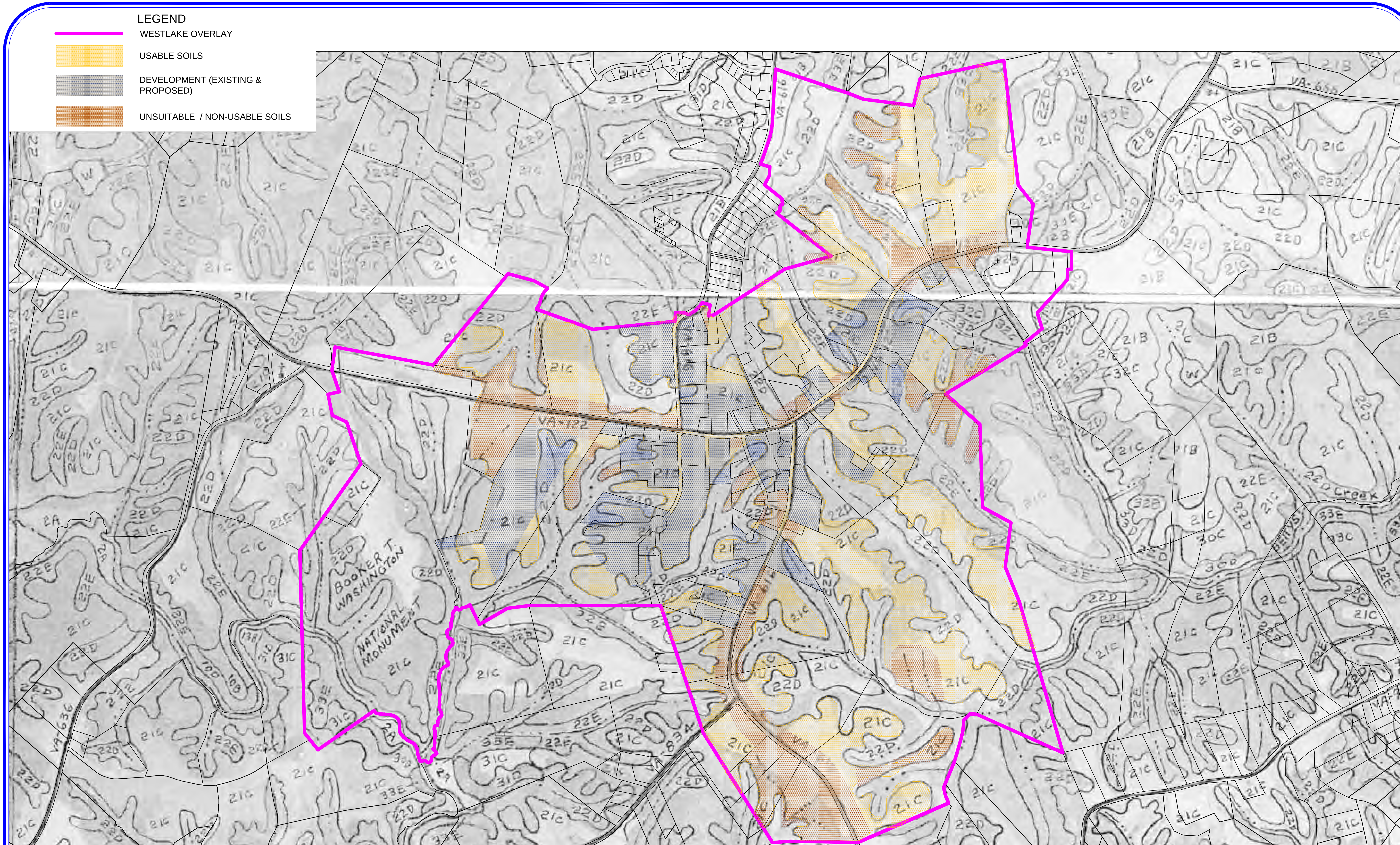
During the next twenty years, it is estimated that nearly 300 acres of land will be needed for wastewater disposal sites using large mass drainfield systems to meet the needs of the service area. The Westlake Overlay District will need approximately 100 acres of suitable land to meet its wastewater needs.

5. Septage and Sludge Disposal

All types of treatment facilities produce solids that must be disposed of properly. Conventional onsite systems produce septage as part of their primary treatment. Septage is the liquid and solid mixture that is pumped out of a septic tank. This wastewater has extremely high concentrations of organic matter and inert material and is anaerobic in nature. Most treatment facilities are not equipped to handle septage. Most septage generated in the study area is hauled to the Roanoke Regional Treatment Facility for disposal and treatment. This treatment facility has recently undergone an upgrade that will allow it to continue to handle septage from neighboring communities.

Facilities providing secondary and tertiary treatment of wastewater will also produce biosolids, but the material has undergone additional treatment and is generally safe for disposal. Most municipal treatment facilities provide facilities to dewater the biosolids and produce a “dry cake” of sludge. The sludge can then be landfilled or land applied. However, small treatment facilities like the ones for Bridgewater and Lakewatch will not have the equipment necessary to dewater the biosolids, so it will be necessary for them to have their liquid sludge hauled to another treatment facility for dewatering and disposal.

As the wastewater volumes increase in the project area, the need for reliable and economical septage and sludge disposal will increase. As facilities in the study area are planned, designed and constructed, each facility must adequately address the means and methods it will use to handle the solids it produces.



ANDERSON AND ASSOCIATES, Inc.

FIGURE 5
WESTLAKE OVERLAY DISTRICT SOILS MAPPING

6. Operational Considerations

All treatment systems must be properly operated and maintained to ensure they function as they were intended. Facilities that discharge to a water body would fall under the jurisdiction of the DEQ. The DEQ would set minimum operating standards for the facility based on its complexity and discharge receiving waters. Facilities under 40,000 gpd and providing only secondary treatment may only require part time operation, seven days per week by a class IV operator. However a treatment facility that would treat up to 500,000 gpd and need tertiary treatment may require staffing up to16 hours per day under the supervision of a Class II or higher operator. Treatment facilities using onsite disposal under the jurisdiction of VDH typically will have a significantly less operational requirement. These facilities will usually require part time operations on a daily basis for larger facilities to no operational requirements for the small facilities.

Any large facility within the study area would be classified by VDH and DEQ as needing to meet Class 1 reliability standards. These facilities and their associated pump stations must be operational during any power outage which means they must have automatic transfer switches and emergency generators to maintain their operational capabilities during power outages. Usually, the small facilities that serve only a few thousand gallons or less do not meet this reliability classification. Facilities that meet Class 1 reliability standards have a higher operational requirement too.

Because of the topographic nature of the study area, most treatment facilities serving more than a few thousand gallons will require a pump station and force main. These pump facilities and their associated linework are not free of operational requirements. They may also require generators if they are required to meet Class 1 reliability standards. Pump stations that serve larger areas will require daily inspections to insure they are properly functioning. Also odor control at pump stations and receiving manholes will have to be considered and must be accounted for in the operational requirements.

Operational costs for treatment facilities vary widely throughout the state. Facilities providing treatment with a capacity between 100,000 gpd and 500,000 gpd will typically see an annual cost of $0.75 to $2.00 per gallon of treatment capacity. As the size of a facility increases, the cost of treatment per gallon decreases. These costs are also influenced by size of the collection system, the number of pump stations, testing requirements, and level of treatment required.

Consideration must also be given to the operation of a single large treatment facility, or a few large treatment facilities, serving hubs of development versus numerous small treatment facilities serving individual establishments. In general larger treatment facilities require a higher degree of operator knowledge and performance testing than a small facility serving only a few thousand gallons. However these small treatment facilities rarely are given the daily or weekly attention of a large treatment facility. Therefore the risk of problems occurring in a small facility is generally considered higher than that of a well monitored and maintained large treatment facility.

Longevity of drainfields is also an operational consideration. A properly operated and maintained system is likely to function indefinitely. However, facilities that are neglected will likely have failures in the drainfield. In some cases the failures are not readily apparent until it is to late and the field is no longer salvageable. In some instances a failed field may be restored if it is given time to recover or cleaned. Areas that are abandoned as a result of failure may sometimes be used for development purposes thereby reducing an area of green space that once existed. It is important that the design process take into account adequate safety factors to minimize the risk of a drainfield failure.

F. PROJECT ALTERNATIVES

1. General

The County essentially has two options available for treating and disposing of the wastewater generated within the service area. The first option is continue along the existing path of handling the wastewater using small treatment systems and drainfields to meet the needs of the community. These types of facilities are often referred to as decentralized systems or cluster systems. Each cluster system would meet the needs of its own unique area. The second alternative would be to construct a regional treatment facility with a discharge to Gills Creek or large mass drainfields. Each alternative has several variations within them that could be considered, and some of these alternatives are discussed below.

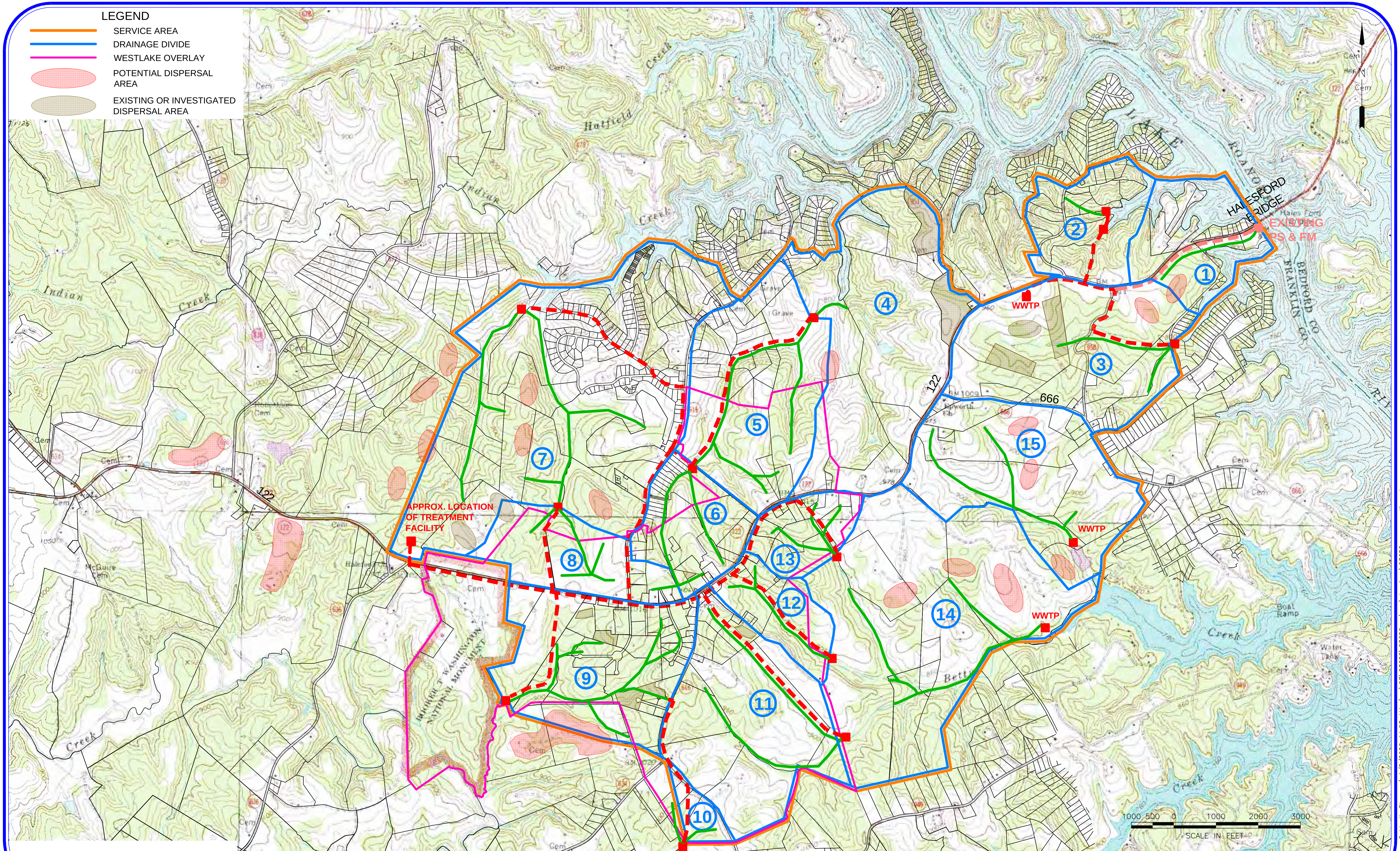
2. Cluster Systems

Clusters systems are set up to collect the wastewater from a given area and treat it prior to disposal. These systems can widely vary in size from a few thousand gallons to a few hundred thousand gallons. The rolling topography of the area lends itself well to developing multiple cluster systems within the proposed service area. Figure 6 is an example of a possible cluster system for the service area.

This option would create two cluster wastewater systems. The first system would be located in the eastern end of the service area and serve the areas and Hales Ford Bridge, Bridgewater and west to Rt. 666, Merriman Way. The treatment facility would be located at the site of the existing Bridgewater treatment plant. Its drainfields could be located in multiple areas. Some of these fields would be located at the current treatment site, but others could be located off site and require pumping to them. The existing treatment facility could be expanded to meet the needs of not only the Bridgewater Development but the area east of Rt. 666. Facilities with adequate functioning wastewater disposal systems may elect not to connect to the system even if one became available.

The second cluster would serve the western part of the service area, in particular the Westlake Overlay District. The collection system would consist of a series of small collection systems for each sewer shed and a pump station conveying the wastewater to a central treatment facility outside of the Overlay District. For discussion purposes, the treatment facility is assumed to be located just to the west of the District. Each minor collection system and pump station would be constructed as development within its sewer shed dictates.

Future cluster systems could be developed in areas that currently do not have any definite development plans. These systems would need to balance their development scope with the available soils in the project area.



ANDERSON AND ASSOCIATES, Inc.

FIGURE 6
EXAMPLE OF CLUSTER SYSTEM

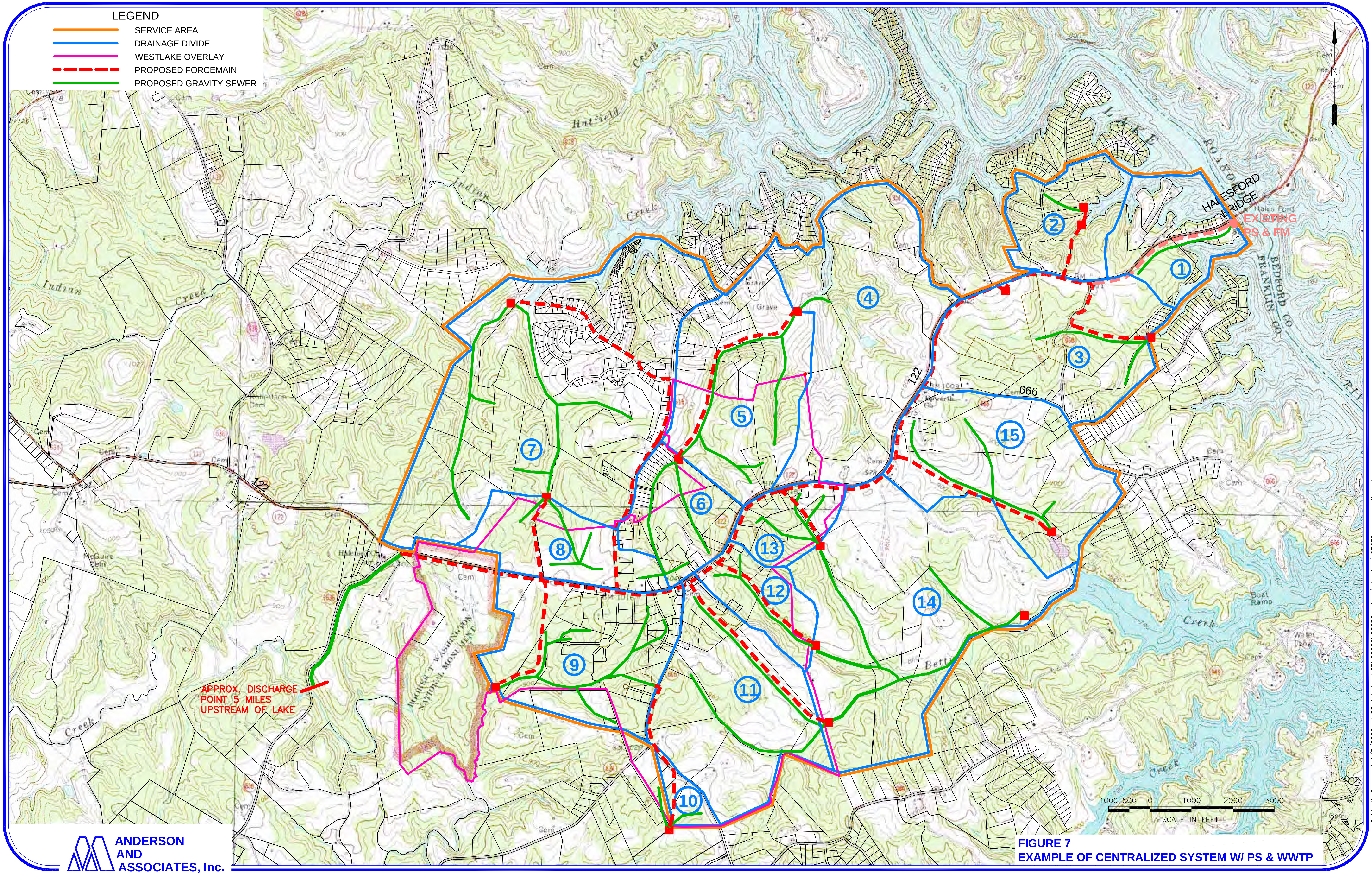
One variation would be doing multiple treatment units utilizing a single mass drainfield system located outside the service area. This option may be feasible, but there are several considerations that must be taken into account. A primary consideration is the testing and reporting necessary to ensure each facility is performing to its design parameters and meeting the effluent criteria required. Sampling would have to be done at each treatment facility, the drainfield pump station and the ground water monitoring well. Also any areas not served by one of the proposed treatment facilities may have a difficulty accessing the effluent force main. The construction of a force main along the primary roads, Rt. 122 and Rt. 616 south, would be problematic due to existing buried utilities and would likely be disruptive to the community. These unique issues could be overcome with proper planning, design and operations, but they must be thoroughly thought out during the planning process.

In developing the cost estimates for the cluster system, only the costs of the collection system, pump stations, and treatment facility were included. The cost of constructing the development's wastewater infrastructure (onsite collection system) is not factored in because it would be a cost born by the developer. The cost of constructing the cluster system would be in the range of $51,800,000. In order to make the project more viable it would need to be phased. The Bridgewater cluster is already in operation and will continue to expand as development at Bridgewater Point and Grand Villas continues. The Westlake Overlay District system would initially cost approximately $13,700,000 to develop the primary infrastructure to serve the District. Additional phases would occur as development dictates. A detailed breakdown of the costs is included in Appendix C.

3. Centralized or Regional System

A centralized or regional type treatment system would include collecting wastewater from each sewer shed and pumping it to a central treatment facility that would serve the entire service area. A primary force main would need to be located along Rt. 122 to receive wastewater from these pump stations and convey it to the proposed treatment facility. After treatment the effluent would be disinfected and discharged to Gills Creek, five miles upstream of the Lake. Figure 7 is an example of a possible centralized treatment system. The treated wastewater could also be disposed of in large mass drainfields that are located outside of the area of prime developable land.

As the area develops, individual sewer sheds would be picked up and pumped to the transmission force main. One operational difficulty that arises with this type of arrangement is the sizing of the transmission main. The main would have to be sized for the ultimate flow. This would prevent some initial operating difficult by not maintaining scour velocity in the main. It would be necessary to routinely flush the force main to remove any solids that had deposited in the main. Also the initial low flows in the main would cause excessive detention times, and thereby create an odor issue that would have to be addressed. Odor is often a very hard parameter to predict, but equipment and chemicals would need to be in place to resolve the problem should it arise.



ANDERSON AND ASSOCIATES, Inc.

FIGURE 7
EXAMPLE OF CENTRALIZED SYSTEM W/ PS & WWTP

Another disadvantage of a centralized approach is the ability to use the large transmission main for people along the Rt. 122 corridor. Even though there would be a pressure sewer main along Rt. 122, it would not be possible for individual residences and businesses to directly connect to the transmission main like they do with a water main. In the event of existing septic system failures along the corridor, these residences or businesses would need to convey their wastewater to the nearest collection system or pump station in order to obtain service. In developing the cost estimates for the centralized system, only the costs of the collection system, pump stations, and treatment facility were included. The cost of constructing the development's wastewater infrastructure (onsite collection system) is not factored in because it would be a cost born by the developer. The cost of constructing the centralized system would be in the range of $51,400,000. If only the core area of the Westlake Overlay District system was constructed initially, the cost would be approximately $11,800,000. Additional phases would occur as development dictates. A detailed breakdown of the costs is included in Appendix D.

G. MANAGEMENT ALTERNATIVES

1. General

All the existing and proposed treatment facilities in the study area are privately owned and operated. These facilities have been designed and constructed to meet the needs of their project. In some cases the owners of these facilities pay a contract operator to run and maintain the treatment system.

As existing facilities are expanded and new facilities are constructed, it will be important that there be some means of regulating the design, construction, operations and management of the facilities. The level of involvement by the County will directly impact the level of control that the County maintains in the process. The County essentially has four options available to them to consider. The first option is to do nothing and let things proceed forward as they currently do through the local review and regulatory process. The second option would be minimal regulatory involvement by the County and allow for private ownership and operation. The third option is total County involvement and control, and the fourth option is to develop a public-private partnership. The table below shows the division of responsibilities for these alternatives.

DIVISION OF RESPONSIBILITIES FOR PRIMARY OWNERSHIP/MANAGEMENT ALTERNATIVES

Task	Alternative			
	1	2	3	4
1. Establish Construction Standards	C	C	C	C
2. Enforce Construction Standards		C	C	C
3. Establish Facilities Management Organization	P	P	C	C
4. Established Operation Standards	C	C	C	C
5. Established Short Term Contingency Plan		P	C	P
6. Established Long Term Contingency Plan	P	C	C	C
7. Prepare Sludge Management Plan		P	C	C
8. Construct Wastewater Collection Facilities	P	P	J	P
9. Construct Wastewater Treatment Facilities	P	P	C	J
10. Construct Wastewater Disposal Facilities	P	P	C	J
11. Convey Facilities to Management Organization	P	P	C	C
12. Operate Facilities	P	P	C	C

13.	Implement Sludge Management Plan	P	P	C	C
14.	Monitor Operational Performance	P	P	C	C
15.	Enforce Operational Performance	C	C	C	C

RESPONSIBILITY KEY
P = Private entity such as developer, homeowner association, or private management company.
C = County or County established public entity such as an authority
J = Jointly performed tasks

One additional item that needs to be noted on privately owned systems is the involvement of the State Corporation Commission (SCC). Any non-publicly owned wastewater system having more than 50 or more physical connections falls under the jurisdiction of the SCC. A physical connection might serve more than one customer as in the case of a condominium. The SCC allows a facility that falls under its jurisdiction to establish a service area. The owner of the system would have to come to the County to obtain a Certificate of Need to define its service area. In the past the County has not approved these requests for water systems in the County, but no privately owned wastewater systems in the County have fallen under SCC guidelines.

2. Do Nothing Alternative (1)

The do nothing alternative would allow the development of wastewater systems under the current State and County regulations to continue. This alternative allows for minimal control and input by the County other than the Special Use Permit process. It does not relieve any of the uncertainty that developers currently experience on their projects. Each project would be evaluated on a case by case basis, and the special use permit process would have to be addressed for all treatment facilities and off site mass drainfields. These private facilities would only be sized to meet the developer’s needs and there would be no public benefit of the wastewater facilities. Designs must take into consideration the long term reliability of the wastewater systems.

Many privately owned systems over time do not receive the maintenance that a publicly owned facility does, and in some cases failure of the system has caused contamination of the groundwater or surface water. A problem sometimes arises too as to the responsibility for repairs of a failed system. There is not always a single owner that a regulatory agency can go back to for remediation.

3. Private Ownership and Operation Alternative (2)

This alternative allows for minimal involvement by the County, and the operation and ownership of the system remains private. This alternative would be the next step beyond doing nothing. The County would develop and enforce the minimum design and construction standards for wastewater facilities that would supplement existing State regulations. The County would also need to establish through regulation the long term contingency plan for the facilities. The County would also enforce wastewater operating performance. In the event of a system or operational failure, the private owner would be held responsible to rectify the problem. This alternative could likely be done with existing County staff with some outside support for technical oversight in development of the policies.

This alternative would not provide for any general public benefit from the privately owned systems unless the County was able to negotiate with the developer for some general public benefit capacity.

4. County Ownership and Operation (3)

This alternative provides the maximum control for the County. The County would take the responsibility for the development of the wastewater standards, establishing the management organization, developing contingency plans, designing and constructing the wastewater treatment facilities, and operating and maintaining the system. The County would have fiscal responsibility for the design, construction, operation, and maintenance of the facilities. The developer's primary responsibility would be the construction of their collection system and conveying it to the County.

This alternative allows the County to take an active role in the project from start to finish, but it also has the highest financial and personnel commitment of all the alternatives. The existing County staffing would not be sufficient to meet the demands of this alternative. Additional staffing would be necessary. Some of these tasks such as design and operations can be hired out services to help reduce County staff requirements.

This alternative allows the County to build in additional capacity for the benefit of the general public.

5. Private Involvement with County Ownership/Operation (4)

This alternative would involve developing a partnership with the development community to achieve the end goal. The County would develop the construction and operating standards for the wastewater systems. The developer would take the lead to design and construct the facilities, but allow the County opportunity to provide input and comment throughout the design and construction process. At the completion of construction, the facilities would be conveyed to the County to operate and maintain. The County would still have a significant fiscal responsibility for the capital investment and operations.

This alternative is the route Bedford County PSA went to develop their Moneta wastewater facilities. The development community took the lead on the project and partnered with the PSA to expedite the project. This work was able to occur through the Public Private Education Facilities and Infrastructure Act of 2002 (PPEA). In order for this to take place the PSA had to adopt certain procurement guidelines that would allow them to receive an unsolicited proposal from the development group. The development group agreed to fund a specific amount of the project, 20 percent of the approximately $10 million in capital cost, in turn for having a certain capacity in the wastewater system and waived availability fees. The development group became responsible for the design and construction of the system, and upon completion the PSA will own and operate the facilities. This process allows the PSA to stay actively involved in the project, but only requires a minimum amount of involvement during the design and construction. Another advantage for the PSA was the initial capital expenditure for the locality was reduced because of the financial commitment of the development group was paid upfront. A second advantage to the PSA was the compressed schedule allowing the facilities to become operational sooner.

H. EVALUATION AND CONCLUSIONS

1. General

a. For design purposes, the anticipated demand over the next 5 years within the designated service area is estimated to be 440,000 gallons per day (gpd). Of this, approximately 120,000 gpd is currently supplied by onsite systems, and approximately another 200,000 gpd will be supplied by the onsite systems at Lakewatch and Bridgewater.

b. For design purposes, the wastewater demand in the service area will double to approximately 880,000 gpd within 10 years. The 20 year design flow for the designated service area is 1,580,000 gpd. This is estimated to increase to 2,630,000 gpd as buildout of the service area is achieved.

c. Wastewater facilities must be designed to accommodate peak daily and seasonal demands. In this recreational and seasonal community, actual annual average wastewater flow could be in the range of only 45 percent of the design flow capacity used to size facilities.

d. Availability of potable water supplies will impact development and its associated wastewater flows.

e. The current land use plan for the study area is outdated and does not reflect the continuing changes that are occurring in the area. As development projects come forward to the County, they often require zoning changes and special use permits that must go before the Planning Commission and the Board of Supervisors for approval. These practices may allow a degree of immediate control, but makes the estimation of wastewater flows and project costs more speculative than normal, due to the uncertainty of the type of development that may occur.

f. The County's ultimate desired land use and density of the study area will significantly impact the need for wastewater facilities in the area. If the County desires to allow a denser development in the Westlake – Hales Ford area, the need for a centralized/regional treatment facility will be increased. If the County wants to maintain a lower density of development in this area, a cluster approach for wastewater treatment will be more feasible and allow the balancing of development needs and available land for wastewater disposal.

g. The development of any centralized wastewater system has the potential to increase density in those areas served by the system. The discharge alternative further increases the potential for higher density by removing the need of large tracts of land for disposal sites.

h. The provision of wastewater service should be considered as the provision of a necessary utility service to accompany any development, and not considered as a tool to control development. The County's zoning and code should be used to directly control density and type of development.

i. The designation of open space for developments needs to be refined. Open space requirements should be further clarified in county code. Use of open space for drainfields is acceptable, but using drainfields and its associated reserves as a means of guaranteeing open space is not a good practice.

j. The topography of the service area presents a challenge for wastewater collection. The area is drained by several small streams and natural drainage ways. The installation of gravity sewer pipes following the natural drainage patterns is generally the most cost effective means of collecting wastewater. The small drainage basins and rolling topography will require the use of pump stations and force mains to convey wastewater to the treatment and disposal sites. These pump facilities will require operational oversight and will likely need to meet a Class 1 reliability standard. The cost of constructing and operating these facilities will be significant and present challenges that must be addressed through the design process.

k. In order to develop a discharging sewer system to ultimately handle the entire service area and provide 2.6 million gallons per day of treatment capacity, the overall cost will be in the range of $51,400,000 using a centralized system with a treatment plant in the vicinity of the west end of the Westlake Overlay District and a discharge to Gills Creek that would fall at least 5 miles upstream of the lake backwaters. The cost of service using clustered onsite wastewater collection and subsurface disposal would be in the range of $51,800,000.

l. The estimated cost to serve the core of the Westlake Overlay District is in the range of $11,800,000 as a discharge system while the cost to serve it with a clustered onsite system would be in the range of $13,700,000. This initial phase of this project would provide approximately 400,000 gallons per day of treatment capacity. During discussions conducted to estimate future wastewater demands some property owners expressed a willingness to apply funds required to develop individual onsite systems toward the funding of a central system. Based on anticipated costs for individual systems, this could be a significant sum and warrants additional investigation. However, costs to the public sector for capital investment and operations would need to be weighed with the development benefit.

m. The Virginia Sewage Collection and Treatment Regulations, the Virginia Onsite Wastewater Regulations, and Franklin County Code Chapter 22 all address wastewater collection and disposal. However, the types of onsite wastewater systems currently proposed for use within the service area is not adequately covered by any one of these regulations. The application of various portions of these regulations to large onsite wastewater systems is open to interpretation and negotiation. In order to fill the gaps in these regulations, the County will need to develop additional code and policy, most likely as an upgrade of Chapter 22.

2. Treatment

a. Current Natural Resources Conservation Service soils mapping was prepared mainly for agricultural use and as such provides a good approximation of shallow soil locations and type. The deeper saprolite soils used for high rate wastewater disposal have only been studied and mapped in a small portion of the service area. However, parameters used by local soil scientists to find these soils appear to indicate the presence of significant areas of these highly permeable saprolite soils dispersed throughout the designated service area.

b. The hydraulic “carrying” capacity of even the highly permeable saprolite soils is not unlimited. The treated water ultimately has to travel laterally to leave the site. The design process must take this into account by determination of the depth of saprolite, restrictive layers in the soil, depth to groundwater, groundwater mounding, and other similar parameters used as assumptions in the design of a disposal field.

c. The availability of an adequate area of highly permeable soils to serve the Westlake Overlay District appears limited within the District. There are some large tracts of potentially good soils currently identified within the District. However some of the proposed development will likely consume these areas of suitable soils. The tracts within the District may have adequate soils to serve a portion of the District or provide some capacity for immediate development. Therefore in order to meet the future needs of the Westlake Overlay District, other tracts of suitable soils from outside the District would likely also be needed.

d. In the eastern end of the study area between the Westlake Overlay District and Hales Ford, there appears to be an area of highly permeable soils to support onsite wastewater disposal. This area is largely undeveloped at this time, and the development plans can be balanced with their onsite wastewater needs.

e. While the Virginia Department of Environmental Quality (DEQ) has indicated that a Virginia Pollutant Discharge Elimination System (VPDES) Permit for a wastewater discharge to a stream that would ultimately enter Smith Mountain Lake is possible, the only certain means of confirming this would be to apply for a discharge permit. DEQ has indicated that discharge limits would require tertiary treatment and nutrient control. The actual discharge (flow) capacity of any potential receiving stream is also unknown and can only be determined by application for a permit. DEQ also feels that there is likely to be public opposition to any discharge that would ultimately enter the lake. The capital and operating costs of the discharge alternative will also be greatly impacted by the degree of treatment required by DEQ.

f. The Virginia Department of Health has expressed concerns over any wastewater discharge within 5 miles of a public water supply. This is a standard policy to protect public water supplies. Since the lake is a designated public water supply, it must be assumed that a discharge would need to be 5 miles upstream of the backwaters of the lake.

g. The only stream within a reasonable proximity of the study area, which can provide a 5 mile buffer from the lake, is Gills Creek. Any discharge to Gills Creek should be located in the vicinity of Route 636 or upstream. The next closest option would be the Blackwater River, an additional 5 miles away. In the development of cost estimates, Gills Creek was assumed as a receiving stream.

h. Septage treatment and solids disposal should be addressed in all treatment facilities. Septic tank management within the Lake area will not be possible without reliable long term disposal sites. Treated solids from onsite treatment facilities can be hauled off site for disposal during the lower flows of startup. Onsite dewatering will become more feasible as flows increase. The Western Virginia Resources Authority has indicated they will continue to accept septage from Franklin County for the foreseeable future. Any arrangements for septage and solids disposal need to be formalized in a sludge management plan.

i. Operational costs between a centralized wastewater collection and treatment facility and numerous “managed” clustered wastewater facilities will be essentially equivalent on an annual basis.

3. Management

a. The significant difference in design flows versus actual annual average flows could impact volumes used to estimate revenue generation. Thus, there is a cost associated with having capacity available even when it is not being used, and this would have to be reflected in user fees, regardless of the alternatives selected.

b. The State Corporation Commission has jurisdiction over any non-publicly owned wastewater system having 50 or more physical connections. A physical connection might serve more than one customer as in the case of a condominium. This jurisdiction includes establishing service areas. A system that falls under SCC jurisdiction would have to come to the County to obtain a Certificate of Need to define its service area. The County has tended to not approve these requests on water systems. Further investigation of these issues needs to be addressed and the County's legal counsel consulted.

c. If the County did nothing and allowed the development of wastewater facilities to continue with little or no involvement, the County may relinquish any control over the construction or operation of facilities. This may not absolve the County of any future involvement in remedying a failing system. The County can elect not to resolve the problem or take on the system, but they will likely be asked to consider it.

d. County control of the wastewater facilities will be a direct function of County involvement in the construction of the facilities. The maximum control would be afforded by ownership and operation of facilities. Doing nothing should not be considered the minimum involvement, as some degree of control is still needed to assure the long term reliability of facilities.

e. Minimum control should include County oversight of the current private wastewater facilities development process. This oversight might include: establishing and enforcing of construction standards, establishing and enforcing of operational standards, requiring a long term sludge management plan, requiring a groundwater monitoring plan, and establishing a short term and long term contingency plan for failure of all onsite disposal systems.

f. If the County elects to take an active role in the development, ownership and operation of the wastewater facilities in the study area, it will be important to begin the implementation of an operational and management structure early in the process. The County would need to weigh the benefits of increasing their current utilities staff against the option of "contracting" the operations to a local wastewater operations firm.

g. The provision of wastewater service should be considered as the provision of a necessary utility service to accompany any development, and not considered as a tool to control development. The utility should be sized to meet the needs of the development based on the developments proposed land use.

h. Regardless of the approach, central/regional or clustered facilities, to handling the wastewater needs in the community, these facilities can be operated either publicly or privately.

4. Schedule Considerations

a. The schedule and path by which public and private utilities are developed will ultimately be dictated by the allowable development and land use within the study area. As the land use plan is further refined and updated, the schedule considerations can be further refined.

b. If the County were to implement the engineering, permitting, funding, and construction of any wastewater facilities immediately, it would likely take at least five years before the facilities could be placed in service. The current development projects are proceeding at a rate that will create demands sooner than this five year period.

c. Alternatives other than constructing facilities with public funds could shorten the implementation schedule. Private development of collection, treatment, and onsite disposal systems for individual development could reduce the implementation time to as little as 2 years. This is due to the elimination of waiting for public agency funding cycles, and the smaller scope of construction required. However the general public use of these private systems would not be likely.

d. Public-private partnerships, such as those permitted under the Virginia Public Private Education Facilities and Infrastructure Act (PPEA) of 2002 could save time by allowing a design-build process, which can streamline procurement and construction. It can also reduce funding agency delays, depending on how the public portion of a project is financed. As an example, the ongoing PPEA for the Moneta Wastewater System in Bedford County was expedited and is expected to take a total of about 2½ years from concept to completion of construction. A less ambitious schedule could still cut the process to 3½ years. However, the County would need to further investigate the aspects of the PPEA process and adopt the necessary policies before it could be pursued. Such an alternative could be considered when development plans for the area indicate a need for a central system in order to fulfill the land use plan.

I. RECOMMENDATIONS

1. Develop a long term land use plan for the study area that addresses the zoning, density, and open space requirements the County wants to see in the area. These decisions will allow the wastewater flow projections and cost estimates to be further refined. If the County elects to allow denser development in the study area, a centralized/regional approach to wastewater will be more feasible. If the County elects to encourage reduced density, a cluster approach of wastewater treatment will be more feasible.

2. If Westlake Overlay District is built to the maximum density of development allowed by its current land use plan a centralized collection system may enhance development. As the County moves forward with refining their land use plan and developing their short and long term plans for wastewater infrastructure, the County should work with the development community to encourage shared participation in private projects to limit the number of wastewater facilities constructed and allow for combining of facilities in the future should the opportunity arise.

3. The area between the Westlake Overlay District and Hales Ford can continue to develop onsite wastewater disposals systems that can be balanced with development needs.

4. If the County wants to provide general public use of a centralized wastewater system in the Westlake Overlay District, the County should consider developing, owning and operating the system. Without County involvement, general public use could be severely limited. The privately developed systems to the east of the Overlay District should continue under private ownership, but the County will need to set minimum requirements for management of the systems that supplement existing state regulations.

5. Develop code and policy to set standards for wastewater collection, treatment and disposal. This would include (but not be limited to) the following:

    a) Reference the appropriate sections of the Onsite Wastewater Regulations and Sewage Collection and Treatment Regulations. Revising Chapter 22 of the County Code to fill in the gaps in these Regulations.

    b) Establishing standards for minimum size, quality, and uniformity of systems to be eligible for ultimate County takeover should the County elect to go forward with involvement in owning and operating wastewater facilities.

    c) Developing institutional arrangements to provide monitoring and enforcement of wastewater facilities performance.

    d) Reviewing state codes that may influence decision-making processes as it relates to defining service areas and public-private partnerships. The County may wish to consider adopting the PPEA guidelines if it anticipates revising its land use plan to allow denser development in the study area.

e) Establish criteria that ensure protection of the environment and public health.

6. Develop a plan that coordinates the wastewater collection and treatment systems to serve the Westlake Overlay District (Phase 1) so that in the future these systems could ultimately be combined into one future system should the need arise. This may begin as a private project that can eventually be phased into a public system as the area continues to grow in time. The project should begin as an onsite system that could eventually be converted to a discharging system as demand increases, availability of suitable soils becomes limited, or discharging becomes cost effective.

7. Should the County revise their land use plan to allow for increased density, consider the use of public-private partnerships as a means to expedite the development of wastewater facilities and reduce construction costs.

8. Consider obtaining user agreements prior to the construction of any wastewater facility. Any wastewater facility should be planned so that its customers/users financially support the facility without supplemental funds from the County

9. Encourage developers to create central treatment systems for their developments. This will help reduce the locations of treatment in the County and could facilitate future County involvement.

10. Require contingency plans to address short term and long term remediation of failed onsite systems. This should include establishment of land and operating cost reserves.

11. Any route the County elects to pursue to handle the wastewater needs within the study area will require further cost benefit analysis. The cost of developing and operating the wastewater infrastructure must be weigh against the financial benefits of the desired land use plan.

12. The County should consider the difference in financial commitment to become active in the wastewater infrastructure at this current time versus becoming involved at some future date. If the County elects to become involved in the development and operation of wastewater facilities now, the costs will likely be significantly less than if they become involved at a future date and have to purchase these systems from their respective owner.

13. As the County moves forward setting their direction in the study area for type of desired land use, density and wastewater provisions, it is likely that the County will need to undertake additional studies that not only investigate the technical and financial issues of the chosen alternative, but also investigates the issues related to ownership and operations of wastewater facilities. The County may also have to consider studies related to transportation and pedestrian movement.

APPENDIX A

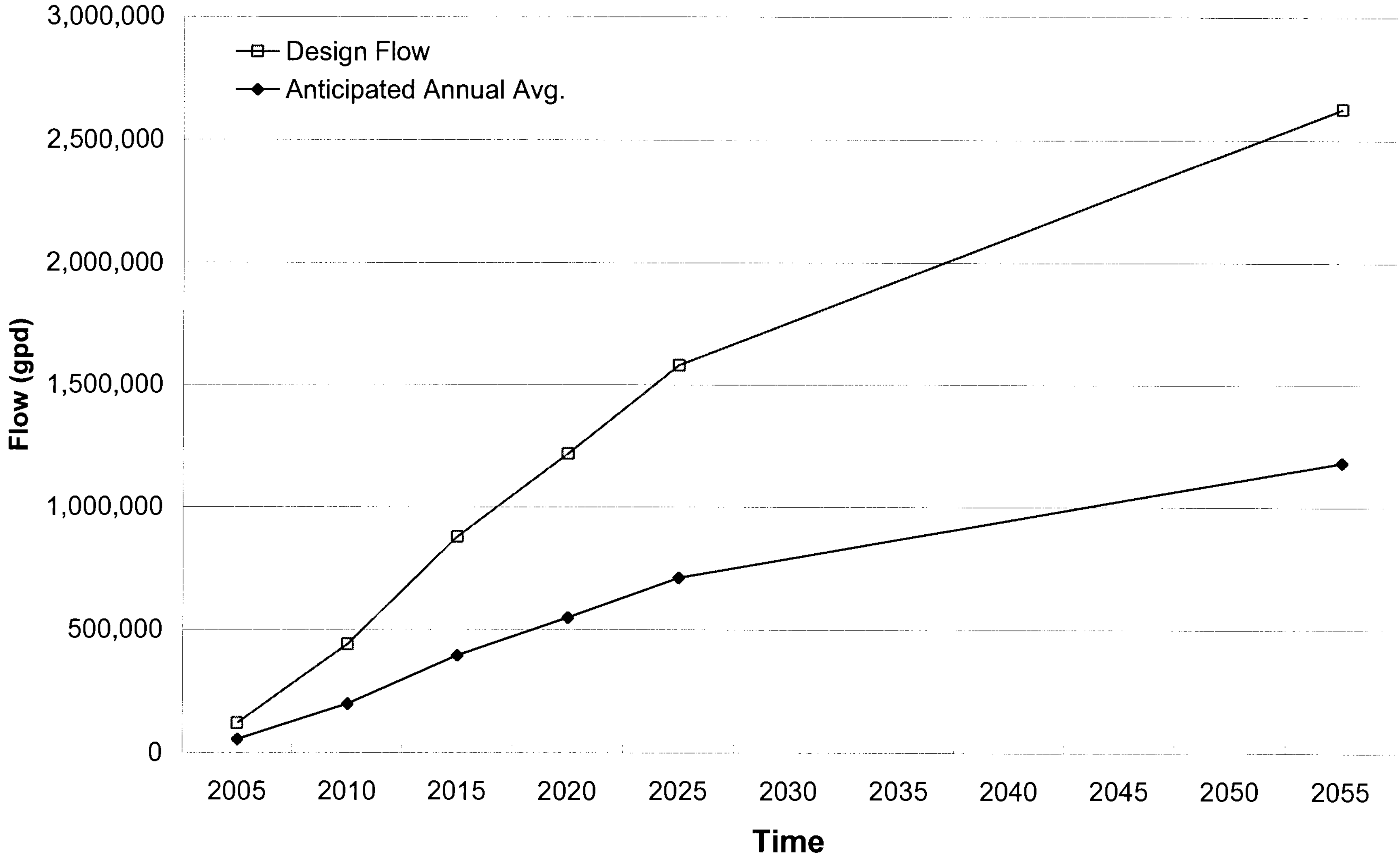
Wastewater Projections

Westlake - Halesford Sewer Study
Franklin County, Virginia
JN 23652

Summary of Projected Flows

Project	Existing	5 years	10 years	15 years	20 years	Build Out
	Projected Flows (gpd)					
Phase 1						
Sewer Shed 1	5,500	83,825	162,150	206,075	250,000	283,250
Phase2						
Sewer Shed 4	25,600	152,000	300,000	300,000	319,800	319,800
Phase 3						
Sewer Shed 6	24,550	42,250	67,250	87,250	107,250	161,050
Sewer Shed 8	0	15,000	30,000	45,000	60,000	135,600
Sewer Shed 9	36,910	78,910	111,910	126,910	141,410	168,410
Sewer Shed 11	4,500	11,000	31,000	51,000	75,000	116,000
Total	65,960	147,160	240,160	310,160	383,660	581,060
Phase 4						
Sewer Shed 12	550	5,000	15,000	20,000	25,000	74,350
Sewer Shed 13	500	1,500	5,000	10,000	20,000	42,100
Sewer Shed 10	0	0	5,000	10,000	15,000	33,000
Total	1,050	6,500	25,000	40,000	60,000	149,450
Phase 5						
Sewer Shed 5	0	0	0	25,000	50,000	188,000
Phase 6						
Sewer Shed 7	20,000	38,000	62,000	129,200	171,200	344,000
Phase 7						
Sewer Shed 14	0	0	25,000	100,000	175,000	350,000
Phase 8						
Sewer Shed 2	500	9,500	18,500	27,000	45,000	90,500
Sewer Shed 3	0	500	40,000	70,000	100,000	136,500
Total	500	10,000	58,500	97,000	145,000	227,000
Phase 9						
Sewer Shed 15	1,000	2,500	5,000	10,000	25,000	184,600
Total	119,610	439,985	877,810	1,217,435	1,579,660	2,627,160

Flow vs. Time


Design Flow
Anticipated Annual Avg.
Flow (gpd)
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050
2055
Time

APPENDIX B

Drainfield Requirements

Halesford - Westlake Sewer Study
Franklin County, Virginia
JN 23652

Estimated Drainfield Area Requirements at Buildout

Project	Estimated Demand (gpd)		Field Area Required (acres)							
			20 yrs				Build Out			
	20 yrs	Build Out	Installed	Overhead	Reserve	Total	Installed	Overhead	Reserve	Total
Phase 1 - Sewer Shed 1	250,000	283,250	20.7	5.2	20.7	46.6	23.4	5.8	23.4	52.6
Phase 2 - Sewer Shed 4	319,800	319,800	26.4	6.6	26.4	59.4	26.4	6.6	26.4	59.4
Phase 3 - Sewer Sheds 6, 8, 9, 11	383,660	581,060	31.7	7.9	31.7	71.3	48	12	48	108
Phase 4 - Sewer Sheds 10, 12, 13	60,000	149,450	5.0	1.2	5.0	11.2	12.4	3.1	12.4	27.9
Phase 5 - Sewer Shed 5	50,000	188,000	4.1	1.0	4.1	9.2	15.6	3.9	15.6	35.1
Phase 6 - Sewer Shed 7	171,200	344,000	14.2	3.5	14.2	31.9	28.4	7.1	28.4	63.9
Phase 7 - Sewer Shed 14	175,000	350,000	14.5	3.6	14.5	32.6	28.9	7.2	28.9	65
Phase 8 - Sewer Sheds 2,3	145,000	227,000	12.0	3.0	12.0	27.0	18.8	4.7	18.8	42.3
Phase 9 - Sewer Shed 15	25,000	184,600	2.1	0.5	2.1	4.7	15.2	3.8	15.2	34.2
Total	1,579,660	2,627,160	130.7	32.5	130.7	293.9	217.1	54.2	217.1	488.4

Notes:

1. Percolation rate used in calculation is 10 minutes per inch. Rate is slightly more conservative than the rates determined in the field by insitu testing of the saprolites. Field tests typically ranged from 0-10 minutes per inch.
2. Slope of field area is assumed at 2% or less.
3. Overhead area is estimated at 25%.
4. Reserve area is 100% per Franklin County Code.

Halesford - Westlake Sewer Study
Franklin County, Virginia
JN 23652

Estimated Drainfield Area Requirements over 20 years

Project	Existing		5 years		10 years		15 years		20 years	
	Demand (gpd)	Field Area (acre)	Demand (gpd)	Field Area (acre)	Demand (gpd)	Field Area (acre)	Demand (gpd)	Field Area (acre)	Demand (gpd)	Field Area (acre)
Phase 1 - Sewer Shed 1	5,500	n/a	83,825	15.5	162,150	30.2	206,075	38.3	250,000	46.6
Phase 2 - Sewer Shed 4	25,600	n/a	152,000	28.3	300,000	55.8	300,000	55.8	319,800	59.4
Phase 3 - Sewer Sheds 6, 8	65,960	n/a	147,160	27.4	240,160	44.8	310,160	57.6	383,660	71.3
Phase 4 - Sewer Sheds 10,	1,050	n/a	6,500	1.1	25,000	4.7	40,000	7.4	60,000	11.2
Phase 5 - Sewer Shed 5	0	n/a	0	n/a	0	n/a	25,000	4.7	50,000	9.2
Phase 6 - Sewer Shed 7	20,000	n/a	38,000	7.0	62,000	11.5	129,200	24.1	171,200	31.9
Phase 7 - Sewer Shed 14	0	n/a	0	n/a	25,000	4.7	100,000	18.6	175,000	32.6
Phase 8 - Sewer Sheds 2,3	500	n/a	10,000	1.8	58,500	10.8	97,000	18.0	145,000	27.0
Phase 9 - Sewer Shed 15	1,000	n/a	2,500	0.4	5,000	0.9	10,000	1.8	25,000	4.7
Total	119,610	0.0	439,985	81.5	877,810	163.4	1,217,435	226.3	1,579,660	293.9

Existing Capacity	120,000		120,000
Approved/Available Capacity			
Under Investigation			106,000
(Deficeit)/Surplus			

APPENDIX C

Cluster System Cost Estimates

Westlake - Halesford Sewer Study
Franklin County, Virginia
JN 23652

Estimated Project Cost for Cluster System

					County		Developer		
Phase	Sewer Shed	Item	Unit	Unit Cost	Quantity	Cost	Quantity	Cost	Total Cost
1	1	Force Main	LF	$30		$0	1500	$45,000	
		Pump Station (490 gpm)	LS	$270,000		$0	1	$270,000	
		Treatment Plant (0.25 MGD)	GAL	$12.40		$0	250000	$3,100,000	
		Onsite Disposal	GAL	$1.75		$0	250000	$437,500	
					Estimated Construction Costs				**$3,852,500**
					Contingency @ 10%				**$385,300**
					Related Costs @ 30%				**$1,155,800**
					Land @ $20,000/Ac.			**55 Ac.**	**$1,100,000**
					Phase 1 Total				**$6,493,600**

Notes: (Same for each sheet, unless otherwise noted)

1. Pump station size based on 2.5 times ultimate flow
2. Treatment plant size based on 20 year flow
3. Pump Station costs based on as bid prices from similar size pump stations
4. Treatment Plant costs based on as bid prices from similar size plants
5. Land required based on drainfield calculations plus 2.5 acres per pump station and 5 acres/0.5 MGD capacity of plant
6. Land acquisition costs based on evaluation of recent acquisitions of parcels in Study Area

Westlake - Halesford Sewer Study
Franklin County, Virginia
JN 23652

Estimated Project Cost for Cluster System

					County		Developer		
Phase	Sewer Shed	Item	Unit	Unit Cost	Quantity	Cost	Quantity	Cost	Total Cost
2	4	Collection (pressure)	LF	$30		$0	7300	$219,000	
		Treatment Plant (0.35 MGD)	GAL	$11.10		$0	350000	$3,885,000	
		Onsite Disposal	GAL	$1.75		$0	350000	$612,500	
					Estimated Construction Costs				**$4,716,500**
					Contingency @ 10%				**$471,700**
					Related Costs @ 30%				**$1,415,000**
					Land @ $20,000/Ac.			**63.5 Ac.**	**$1,270,000**
					Phase 2 Total				**$7,873,200**

Westlake - Halesford Sewer Study
Franklin County, Virginia
JN 23652

Estimated Project Cost for Cluster System

Phase	Sewer Shed	Item	Unit	Unit Cost	County Quantity	County Cost	Developer Quantity	Developer Cost	Total Cost
3	6	Force Main	LF	$30	4300	$129,000		$0	
		Gravity Collection	LF	$40	4200	$168,000		$0	
		Gravity Interceptor	LF	$45	3100	$139,500		$0	
		Manholes	EA	$2,000	37	$74,000	0	$0	
		Pump Station (280 gpm)	LS	$180,000	1	$180,000		$0	
		Telemetry System	EA	$25,000	3	$75,000		$0	
		Total Sewer Shed Cost							$765,500
	8	Force Main	LF	$30	2300	$69,000		$0	
		Gravity Collection	LF	$40	400	$16,000	3000	$120,000	
		Gravity Interceptor	LF	$45	800	$36,000		$0	
		Manholes	EA	$2,000	6	$12,000	15	$30,000	
		Pump Station (240 gpm)	LS	$170,000	1	$170,000		$0	
		Telemetry System	EA	$25,000	1	$25,000		$0	
		Total Sewer Shed Cost							$478,000
	9	Force Main	LF	$30	3500	$105,000		$0	
		Gravity Collection	LF	$40	3100	$124,000	4100	$164,000	
		Gravity Interceptor	LF	$45	4400	$198,000		$0	
		Manholes	EA	$2,000	38	$76,000	21	$42,000	
		Pump Station (350 gpm)	LS	$210,000	1	$210,000		$0	
		Telemetry System	EA	$25,000	1	$25,000		$0	
		Total Sewer Shed Cost							$944,000
	11	Force Main	LF	$30	4700	$141,000		$0	
		Gravity Collection	LF	$40	2100	$84,000	4100	$164,000	
		Gravity Interceptor	LF	$45	3200	$144,000		$0	
		Manholes	EA	$2,000	27	$54,000	21	$42,000	
		Pump Station (200gpm)	LS	$150,000	1	$150,000		$0	
		Telemetry System	EA	$25,000	1	$25,000		$0	
		Total Sewer Shed Cost							$804,000

Westlake - Halesford Sewer Study
Franklin County, Virginia
JN 23652

Estimated Project Cost for Cluster System

					County		Developer		
Phase	Sewer Shed	Item	Unit	Unit Cost	Quantity	Cost	Quantity	Cost	Total Cost
3		Central Force Main	LF	$40	7300	$292,000		$0	
		Treatment Plant (0.40 MGD)	GAL	$10.80	400000	$4,320,000		$0	
		Onsite Disposal	GAL	$1.75	400000	$700,000		$0	
		Total Treatment Costs							$5,312,000
						Estimated Construction Costs			**$8,303,500**
						Contingency @ 10%			**$830,400**
						Related Costs @ 30%			**$2,491,100**
						Land @ $20,000/Ac.		**105 Ac.**	**$2,100,000**
						Phase 3 Total			**$13,725,000**

Notes:

1. Land required based on drainfield calculations for Phases 3, 4, and 5 plus 2.5 acres per pump station and 5 acres for plant

Westlake - Halesford Sewer Study
Franklin County, Virginia
JN 23652

Estimated Project Cost for Cluster System

					County		Developer		
Phase	Sewer Shed	Item	Unit	Unit Cost	Quantity	Cost	Quantity	Cost	Total Cost
4	12	Force Main	LF	$30	3000	$90,000		$0	
		Gravity Collection	LF	$40	1000	$40,000		$0	
		Gravity Interceptor	LF	$45	2700	$121,500		$0	
		Manholes	EA	$2,000	19	$38,000	0	$0	
		Pump Station (130 gpm)	LS	$120,000	1	$120,000		$0	
		Telemetry System	EA	$25,000	1	$25,000		$0	
		Total Sewer Shed Cost							$434,500
	13	Force Main	LF	$30	1600	$48,000		$0	
		Gravity Collection	LF	$40	3700	$148,000		$0	
		Gravity Interceptor	LF	$45	0	$0		$0	
		Manholes	EA	$2,000	19	$38,000	0	$0	
		Pump Station (80 gpm)	LS	$100,000	1	$100,000		$0	
		Telemetry System	EA	$25,000	1	$25,000		$0	
		Total Sewer Shed Cost							$359,000
	10	Force Main	LF	$30	4000	$120,000		$0	
		Gravity Collection	LF	$40	1700	$68,000		$0	
		Gravity Interceptor	LF	$45	0	$0		$0	
		Manholes	EA	$2,000	9	$18,000	0	$0	
		Pump Station (60 gpm)	LS	$90,000	1	$90,000		$0	
		Telemetry System	EA	$25,000	1	$25,000		$0	
		Total Sewer Shed Cost							$321,000
4		Central Force Main	LF	$40	3300	$132,000		$0	
		Treatment Plant Upgrade (0.45 MGD)	GAL	$15.00	50000	$750,000		$0	
		Onsite Disposal	GAL	$1.75	50000	$87,500		$0	
		Total Treatment Costs							$132,000
					Estimated Construction Costs				**$1,246,500**
					Contingency @ 10%				**$124,700**
					Related Costs @ 30%				**$374,000**
					Land @ $20,000/Ac.			**7.5 Ac.**	**$150,000**
					Phase 4 Total				**$1,895,200**

Westlake - Halesford Sewer Study
Franklin County, Virginia
JN 23652

Estimated Project Cost for Cluster System

Phase	Sewer Shed	Item	Unit	Unit Cost	County Quantity	County Cost	Developer Quantity	Developer Cost	Total Cost
5	5	Force Main	LF	$30	5000	$150,000		$0	
		Gravity Collection	LF	$40	1000	$40,000	3700	$148,000	
		Gravity Interceptor	LF	$45	5000	$225,000	700	$31,500	
		Manholes	EA	$2,000	30	$60,000	22	$44,000	
		Pump Station (1170 gpm)	LS	$550,000	1	$550,000		$0	
		Telemetry System	EA	$25,000	1	$25,000		$0	
		Total Sewer Shed Cost							$1,273,500
5		Abandon Pump Station	LS	$25,000	1	$25,000		$0	
		Treatment Plant Upgrades (.5 MGD)	GAL	$15.00	50000	$750,000		$0	
		Total Treatment Costs							
									$775,000
						Estimated Construction Costs			**$2,048,500**
						Contingency @ 10%			**$204,900**
						Related Costs @ 30%			**$614,600**
						Land @ $20,000/Ac.		**2.5 Ac.**	**$50,000**
						Phase 5 Total			**$2,918,000**

Westlake - Halesford Sewer Study
Franklin County, Virginia
JN 23652

Estimated Project Cost for Cluster System

Phase	Sewer Shed	Item	Unit	Unit Cost	County Quantity	County Cost	Developer Quantity	Developer Cost	Total Cost
6	7	Force Main	LF	$30	5900	$177,000		$0	
		Gravity Collection	LF	$40	4700	$188,000	$0	$0	
		Gravity Interceptor	LF	$45	9200	$414,000	$0	$0	
		Manholes	EA	$2,000	70	$140,000	0	$0	
		Pump Station (840 gpm)	LS	$420,000	1	$420,000		$0	
		Telemetry System	EA	$25,000	1	$25,000		$0	
		Total Sewer Shed Cost							$1,364,000
6		Treatment Plant (0.175 MGD)	GAL	$13.50	175000	$2,362,500		$0	
		Onsite Disposal	GAL	$1.75	175000	$306,250		$0	
		Total Treatment Costs							$2,668,750
						Estimated Construction Costs			**$4,032,750**
						Contingency @ 10%			**$403,300**
						Related Costs @ 30%			**$1,209,800**
						Land @ $20,000/Ac.		**34.5 Ac.**	**$690,000**
						Phase 6 Total			**$6,335,850**

Westlake - Halesford Sewer Study
Franklin County, Virginia
JN 23652

Estimated Project Cost for Cluster System

Phase	Sewer Shed	Item	Unit	Unit Cost	County		Developer		Total Cost
					Quantity	Cost	Quantity	Cost	
7	14	Force Main	LF	$30	5200	$156,000		$0	
		Gravity Collection	LF	$40	3500	$140,000	2000	$80,000	
		Gravity Interceptor	LF	$45	4100	$184,500	0	$0	
		Manholes	EA	$2,000	38	$76,000	10	$20,000	
		Pump Station (1020 gpm)	LS	$490,000	1	$490,000		$0	
		Telemetry System	EA	$25,000	1	$25,000		$0	
		Total Sewer Shed Cost							$1,171,500
7		Treatment Plant (0.18 MGD)	GAL	$13.50		$0	180000	$2,430,000	
		Onsite Disposal	GAL	$1.75		$0	180000	$315,000	
		Total Treatment Costs							$2,745,000
					Estimated Construction Costs				**$3,916,500**
					Contingency @ 10%				**$391,700**
					Related Costs @ 30%				**$1,175,000**
					Land @ $20,000/Ac.			**38.0 Ac.**	**$760,000**
					Phase 7 Total				**$6,243,200**

Notes:

1. Land required based on drainfield calculations for Phases 7 plus 2.5 acres per pump station and 2.5 acres for plant

Westlake - Halesford Sewer Study
Franklin County, Virginia
JN 23652

Estimated Project Cost for Cluster System

Phase	Sewer Shed	Item	Unit	Unit Cost	County Quantity	County Cost	Developer Quantity	Developer Cost	Total Cost
8	2	Force Main	LF	$30	1800	$54,000		$0	
		Gravity Collection	LF	$40	0	$0	1000	$40,000	
		Gravity Interceptor	LF	$45	0	$0		$0	
		Manholes	EA	$2,000	0	$0	5	$10,000	
		Pump Stations (160 gpm)	LS	$130,000	2	$260,000		$0	
		Telemetry System	EA	$25,000	1	$25,000		$0	
		Total Sewer Shed Cost							$389,000
	3	Force Main	LF	$30	2700	$81,000		$0	
		Gravity Collection	LF	$40	1600	$64,000	1700	$68,000	
		Gravity Interceptor	LF	$45	0	$0		$0	
		Manholes	EA	$2,000	8	$16,000	9	$18,000	
		Pump Station (240 gpm)	LS	$170,000	1	$170,000		$0	
		Telemetry System	EA	$25,000	1	$25,000		$0	
		Total Sewer Shed Cost							$442,000
8		Gravity Collection (Area 1)	LF	$40		$0	1400	$56,000	
		Manholes	EA	$2,000		$0	7	$14,000	
		Treatment Plant Upgrades (0.395 MGD)	GAL	$13.90	145000	$2,015,500		$0	
		Onsite Disposal	GAL	$1.75	145000	$253,750		$0	
		Total Treatment Costs							$2,339,250
						Estimated Construction Costs			**$3,170,250**
						Contingency @ 10%			**$317,000**
						Related Costs @ 30%			**$951,100**
						Land @ $20,000/Ac.		**37.0 Ac.**	**$740,000**
						Phase 8 Total			**$5,178,350**

Westlake - Halesford Sewer Study
Franklin County, Virginia
JN 23652

Estimated Project Cost for Cluster System

Phase	Sewer Shed	Item	Unit	Unit Cost	County Quantity	County Cost	Developer Quantity	Developer Cost	Total Cost
9	15	Force Main	LF	$30	4300	$129,000		$0	
		Gravity Collection	LF	$40	3700	$148,000	3200	$128,000	
		Gravity Interceptor	LF	$45	0	$0		$0	
		Manholes	EA	$2,000	19	$38,000	16	$32,000	
		Pump Station (320 gpm)	LS	$200,000	1	$200,000		$0	
		Telemetry System	EA	$25,000	1	$25,000		$0	
		Total Sewer Shed Cost							$700,000
9		Treatment Plant (0.025 MGD)	GAL	$15.30		$0	25000	$382,500	
		Onsite Disposal	GAL	$1.75		$0	25000	$43,750	
		Total Treatment Costs							$426,250
						Estimated Construction Costs			**$700,000**
						Contingency @ 10%			**$70,000**
						Related Costs @ 30%			**$210,000**
						Land @ $20,000/Ac.		**10.0 Ac.**	**$200,000**
						Phase 9 Total			**$1,180,000**

Notes:

1. Land required based on drainfield calculations for Phase 9 plus 2.5 acres per pump station and 2.5 acres for plant

GRAND TOTAL PROJECT COSTS **$51,842,400**

APPENDIX D

Centralized or Regional Cost Estimates

Westlake - Halesford Sewer Study
Franklin County, Virginia
JN 23652

Estimated Project Cost for Centralized System

					County		Developer		
Phase	Sewer Shed	Item	Unit	Unit Cost	Quantity	Cost	Quantity	Cost	Total Cost
1	1	Force Main	LF	$30		$0	1500	$45,000	
		Pump Station (490 gpm)	LS	$270,000		$0	1	$270,000	
		Treatment Plant (0.25 MGD)	GAL	$12.40		$0	250000	$3,100,000	
		Onsite Disposal	GAL	$1.50		$0	250000	$375,000	
						Estimated Construction Costs			**$3,790,000**
						Contingency @ 10%			**$379,000**
						Related Costs @ 30%			**$1,137,000**
						Land @ $20,000/Ac.		**55 Ac.**	**$1,100,000**
						Phase 1 Total			**$6,406,000**

Notes: (Same for each sheet, unless otherwise noted)

1. Pump station size based on 2.5 times ultimate flow
2. Treatment plant size based on 20 year flow
3. Pump Station costs based on as bid prices from similar size pump stations
4. Treatment Plant costs based on as bid prices from similar size plants
5. Land required based on drainfield calculations plus 2.5 acres per pump station and 5 acres/0.5 MGD capacity of plant
6. Land acquisition costs based on evaluation of recent acquisitions of parcels in Study Area

Westlake - Halesford Sewer Study
Franklin County, Virginia
JN 23652

Estimated Project Cost for Centralized System

Phase	Sewer Shed	Item	Unit	Unit Cost	County Quantity	County Cost	Developer Quantity	Developer Cost	Total Cost
2	4	Collection (pressure)	LF	$30		$0	7300	$219,000	
		Treatment Plant (0.35 MGD)	GAL	$11.10		$0	350000	$3,885,000	
		Onsite Disposal	GAL	$1.50		$0	350000	$525,000	
						Estimated Construction Costs			**$4,629,000**
						Contingency @ 10%			**$462,900**
						Related Costs @ 30%			**$1,388,700**
						Land @ $20,000/Ac.		**63.5 Ac.**	**$1,270,000**
						Phase 2 Total			**$7,750,600**

Westlake - Halesford Sewer Study
Franklin County, Virginia
JN 23652

Estimated Project Cost for Centralized System

					County		Developer		
Phase	Sewer Shed	Item	Unit	Unit Cost	Quantity	Cost	Quantity	Cost	Total Cost
3	6	Force Main	LF	$30	4300	$129,000		$0	
		Gravity Collection	LF	$40	4200	$168,000		$0	
		Gravity Interceptor	LF	$45	3100	$139,500		$0	
		Manholes	EA	$2,000	37	$74,000	0	$0	
		Pump Station (280 gpm)	LS	$180,000	1	$180,000		$0	
		Telemetry System	EA	$25,000	3	$75,000		$0	
		Total Sewer Shed Cost							$765,500
	8	Force Main	LF	$30	2300	$69,000		$0	
		Gravity Collection	LF	$40	400	$16,000	3000	$120,000	
		Gravity Interceptor	LF	$45	800	$36,000		$0	
		Manholes	EA	$2,000	6	$12,000	15	$30,000	
		Pump Station (240 gpm)	LS	$170,000	1	$170,000		$0	
		Telemetry System	EA	$25,000	1	$25,000		$0	
		Total Sewer Shed Cost							$478,000
	9	Force Main	LF	$30	3500	$105,000		$0	
		Gravity Collection	LF	$40	3100	$124,000	4100	$164,000	
		Gravity Interceptor	LF	$45	4400	$198,000		$0	
		Manholes	EA	$2,000	38	$76,000	21	$42,000	
		Pump Station (350 gpm)	LS	$210,000	1	$210,000		$0	
		Telemetry System	EA	$25,000	1	$25,000		$0	
		Total Sewer Shed Cost							$944,000
	11	Force Main	LF	$30	4700	$141,000		$0	
		Gravity Collection	LF	$40	2100	$84,000	4100	$164,000	
		Gravity Interceptor	LF	$45	3200	$144,000		$0	
		Manholes	EA	$2,000	27	$54,000	21	$42,000	
		Pump Station (200gpm)	LS	$150,000	1	$150,000		$0	
		Telemetry System	EA	$25,000	1	$25,000		$0	
		Total Sewer Shed Cost							$804,000

Westlake - Halesford Sewer Study
Franklin County, Virginia
JN 23652

Estimated Project Cost for Centralized System

					County		Developer		
Phase	Sewer Shed	Item	Unit	Unit Cost	Quantity	Cost	Quantity	Cost	Total Cost
3		Central Force Main	LF	$40	7300	$292,000		$0	
		Plant Interceptor	LF	$50	4700	$235,000		$0	
		Manholes	EA	$2,000	24	$48,000	0	$0	
		Treatment Plant (0.4 MGD)	GAL	$11.10	400000	$4,440,000		$0	
		Outfall Sewer	LF	$65	500	$32,500		$0	
		Total Treatment Costs							$5,047,500
					Estimated Construction Costs				**$8,039,000**
					Contingency @ 10%				**$803,900**
					Related Costs @ 30%				**$2,411,700**
					Land @ $20,000/Ac.			**25 Ac.**	**$500,000**
					Phase 3 Total				**$11,754,600**

Notes:

1. Land required based on 2.5 acres per pump station, and purchase of total land for 1.5 MGD WWTP (15 Ac.)

Westlake - Halesford Sewer Study
Franklin County, Virginia
JN 23652

Estimated Project Cost for Centralized System

Phase	Sewer Shed	Item	Unit	Unit Cost	County Quantity	County Cost	Developer Quantity	Developer Cost	Total Cost
4	12	Force Main	LF	$30	3000	$90,000		$0	
		Gravity Collection	LF	$40	1000	$40,000		$0	
		Gravity Interceptor	LF	$45	2700	$121,500		$0	
		Manholes	EA	$2,000	19	$38,000	0	$0	
		Pump Station (130 gpm)	LS	$120,000	1	$120,000		$0	
		Telemetry System	EA	$25,000	1	$25,000		$0	
		Total Sewer Shed Cost							$434,500
	13	Force Main	LF	$30	1600	$48,000		$0	
		Gravity Collection	LF	$40	3700	$148,000		$0	
		Gravity Interceptor	LF	$45	0	$0		$0	
		Manholes	EA	$2,000	19	$38,000	0	$0	
		Pump Station (80 gpm)	LS	$100,000	1	$100,000		$0	
		Telemetry System	EA	$25,000	1	$25,000		$0	
		Total Sewer Shed Cost							$359,000
	10	Force Main	LF	$30	4000	$120,000		$0	
		Gravity Collection	LF	$40	1700	$68,000		$0	
		Gravity Interceptor	LF	$45	0	$0		$0	
		Manholes	EA	$2,000	9	$18,000	0	$0	
		Pump Station (60 gpm)	LS	$90,000	1	$90,000		$0	
		Telemetry System	EA	$25,000	1	$25,000		$0	
		Total Sewer Shed Cost							$321,000
4		Central Force Main	LF	$40	3300	$132,000		$0	
		Total Treatment Costs							$132,000
						Estimated Construction Costs			**$1,246,500**
						Contingency @ 10%			**$124,700**
						Related Costs @ 30%			**$374,000**
						Land @ $20,000/Ac.		**7.5 Ac.**	**$150,000**
						Phase 4 Total			**$1,895,200**

Westlake - Halesford Sewer Study
Franklin County, Virginia
JN 23652

Estimated Project Cost for Centralized System

					County		Developer		
Phase	Sewer Shed	Item	Unit	Unit Cost	Quantity	Cost	Quantity	Cost	Total Cost
5	5	Force Main	LF	$30	5000	$150,000		$0	
		Gravity Collection	LF	$40	1000	$40,000	$3,700	$148,000	
		Gravity Interceptor	LF	$45	5000	$225,000	$700	$31,500	
		Manholes	EA	$2,000	30	$60,000	22	$44,000	
		Pump Station (1170 gpm)	LS	$550,000	1	$550,000		$0	
		Telemetry System	EA	$25,000	1	$25,000		$0	
		Total Sewer Shed Cost							$1,273,500
5		Central Force Main	LF	$40	0	$0		$0	
		Abandon Pump Station	LS	$25,000	1	$25,000		$0	
		Treatment Plant Upgrades (1 MGD)	GAL	$8.80	600000	$5,280,000		$0	
		Total Treatment Costs							$5,305,000
					Estimated Construction Costs				**$6,578,500**
					Contingency @ 10%				**$657,900**
					Related Costs @ 30%				**$1,973,600**
					Land @ $20,000/Ac.			**2.5 Ac.**	**$50,000**
					Phase 5 Total				**$9,260,000**

Westlake - Halesford Sewer Study
Franklin County, Virginia
JN 23652

Estimated Project Cost for Centralized System

					County		Developer		
Phase	Sewer Shed	Item	Unit	Unit Cost	Quantity	Cost	Quantity	Cost	Total Cost
6	7	Force Main	LF	$30	5900	$177,000		$0	
		Gravity Collection	LF	$40	4700	$188,000	$0	$0	
		Gravity Interceptor	LF	$45	9200	$414,000	$0	$0	
		Manholes	EA	$2,000	70	$140,000	0	$0	
		Pump Station (840 gpm)	LS	$420,000	1	$420,000		$0	
		Telemetry System	EA	$25,000	1	$25,000		$0	
		Total Sewer Shed Cost							$1,364,000
6		Central Force Main	LF	$40	0	$0		$0	
		Abandon Pump Station	LS	$25,000	1	$25,000		$0	
		Total Treatment Costs							$25,000
						Estimated Construction Costs			**$1,389,000**
						Contingency @ 10%			**$138,900**
						Related Costs @ 30%			**$416,700**
						Land @ $20,000/Ac.		**2.5 Ac.**	**$50,000**
						Phase 6 Total			**$1,994,600**

Westlake - Halesford Sewer Study
Franklin County, Virginia
JN 23652

Estimated Project Cost for Centralized System

					County		Developer		
Phase	Sewer Shed	Item	Unit	Unit Cost	Quantity	Cost	Quantity	Cost	Total Cost
7	14	Force Main	LF	$30	5200	$156,000		$0	
		Gravity Collection	LF	$40	5300	$212,000	$2,000	$80,000	
		Gravity Interceptor	LF	$45	5200	$234,000	$0	$0	
		Manholes	EA	$2,000	53	$106,000	10	$20,000	
		Pump Station (1020 gpm)	LS	$490,000	1	$490,000		$0	
		Telemetry System	EA	$25,000	1	$25,000		$0	
		Total Sewer Shed Cost							$1,323,000
7		Central Force Main	LF	$40	0	$0		$0	
		Abandon Pump Station	LS	$25,000	3	$75,000		$0	
		Treatment Plant Upgrades (1.5 MGD)	GAL	$9.90	500000	$4,950,000		$0	
		Total Treatment Costs							$5,025,000
					Estimated Construction Costs				**$6,348,000**
					Contingency @ 10%				**$634,800**
					Related Costs @ 30%				**$1,904,400**
					Land @ $20,000/Ac.			**2.5 Ac.**	**$50,000**
					Phase 7 Total				**$8,937,200**

Westlake - Halesford Sewer Study
Franklin County, Virginia
JN 23652

Estimated Project Cost for Centralized System

					County		Developer		
Phase	Sewer Shed	Item	Unit	Unit Cost	Quantity	Cost	Quantity	Cost	Total Cost
8	2	Force Main	LF	$30	1800	$54,000		$0	
		Gravity Collection	LF	$40	0	$0	1000	$40,000	
		Gravity Interceptor	LF	$45	0	$0		$0	
		Manholes	EA	$2,000	0	$0	5	$10,000	
		Pump Stations (160 gpm)	LS	$130,000	2	$260,000		$0	
		Telemetry System	EA	$25,000	1	$25,000		$0	
		Total Sewer Shed Cost							$389,000
	3	Force Main	LF	$30	2700	$81,000		$0	
		Gravity Collection	LF	$40	1600	$64,000	1700	$68,000	
		Gravity Interceptor	LF	$45	0	$0		$0	
		Manholes	EA	$2,000	8	$16,000	9	$18,000	
		Pump Station (240 gpm)	LS	$170,000	1	$170,000		$0	
		Telemetry System	EA	$25,000	1	$25,000		$0	
		Total Sewer Shed Cost							$442,000
8		Central Force Main	LF	$40	8800	$352,000		$0	
		Gravity Collection (Area 1)	LF	$40	0	$0	1400	$56,000	
		Gravity Interceptor	LF	$45	0	$0		$0	
		Manholes	EA	$2,000	0	$0	7	$14,000	
		Central Pump Station (890gpm)	LS	$270,000	1	$270,000		$0	
		Telemetry System	EA	$25,000	1	$25,000		$0	
		Total Treatment Costs							$717,000
						Estimated Construction Costs			**$1,548,000**
						Contingency @ 10%			**$154,800**
						Related Costs @ 30%			**$464,400**
						Land @ $20,000/Ac.		**10.0 Ac.**	**$200,000**
						Phase 8 Total			**$2,367,200**

Westlake - Halesford Sewer Study
Franklin County, Virginia
JN 23652

Estimated Project Cost for Centralized System

					County		Developer		
Phase	Sewer Shed	Item	Unit	Unit Cost	Quantity	Cost	Quantity	Cost	Total Cost
9	15	Force Main	LF	$30	4300	$129,000		$0	
		Gravity Collection	LF	$40	3700	$148,000	3200	$128,000	
		Gravity Interceptor	LF	$45	0	$0		$0	
		Manholes	EA	$2,000	19	$38,000	16	$32,000	
		Pump Station (320 gpm)	LS	$200,000	1	$200,000		$0	
		Telemetry System	EA	$25,000	1	$25,000		$0	
		Total Sewer Shed Cost							$700,000
					Estimated Construction Costs				**$700,000**
					Contingency @ 10%				**$70,000**
					Related Costs @ 30%				**$210,000**
					Land @ $20,000/Ac.			**2.5 Ac.**	**$50,000**
					Phase 9 Total				**$1,030,000**
					GRAND TOTAL PROJECT COSTS				**$51,395,400**