



The Southwest Virginia Regional Wastewater Study

The Clear Choice

Prepared for the

LENOWISCO Planning District Commission
Cumberland Plateau Planning District Commission
Mount Rogers Planning District Commission

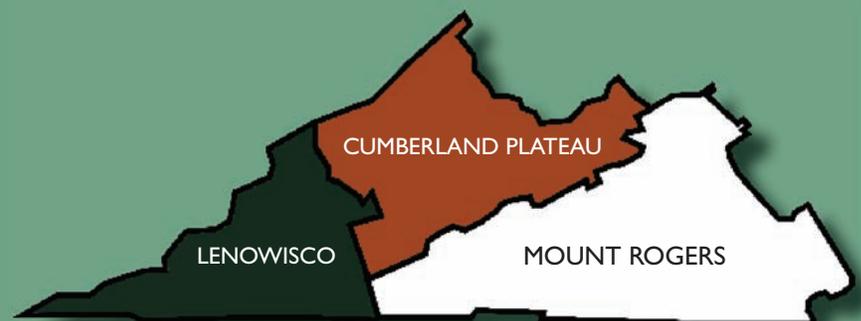
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Funding Provided By

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Virginia Tobacco Indemnification and Community Revitalization
Commission

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October 2005

Southwest Virginia Regional Wastewater Study
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I. EXECUTIVE SUMMARY

Scope

The development of public wastewater collection, treatment and disposal infrastructure is one of the most challenging issues facing local governments within the LENOWISCO, Cumberland Plateau and Mount Rogers Planning District Commissions. Issues common to all of the localities include limited service area boundaries due to existing system capacities, aging systems that are becoming inadequate to serve the current customer base and an inability to serve adjacent areas of potential growth and development. Many areas have clusters of housing that currently have no acceptable means of wastewater treatment. In fact, many households are currently discharging into inadequate septic systems or discharging directly into streams, affecting environmental quality as well as public health.

The presence of approved wastewater collection and treatment systems is essential for the enhancement of public health, protection of the environment, successful economic development initiatives, and an increase in new housing production. Some of the most common problems resulting from the lack of this vital infrastructure include, but are not limited to, the following:

- Numerous environmental and public health problems stemming from the illegal discharge of raw sewage into surface waters and/or groundwater resources;
- Numerous environmental and public health problems arising from the use of failed, overstressed, and/or poorly maintained on-site septic tank/drain field systems;
- An inability to accommodate new housing production due to shallow depths of soil to bedrock and/or high groundwater conditions on potential building lots thereby preventing the approval of septic tank/drainfield systems;
- The lack of public wastewater collection and treatment systems limits the ability of planners and local officials to market Southwest Virginia to potential industrial prospects. Economic development activities are underway throughout Southwest Virginia in an effort to attract new industries, create jobs, and diversify the local economy. In many cases, the ability to market the region to a particular industrial prospect is directly linked to the availability of public wastewater collection and treatment services. Potential industries expect public wastewater collection and treatment to be available. Moreover, the prospect of developing mass septic tank/drainfield systems to accommodate industrial users is problematic due to costs and the resulting land area requirements.
- In some instances, building moratoriums are in effect for localities with existing wastewater collection and/or treatment systems that are hydraulically

overloaded due to the impacts of I/I or existing average flows that exceed permitted capacities.

The sewer problems described in this Study affect many rural communities throughout the Commonwealth, however, the needs are more dramatic in Southwest Virginia due, in part to the steep topography, unique geology and several of the most bio-diverse rivers in the United States.

Purpose

With generous funding provided by the United States Department of Agriculture's Rural Development, the Virginia Tobacco Indemnification and Community Revitalization Commission, and the Virginia Department of Housing and Community Development, the Southwest Virginia Regional Wastewater Study is intended to serve as a road map for future implementation of sanitary sewer collection, treatment and disposal projects in Southwest Virginia. The Study's goals include identifying the need for sewer service in the region, identifying and prioritizing projects, finding and identifying funding sources for these projects, and eliminating the health hazards and environmental problems associated with inadequate septic systems and straight pipe discharges to streams. The study also identifies projects that due to their remote location, topographic situations, small size or soil conditions, will benefit from non-traditional de-centralized managed wastewater systems (DMWS).

Methods

During the course of this Study, the Design Team examined over 136 projects. These projects were analyzed and prioritized based on the degree of health hazard, the severity of environmental problems, the number of customers served, construction cost per connection, construction feasibility, as well as residential, commercial and industrial growth potential.

Conclusions

The project rankings led to a recommendation to pursue 44 centralized projects, 12 de-centralized projects and 3 hybrid projects combining new de-centralized sewer collection with existing central systems.

The 44 centralized projects will serve more than 47,025 residents (16,500 connections) in 11 counties at a cost of \$306,086,269. The 15 de-centralized projects will serve 4,130 residents (1,449 connections) at a cost of \$18,565,493. (It has been assumed that there are an average of 2.85 residents per connection).

Recommendations

There is very little grant funding available for sanitary sewer projects, despite the urgent need that has been identified in this Study. It is imperative that additional grant funding be established to help solve this critical environmental and public health threat, such that Southwest Virginia can benefit from a cleaner, healthier and more economically viable future.

Cost Summary - Centralized Projects

Project Number	County	Planning Distric	Project Name	Project Cost	Present Worth	Estimated Number of Equivalent Connections	Present Worth Per New Connection
1	Tazewell	CP	Bluefield to Divides Ph 2&3	\$ 6,894,570	\$ 7,032,005	589	\$ 11,939
2	Lee	LEN	Woodway	\$ 4,524,780	\$ 4,692,071	510	\$ 9,200
3	Washington	MTR	West Central (Beaver Creek)	\$ 24,273,288	\$ 24,551,941	1160	\$ 21,165
4	Grayson	MTR	Fairview	\$ 11,637,080	\$ 11,860,660	335	\$ 35,405
5	Lee	LEN	Sandy Ridge/N. Jonesville	\$ 2,996,370	\$ 3,037,348	261	\$ 11,637
6	Russell	CP	Castlewood	\$ 23,374,520	\$ 24,609,951	1,322	\$ 18,616
7	Smyth	MTR	Groseclose	\$ 5,294,020	\$ 5,359,745	215	\$ 24,929
8	Tazewell	CP	Baptist Valley East	\$ 6,910,020	\$ 6,993,215	955	\$ 7,323
9	Tazewell	CP	Baptist Valley West	\$ 14,408,849	\$ 14,822,235	1,108	\$ 13,377
10	Wise	LEN	East Stone Gap/Cracker Neck	\$ 8,085,870	\$ 8,153,417	473	\$ 17,238
11	Buchanan	CP	Leemaster/Lovers Gap	\$ 3,787,160	\$ 3,840,522	272	\$ 14,120
12	Lee	LEN	Dryden Hts/Cross Creek	\$ 3,952,442	\$ 4,043,214	250	\$ 16,173
13	Lee	LEN	Rose Hill	\$ 5,804,765	\$ 5,903,638	358	\$ 16,491
14	Russell	CP	Hansonville	\$ 11,670,620	\$ 12,134,104	525	\$ 23,113
15	Smyth	MTR	Pleasant Heights	\$ 3,291,600	\$ 3,324,135	153	\$ 21,726
16	Tazewell	CP	Gratton	\$ 5,041,972	\$ 5,220,633	425	\$ 12,284
17	Washington	MTR	Benhams Road	\$ 7,014,280	\$ 7,150,162	325	\$ 22,000
18	Washington	MTR	Clear Creek	\$ 1,956,169	\$ 1,967,320	115	\$ 17,107
19	Washington	MTR	Spring Creek	\$ 15,795,910	\$ 16,192,916	727	\$ 22,274
20	Wise	LEN	Wildcat/Irondale	\$ 7,141,030	\$ 7,264,303	377	\$ 19,269
21	Scott	LEN	Daniel Boone	\$ 7,271,680	\$ 7,434,017	370	\$ 20,092
22	Scott	LEN	Yuma	\$ 6,671,197	\$ 6,963,720	390	\$ 17,856
23	Dickenson	CP	Rt 83/Georges Fork	\$ 3,094,260	\$ 3,195,355	140	\$ 22,824
24	Buchanan	CP	Poplar Creek	\$ 2,363,530	\$ 2,397,585	142	\$ 16,884

Cost Summary - Centralized Projects

Project Number	County	Planning Distric	Project Name	Project Cost	Present Worth	Estimated Number of Equivalent Connections	Present Worth Per New Connection
25	Smyth	MTR	Watson Gap	\$ 5,017,350	\$ 5,128,690	193	\$ 26,574
26	Tazewell	CP	Tazewell to Divides	\$ 2,767,310	\$ 2,916,926	165	\$ 17,678
27	Tazewell	CP	Tazewell to Claypool Alt I	\$ 13,670,800	\$ 13,860,719	464	\$ 29,872
28	Tazewell	CP	Abbs Valley	\$ 3,838,583	\$ 4,053,429	435	\$ 9,318
29	Washington	MTR	East Central	\$ 22,208,004	\$ 23,034,473	806	\$ 28,579
30	Wise	LEN	Coeburn Mountain	\$ 8,217,300	\$ 8,453,714	500	\$ 16,907
31	Wise	LEN	Powell Valley	\$ 9,055,150	\$ 9,210,508	355	\$ 25,945
32	Scott	LEN	Hiltons	\$ 5,895,110	\$ 6,182,184	263	\$ 23,506
33	Tazewell	CP	Birmingham	\$ 3,172,780	\$ 3,425,968	150	\$ 22,840
34	Bland	MTR	Bland Sewer System	\$ 5,874,050	\$ 5,930,339	245	\$ 24,205
35	Buchanan	CP	Lower Mill Branch	\$ 2,174,770	\$ 2,206,855	103	\$ 21,426
36	Buchanan	CP	Lynn Camp/Looney Creek	\$ 1,907,880	\$ 1,934,899	132	\$ 14,658
37	Grayson	MTR	Providence	\$ 5,191,940	\$ 5,380,396	258	\$ 20,854
38	Grayson	MTR	Stevens Creek	\$ 3,205,540	\$ 3,251,472	202	\$ 16,096
39	Lee	LEN	Red Hill/Poor Valley	\$ 3,084,094	\$ 3,226,505	141	\$ 22,883
40	Tazewell	CP	Red Ash	\$ 1,448,850	\$ 1,467,988	105	\$ 13,981
41	Washington	MTR	Larwood	\$ 2,665,689	\$ 2,742,518	126	\$ 21,766
42	Wise	LEN	Tacoma	\$ 1,881,360	\$ 1,892,618	144	\$ 13,143
43	Wise	LEN	Banner	\$ 2,402,010	\$ 2,418,334	169	\$ 14,310
44	Scott	LEN	Route 871	\$ 1,206,478	\$ 1,223,522	85	\$ 14,394
totals				\$ 298,141,030	\$ 306,086,269	16,538	\$ 18,508

Cost Summary - Decentralized Systems

Project Number	County	PDC	Project Name	Project Cost	Present Worth	Estimated Number of Equivalent Connections	Present Worth Per New Connection
1	Dickenson	CP	McClure/Stratton	\$ 1,229,900	\$ 1,504,815	110	\$ 13,680
2	Dickenson	CP	Nora	\$ 224,560	\$ 278,597	20	\$ 13,930
3	Wise	LEN	Bold Camp-Right Fork	\$ 1,124,592	\$ 1,394,779	100	\$ 13,948
4	Lee	LEN	Ewing	\$ 213,500	\$ 264,160	15	\$ 17,611
5	Russell	CP	Morefield Bottom	\$ 419,860	\$ 533,339	42	\$ 12,699
6	Wise	LEN	Exeter	\$ 1,412,320	\$ 1,769,710	143	\$ 12,376
7	Wise	LEN	Stephens	\$ 2,382,800	\$ 2,815,100	200	\$ 14,076
8	Wise	LEN	Cranes Nest	\$ 154,000	\$ 201,283	14	\$ 14,377
9	Wise	LEN	Dunbar	\$ 406,000	\$ 514,075	40	\$ 12,852
10	Washington	MTR	Clinchburg	\$ 577,920	\$ 740,032	60	\$ 12,334
11	Smyth	MTR	Flat Ridge/Sugar Grove	\$ 1,973,020	\$ 2,386,406	170	\$ 14,038
12	Smyth	MTR	St. Clair Creek	\$ 1,495,200	\$ 1,870,085	150	\$ 12,467
total				\$ 11,613,672	\$ 14,272,381	1064	\$ 13,414

Cost Summary - Effluent Collection Systems

Project Number	County	PDC	Project Name	Project Cost	Present Worth	Estimated Number of Equivalent Connections	Present Worth Per New Connection
1	Wise	LEN	Bold Camp - Right Fork	\$ 729,400	\$ 761,822	80	\$ 9,523
2	Wise	LEN	Bold Camp - Phase 2	\$ 2,680,597	\$ 2,764,044	213	\$ 12,977
3	Wise	LEN	Cranes Nest	\$ 729,960	\$ 767,246	92	\$ 8,340
total				\$ 4,139,957	\$ 4,293,112	385	\$ 11,151
DMWS grand total				\$ 15,753,629	\$ 18,565,493	1449	\$ 12,813

II. INTRODUCTION

Purpose

The LENOWISCO, Cumberland Plateau and Mt. Rogers Planning District Commissions have received funding from the United States Department of Agriculture's Rural Development, the Virginia Tobacco Indemnification and Community Revitalization Commission, and the Virginia Department of Housing and Community Development for the completion of a comprehensive regional wastewater service plan for Planning Districts One, Two and Three.

The intent of this Southwest Virginia Regional Wastewater Study is to develop alternatives for sewage collection and treatment, including traditional centralized systems and de-centralized managed systems (DMWS). The study will also identify specific projects, prioritize them and provide project costs. It is anticipated that this study will serve as a road map for sewer projects in Southwest Virginia over the next twenty years. This study, hereafter referred to as the Southwest Virginia Regional Wastewater Study (SVRWS), is the result of a combined effort of the LENOWISCO, Cumberland Plateau and Mt. Rogers Planning District Commissions.

This study included the cooperative development of an overall project list to be evaluated. The development of the project list was facilitated by the Project Management Team, consisting of members representing the three subject PDC's, the local health districts, funding agencies, local watershed groups, sewer providers, local government representatives, concerned citizens and the Design Team. The Project Management Team met monthly throughout the project to advise the Design Team on various aspects of the project including project selection/evaluation, study contents, criteria for the ranking matrix and the timetable of activities.

The sewer problems described in this study affect many rural communities throughout the Commonwealth, however, the need is more dramatic in Southwest Virginia due, in part, to the region's steep terrain, unique geology and some of the most bio-diverse rivers in the United States.

Scope

Thompson & Litton, in association with Maxim Engineering and Lane Engineering has been commissioned to prepare this study with emphasis on projects that illustrate the urgent need for sewer facilities in the region, such that funding can be secured for projects that will have a maximum positive impact on the health and environmental quality within the LENOWISCO, Cumberland Plateau and Mt. Rogers Planning Districts. As a planning document, the study only evaluates each project in sufficient detail to assemble cost estimates. The design team made use of the available 604(b) planning documents for each county as well as River Basin Studies, preliminary engineering reports and comprehensive master plans.

Uniform cost estimating methodology was developed to prepare estimates for the projects studied herein. Recognizing that construction costs may vary to some degree within the study area, uniform unit pricing has been used to justify cost estimates. Unit pricing was developed by averaging recent bid data from the study region.

Construction Costs

The moderate inflation rates experienced by the construction industry over the past 13 years were made possible by a combination of cheap imports, energy and money combined with a weak global economy. These conditions have changed radically in the past year.

The recent increased construction inflation rates are driven by a broad based escalation in material prices as well as natural disasters. These price increase are being passed on to Owners, as there have been large increases in the selling price indices that measure what contractors bid work for. Current bids for multi-million dollar projects nationwide are typically 20 to 30% over-budget and only 5 to 10% of that can be attributed to material prices. The remaining percentage increase appear to be buffers against uncertain market and price security. With this in mind, the cost estimates for these projects attempt to reflect these conditions, but future bidding and economic climates are difficult to forecast.

III. WASTEWATER PRIMER

Water leaving a home (“wastewater”) has much different characteristics than water entering a home (“potable water”). This section explains, in simple terms, the definition of wastewater and it’s various components.

Wastewater contains the following components...microorganisms, toxic substances, solids, organic material, and nutrients...each of which must be addressed by a treatment system prior to discharge into the environment. Each component can be more fully described as follows:

Microorganisms

Microorganisms in wastewater include bacteria, viruses and protozoans. Some of these microorganisms are helpful in breaking down the contaminants in wastewater, while others can cause disease. Disease causing microorganisms are called pathogens.

People who come in contact with contaminated drinking or recreation water risk infection and development of diseases such as cholera, typhoid, dysentery and hepatitis.

The main sources of waterborne pathogens include leaking collection systems, failed septic systems, failed treatment and feedlot runoff.

As it is not practical to test wastewater for each type of pathogen, the degree of contamination of water by human and animal wastes is gauged by the level of fecal coliform bacteria present.

Toxic Substances

Toxic substances found in wastewater can include pesticides, herbicides, paints, solvents and heavy metals. These substances are often disposed of unknowingly by homeowners who flush them into the wastewater collection system.

Many of these common toxic substances are known to cause cancer or other human health problems.

Solids

Wastewater typically contains solid materials including sand particles, grit, clay, wood, fecal waste and food. These solids can accumulate in waterways, causing fouling and damage to higher order organisms.

The presence of solids is measured as Total Suspended Solids (TSS)...these are solids that will not readily settle out.

Organic Material

Organic materials are derived from plants and animals, and come mainly from feces and kitchen wastes. This material is a source of food for the bacteria in wastewater. As organic material is broken down (decomposes), oxygen in the water is consumed, making less available for aquatic life. This can result in fish kills or otherwise impair aquatic life.

Concentrations of organic matter are measured as Biochemical Oxygen Demand (BOD).

Nutrients

Nutrients in wastewater include nitrogen and phosphorous, both of which can have a negative impact on receiving waters.

Phosphorous is the limiting nutrient in aquatic ecosystems. The addition of phosphorous results in excessive algae and plant growth. As these plants die, they deplete dissolved oxygen and harm the aquatic community.

Nitrogen comes from domestic, industrial and agricultural sources and undergoes a cyclic process where various forms of nitrogen, including ammonia, are produced. Ammonia is extremely toxic to aquatic organisms. Nitrate, another form of nitrogen (when found in water) can cause methemoglobinemia, a serious health effect in infants and pregnant or lactating women.

IV. HEALTH RISK

By using water, impurities are added that pollute it. Common pollutants include human wastes, nutrients and household chemicals. Polluted water results in public health problems and damages aquatic ecosystems.

It is estimated that, in the United States, 10% of on-site septic systems have stopped working and that some communities report failure rates as high as 70%. In Southwest Virginia, the leading cause of impairment in our rivers and streams is violation of bacteria standards. Failing septic tanks are reported as a significant contributing source for these water quality problems. The federal Centers For Disease Control and Prevention estimates that 73,000 Americans are infected and 61 die each year from a virulent form of coliform bacteria.

The effects of this pollution can be far reaching, resulting in the degradation of our natural resources, increased costs for treating drinking water, illness and even death.

Disease causing organisms, also called pathogens, make water unsafe for drinking, recreation and most other uses. People who come in contact with contaminated water, whether by drinking or recreation, risk infection and development of diseases such as cholera, typhoid, dysentery, viral hepatitis A, salmonellosis, shigellosis, sporadic viral gastroenteritis, epidemic viral gastroenteritis, and amebiasis . Sources of waterborne pathogens (bacteria, viruses and parasites) include failed septic systems, straight pipes, leaking collection systems, failed treatment and feedlot runoff. These diseases may also be contracted through contact with any number of creatures that have been exposed to untreated waste, including dogs, cats, rats, flies, cockroaches, fleas and a host of others.

Other health risks from coming in contact with contaminated water include:

- Contact with toxins (pesticides, herbicides, paints, solvents, heavy metals...) Many of these substances are known to cause cancer and other serious human health problems.
- Contact with nitrate (from nitrogen) in water. High nitrate levels in groundwater can result from inadequately treated wastewater and can cause methemoglobinemia, a serious health problem for infants and pregnant or lactating women.
- Contact synthetic cleaning products or other chemicals used around the house can be toxic to humans, pets and wildlife. These products can reach the ground surface or end up in the water.
- Flies and mosquitoes that are attracted to and breed in wet areas where wastewater reaches the surface can also spread disease.

Inadequate treatment of wastewater can also allow excess nutrients to reach streams, lakes and ponds, promoting algae or weed growth. Algal blooms and abundant weeds not only make the water body unpleasant for recreation (swimming, boating), but they

also affect the water quality for fish and wildlife habitat. As plants die, settle to the bottom, and decompose, they use up oxygen that fish need to survive.

V. WASTEWATER SYSTEMS

CENTRALIZED WASTEWATER SYSTEMS

Centralized wastewater systems are the most common type of publicly owned wastewater systems and contain collection lines and a centralized treatment facility. They are used to collect and treat large volumes of wastewater. The collection system typically requires large diameter deep pipes, major excavation and frequent manhole access. At the treatment facility, the wastewater is treated to standards required for discharge to a surface water body. The large amounts of biosolids (sludge) generated in treatment are treated and either land-applied, placed on a surface disposal site or incinerated.

DECENTRALIZED MANAGED WASTEWATER SYSTEMS (DMWS)

Decentralized managed wastewater systems are (as implied in the name itself) any wastewater system that is not considered a central wastewater system. In general terminology, this means a wastewater system that is not connected to a large centralized wastewater treatment plant, usually by an extensive pipe network termed a “big pipe” system.

In its 1997 *Response to Congress on the Use of Decentralized Wastewater Treatment Systems*, the U.S. Environmental Protection Agency (EPA) determined that decentralized wastewater systems, when adequately managed, are a cost-effective and long-term option to centralized sewers, particularly in rural areas.

General Description

Decentralized wastewater systems (DWS) cover a wide variety of collection, treatment, and disposal systems. In most cases, the sewage flows first from the building sewer to an interceptor (septic) tank. This interceptor tank is the first and a very key component in nearly all decentralized wastewater systems. These solids, called septage, are subsequently disposed of at a central treatment facility, or stabilized and land applied at an approved site.

Conventional septic systems utilizing subsurface soil absorption drain fields are an effective and reliable option where site and soil conditions are favorable, and where the systems are properly maintained. However, today’s technology has introduced a number of alternative systems that can be used over a much broader range of site and soil conditions than the conventional septic system.

Alternative treatment systems include small aerobic treatment plants, biofiltration systems using a variety of filter mediums such as sand, peat, synthetic textile, or open cell foam. The treated effluent is then dispersed into the soil for further treatment, or it may be disinfected and discharged to a surface stream. Permitting and testing requirements are less costly when discharging into the soil, so that is the preferred method of disposal. There are several alternative soil disposal methods available including non-gravel trenches utilizing infiltration chambers, low-pressure distribution, drip dispersal, and spray irrigation. Disinfection methods

for systems discharging to a surface stream include tablet chlorination/dechlorination, ultraviolet (UV) light, and ozone.

In cluster systems (decentralized wastewater systems serving more than a single home), the effluent from the interceptor tank is conveyed to the treatment system through a common collection line. Thus, these collection lines are called effluent sewers. Effluent sewers have several cost advantages over centralized “big pipe” sewers: (1) they are smaller in diameter, (2) they do not need to be installed as deep or laid on grade, and (3) they do not require manholes for access. There are two types of effluent sewers, gravity and pressure. Gravity systems are known as STEG, for septic tank effluent gravity, and pressure systems are known as STEP, for septic tank effluent pumping. Following collection, there are a number of treatment and disposal system alternatives that can be used in cluster systems, depending primarily on the number of connections. These options fall into the same categories as described above for treatment and disposal, only on a larger scale. Cluster systems utilizing DMWS are generally considered feasible up to approximately 100 homes.

Benefits

The primary benefit of managed decentralized wastewater systems is an improvement to the public health and environment in any area where they are used. This is due to the elimination of illegal discharges (“straight pipes”) into surface streams, and the elimination of failing or poorly performing soil absorption systems that contaminate the groundwater supply.

Beyond these primary benefits, however, there are secondary benefits of managed DWS, discussed as follows.

Benefits to public utilities:

1. DMWS allow utilities to add sewer service to their other services, expanding both their customer base and their revenue base.
2. DMWS are economical to install. An entire decentralized system (including collection, treatment, and disposal) often will cost less than extending a conventional gravity sewer line, especially in less populated areas. DMWS also conserve the capacity of the central treatment facility, thus avoiding the expense of a plant expansion.
3. DMWS are economical to operate and maintain. They require routine maintenance every few months and their performance can be monitored and controlled using remote telemetry. Two or three employees can maintain DWS systems serving hundreds of homes.
4. DMWS often allow utilities to acquire land for treatment facilities at minimum expense, as developers may deed over land for treatment in exchange for the benefits of a managed decentralized wastewater system.

Benefits to homeowners:

1. Home sites become available in areas where central sewers do not exist and/or conventional septic systems do not work.
2. Homeowners are relieved of maintaining an onsite sewer system.
3. Monthly sewer rates are typically lower than with centralized systems because the costs of installing and maintaining the DWS are lower.

Benefits to developers:

1. A prime residential location can be developed in a timely manner rather than waiting for a central sewer line to be extended.
2. Development density can also be increased by as much as 20% because homes can be sited on smaller lots than conventional septic systems require.
3. The presence of a publicly owned and operated sewer system is a selling point to homeowners.

VI. PRIORITIZATION

Scoring Criteria

Based on the existing needs and future sewer demands presented in this report, there is a significant need for sanitary sewer collection and treatment within the study area over the 20-year planning horizon. A need has been identified to rank the projects in order to maximize the benefits to the area.

Ranking criteria for centralized and decentralized sewer projects have been developed in order to assist in the prioritization of the proposed projects identified in this study. For centralized projects, these criteria were used in order to evaluate each project with respect to the number of households served, present worth per new residential connection, elimination of health hazards, construction feasibility, the number of new connections that can be served by extensions of the proposed project, and industrial/commercial growth potential. For decentralized projects, the criteria used to evaluate the projects were somewhat different and included health and environmental issues, availability of public water, community involvement, utility willingness and financial support. The criteria employed for decentralized (DMWS) projects differed from those used for centralized projects due to the fact that the DMWS projects are usually much smaller in scale, scope and cost, they tend to be community oriented projects, they do not always require discharge permits and they are typically funded differently than centralized projects.

Each criterion was assigned a point value, which was used to measure how well a proposed project meets and/or addresses the intent of the criteria. A project can receive a maximum of 100 points if it meets or addresses all of the ranking criteria. Weighting factors are built in to each of the evaluation criteria based on their relative importance. The criteria were selected based on input from the Project Management Team and from funding agencies' existing methodologies for evaluating projects.

CENTRALIZED SEWER PROJECTS

Number of Equivalent Customers Served by the Project (25 points)

The total number of equivalent customers served by the project will be evaluated for each project. Since one of the objectives of this study is to serve new customers, projects that serve more customers will receive more points.

This criterion shall be evaluated in accordance with the following point system:

< 50 equivalent connections	=	0 points
50 – 100 equivalent connections	=	5 points
100 – 200 equivalent connections	=	10 points
200 – 300 equivalent connections	=	15 points

300 – 500 equivalent connections	=	20 points
> 500 equivalent connections	=	25 points

Present Worth Per Connection (25 points)

The total present worth of the project (including construction, related and annual O&M costs) will be evaluated with respect to the potential number of connections that will be served by the proposed project. The lower the cost per connection the more points the project will receive under this criteria due to the fact that less grant funding is required the lower the per connection cost.

This criterion shall be evaluated in accordance with the following point system:

< \$15,000 per connection	=	25 points
\$15,001 - \$20,000 per connection	=	20 points
\$20,001 - \$25,000 per connection	=	15 points
\$25,001 - \$30,000 per connection	=	10 points
\$30,001 - \$35,000 per connection	=	5 points
> \$35,000 per connection	=	0 points

Elimination of Health Hazards and Water Quality Problems (20 points)

If a proposed project will minimize/eliminate an existing health hazard, a maximum of 10 points will be awarded. Health hazards may include, but are not limited to areas with failing septic systems and areas that “straight pipe” sewage into a creek or other water body. If a proposed project helps eliminate an existing water quality problem (such as Impaired Stream or watershed status), 10 points will be awarded. A proposed project that eliminates both a health hazard and a water quality problem will be awarded 20 points. Proposed projects which do not target an identified health hazard or water quality problem will be awarded 0 points with respect to this criteria.

Construction Feasibility (10 points)

Construction feasibility considers whether a proposed project will be connected to an existing system or whether it will be connected to another proposed project. If a proposed project can be connected to an existing wastewater treatment plant without requiring modifications to the existing plant it will be awarded 10 points. If modifications are required to the existing wastewater treatment plant prior to construction of the new facilities, the project will be awarded 5 points. If proposed treatment facilities must be constructed in order to provide a connection point for the project being evaluated, then 0 points will be awarded.

Residential Service Growth Potential (10 points)

If a proposed project will potentially provide sewer service that will allow for the construction of other residences adjacent to the project, it will be given a higher score.

This criterion shall be evaluated in accordance with the following point system:

High residential growth potential	=	10 points
Moderate residential growth potential	=	5 points
Low or no residential growth potential	=	0 points

Industrial/Commercial Growth Potential (10 points)

If a proposed project will potentially provide sewer service to designated industrial/commercial growth areas as well as residential customers, it will be awarded 10 points. If a project will potentially provide service to commercial growth areas or industrial growth areas, it will be awarded 5 points. A project that will provide little to no potential for economic growth of any significance will be given 0 points.

DECENTRALIZED SEWER PROJECTS

Health and Environmental Issues (30 points)

Proposed projects that have health and/or environmental issues as identified by the Virginia Department of Health or the Virginia Department of Environmental Quality shall be evaluated in accordance with the following point system:

Impaired stream or watershed designation	=	15 points
Health hazard from straight pipes, failing septic systems	=	15 points
Both health hazard and impaired waters	=	30 points
No known health or environmental issues	=	0 points

Public Water (10 points)

If a proposed project currently has a public water system, 10 points will be awarded. Projects that will have public water available within one year will be awarded 5 points and projects that do not have public water available will be awarded 0 points. The existence of a public water system is important as it provides a way to enforce

customer payment of monthly sewer bills. Many funding agencies will not provide money for sewer projects where there is no public water.

Community Involvement (20 points)

Projects will be evaluated based on current community involvement in trying to solve their existing sewerage problems. Projects in communities demonstrating watershed group activity, including surveys, water quality monitoring, community meetings, etc...will be awarded 10 points. Projects in communities exhibiting evidence of citizen initiatives such as public meetings, requests for assistance, etc...will be awarded 10 points. Projects in communities having both activities will be awarded 20 points while those having neither activity will receive 0 points.

Utility Willingness (20 points)

Utility willingness considers whether a proposed project has a potential Responsible Management Entity, prior knowledge in owning and operating a de-centralized system, and prior experience operating a de-centralized system.

This criteria shall be evaluated in accordance with the following point system:

Existence of a Responsible Management Entity (RME)	=	10 points
Knowledge of RME in owning and operating DWS	=	5 points
Prior Experience of RME in operating DWS	=	5 points

Financial Support (20 points)

If a proposed project will have a low cost per connection (less than \$10,000 per connection) the project will be awarded 10 points. A proposed project that has had prior financial expenditures (planning, studies, etc...) will be awarded 5 points. Projects that have had funding requested or committed will receive 5 points.

Matrix Scoring Summary - Centralized Projects

Equivalent Connections	Score	(25 points total)
<50	0	points
50-100	5	points
100-200	10	points
200-300	15	points
300-500	20	points
>500	25	points

Present Worth Per Connection	Score	(25 points total)
>\$35,001	0	points
\$30,001-\$35,000	5	points
\$25,001-\$30,000	10	points
\$20,001-\$25,000	15	points
\$15,001-\$20,000	20	points
<\$15,000	25	points

Elimination of Health Hazard & Water Quality Problems (20 points total)

- i. Eliminates health hazard only – 10 points
- ii. Eliminates Water Quality problem only – 10 points
- iii. Eliminates both – 20 points
- iv. Does not eliminate either – 0 points

Construction Feasibility (10 points total)

- i. Very feasible – 10 points
- ii. Moderately feasible – 5 points
- iii. Not feasible – 0 points

Residential Service Growth Potential (10 points total)

- i. High growth potential – 10 points
- ii. Moderate growth potential – 5 points
- iii. Low or no growth potential – 0 points

Industrial/Commercial Growth Potential (10 points total)

- i. Both Industrial and Commercial Growth Potential – 10 points
- ii. Industrial growth potential only – 5 points
- iii. Commercial growth potential only – 5 points
- iv. No growth potential – 0 points

Matrix Scoring Summary - Decentralized (DMWS) Projects

Health & Environmental Issues	Score	(30 points total)
Impairment & Health Hazard	30	points
Impaired Stream Designation	15	points
Health Hazard	15	points
No Health or Environmental Issues	0	points

Public Water	Score	(10 points total)
Currently Available	10	points
Available Within One Year	5	points
Not Available	0	points

Community Involvement	Score	(20 points)
Watershed Group Activity	10	points
Citizen Initiatives	10	points
Both Activity & Initiatives	20	points
No Activity or Initiatives	0	points

Utility Willingness	Score	(20 points)
Existing Responsible Mgmt Entity	10	points
Knowledge of RME in DWS	5	points
Prior Experience in Owning & Operating DWS	5	points
No Responsible Mgmt Entity	0	points

Financial Support	Score	(20 points)
Low Cost Per Connection (< \$10,000)	10	points
Prior Expenditures	5	points
Project Funding Requested or Committed	5	points
None of the Above	0	points

Overall Project Ranking - Centralized Projects

County	PDC	Project	Public Water Available?	Equivalent Customers Served	Present Worth Per Connection	Elimination of Health Hazards	Constr. Feasibility	Residential Growth Potential	Industrial Commercial Growth Potential	Total Points	
				<i>25</i>	<i>25</i>	<i>20</i>	<i>10</i>	<i>10</i>	<i>10</i>	<i>100</i>	
1	Tazewell	CP	Bluefield to Divides Ph 2&3	Y	25	20	20	5	10	10	90
2	Lee	LEN	Woodway	Y	25	25	10	10	10	5	85
3	Washington	MTR	West Central (Beaver Creek)	Y	25	15	20	5	10	10	85
4	Grayson	MTR	Fairview	Y	20	5	20	10	10	10	75
5	Lee	LEN	Sandy Ridge/N. Jonesville	Y	15	25	10	10	10	5	75
6	Russell	CP	Castlewood	Y	25	20	10	5	5	10	75
7	Smyth	MTR	Groseclose	Y	15	15	15	10	10	10	75
8	Tazewell	CP	Baptist Valley East	Y	25	25	10	10	5	0	75
9	Tazewell	CP	Baptist Valley West	Y	25	25	10	10	5	0	75
10	Wise	LEN	East Stone Gap/Cracker Neck	Y	20	20	20	5	10	0	75
11	Buchanan	CP	Leemaster/Lovers Gap	Y	15	25	10	10	5	5	70
12	Lee	LEN	Dryden Hts/Cross Creek	Y	15	20	20	5	10	0	70
13	Lee	LEN	Rose Hill	Y	20	20	10	10	5	5	70
14	Russell	CP	Hansonville	N	25	15	0	10	10	10	70
15	Smyth	MTR	Pleasant Heights	Y	10	15	20	10	10	5	70
16	Tazewell	CP	Gratton	Y	15	15	10	10	10	10	70
17	Washington	MTR	Benhams Road	Y	20	15	15	10	10	0	70
18	Washington	MTR	Clear Creek	Y	10	20	10	10	10	10	70
19	Washington	MTR	Spring Creek	Y	25	10	10	10	10	5	70
20	Wise	LEN	Wildcat/Irondale	Y	20	15	10	10	10	5	70
21	Scott	LEN	Daniel Boone	Y	20	20	10	10	5	5	70
22	Scott	LEN	Yuma	Y	20	15	10	10	10	5	70
23	Dickenson	CP	Rt 83/Georges Fork	Y	10	15	20	10	5	5	65
24	Buchanan	CP	Poplar Creek	Y	10	20	10	10	10	5	65
25	Smyth	MTR	Watson Gap	Y	10	10	20	10	10	5	65

Overall Project Ranking - Centralized Projects

County	PDC	Project	Public Water Available?	Equivalent Customers Served	Present Worth Per Connection	Elimination of Health Hazards	Constr. Feasibility	Residential Growth Potential	Industrial Commercial Growth Potential	Total Points	
				<i>25</i>	<i>25</i>	<i>20</i>	<i>10</i>	<i>10</i>	<i>10</i>	<i>100</i>	
26	Tazewell	CP	Tazewell to Divides	Y	10	20	10	10	5	10	65
27	Tazewell	CP	Tazewell to Claypool Alt I	some	20	10	10	10	5	10	65
28	Tazewell	CP	Abbs Valley	proposed	20	25	10	5	5	0	65
29	Washington	MTR	East Central	Y	25	0	20	5	10	5	65
30	Wise	LEN	Coeburn Mountain	Y	20	20	20	0	5	0	65
31	Wise	LEN	Powell Valley	Y	20	10	20	5	10	0	65
32	Scott	LEN	Hiltons	Y	15	15	10	10	10	5	65
33	Tazewell	CP	Birmingham	Y	10	15	20	10	5	5	65
34	Bland	MTR	Bland Sewer System	Y	15	15	10	5	5	10	60
35	Buchanan	CP	Lower Mill Branch	I/3	10	15	10	10	10	5	60
36	Buchanan	CP	Lynn Camp/Looney Creek	N	10	25	10	10	5	0	60
37	Grayson	MTR	Providence	N	15	15	10	5	10	5	60
38	Grayson	MTR	Stevens Creek	N	15	20	10	10	5	0	60
39	Lee	LEN	Red Hill/Poor Valley	Y	10	15	20	10	5	0	60
40	Tazewell	CP	Red Ash	N	10	25	10	10	5	0	60
41	Washington	MTR	Larwood	Y	10	15	10	5	10	10	60
42	Wise	LEN	Tacoma	Y	10	25	10	10	5	0	60
43	Wise	LEN	Banner	Y	10	20	20	5	5	0	60
44	Scott	LEN	Route 87I	Y	5	25	10	10	5	5	60

Overall Project Ranking - Decentralized Projects

	County	PDC	Project	Equivalent Customers Served	Health & Environmental Issues	Public Water Available?	Community Involvement	Utility Willingness	Financial Support	Total Points
					30	10	20	20	20	100
1	Dickenson	CP	McCLure/Stratton	110	30	10	15	15	0	70
2	Dickenson	CP	Nora	20	30	10	15	15	0	70
3	Wise	LEN	Bold Camp - Right Fork	100	30	10	10	10	10	70
4	Lee	LEN	Ewing	15	15	10	20	15	10	70
5	Russell	CP	Morefield Bottom	42	30	10	10	15	0	65
6	Wise	LEN	Exeter	143	15	10	10	20	10	65
7	Wise	LEN	Stephens	200	30	10	10	15	0	65
8	Wise	LEN	Cranes Nest	14	30	10	10	10	5	65
9	Wise	LEN	Dunbar	40	30	10	5	15	0	60
10	Washington	MTR	Clinchburg	60	30	10	0	10	10	60
11	Smyth	MTR	Flat Ridge/Sugar Grove	170	30	10	10	10	0	60
12	Smyth	MTR	St. Clair Creek	150	30	10	0	10	10	60

Overall Project Ranking - Effluent Collection Systems

County	PDC	Project	Equivalent Customers Served	Health & Environmental Issues	Public Water Available?	Community Involvement	Utility Willingness	Financial Support	Total
				<i>30</i>	<i>10</i>	<i>20</i>	<i>20</i>	<i>20</i>	<i>100</i>
1 Wise	LEN	Bold Camp - Right Fork	80	30	10	10	10	10	70
2 Wise	LEN	Bold Camp - Phase 2	213	30	10	10	10	10	70
3 Wise	LEN	Cranes Nest	92	30	10	10	10	5	65

VII. METHODOLOGY

Present Worth Analysis

The cost of sewer system ownership can be separated into two categories. The first category is capital cost, which is the measure of the cost to install a new system. Capital costs are composed of hard costs and soft costs. Hard costs include the price of new materials and the cost to install them, while soft capital costs are those that are related to the construction costs such as engineering, legal, rights, and administrative costs. A second cost of ownership of sewer systems is the annual operation and maintenance (O&M) costs. This is the continuous cost of operating the system and keeping it in good repair. The present worth analysis provides a convenient mechanism for accounting for all of the costs in the system analysis. Present Worth, as used in this report, is defined as the amount of money that must be placed on deposit today at 8% interest for 30 years to pay all of the capital and O&M costs for the planning period.

Inflow/Infiltration

General

One serious impediment to the provision of adequate wastewater collection and treatment to areas needing sewer service is the hydraulic overloading of existing facilities by the infiltration of ground water and the inflow of surface water and rainfall runoff into constructed sanitary sewer laterals and interceptor lines. The entrance of ground water, surface water and rainfall into the sanitary sewer system is referred to as "Inflow/Infiltration" (I/I). Most communities within the three Planning Districts included as a part of this study have significant problems with I/I.

Some of the problems associated with excessive I/I include raw sewage discharges, overflows, loss of capacity, inadequate wastewater treatment and permit violations. From the standpoint of the provision of wastewater services to unsewered areas, the most significant of these is probably the loss of capacity at existing wastewater facilities. One gallon of rainwater costs practically as much to treat as one gallon of sewage and takes up the same amount of transmission and treatment plant capacity. If existing systems are to be economically expanded into unsewered areas, it is essential that I/I problems be addressed and corrected.

As with other types of sewer system construction, I/I location and correction is an extremely expensive endeavor. Communities within the three Planning Districts will need significant financial assistance from a variety of funding sources if I/I correction is to be effectively addressed. Infiltration and inflow location and correction, like water system leak detection, is considered "maintenance" by some funding agencies and therefore is not given the same consideration as is new construction. This fact creates additional funding acquisition challenges to localities seeking to address I/I.

The Magnitude of the Problem

Due to the age of many of the existing sewage collection and transport systems within the study area, I/I problems are almost “universal”. Since early wastewater treatment philosophy included the belief that “the answer to pollution is dilution”, many of our existing systems were constructed with intentional cross-connections with storm sewers. Also as towns and communities developed, downspouts and roof drains were connected to the sanitary sewer. Many sewer lines were installed with terra cotta lines that are subject to root intrusion and result in a “French drain” effect. Many of the existing systems therefore experience wet weather flows in excess of two to three times dry weather flows.

As we begin to consider expanding sewer service to unsewered areas, I/I correction will therefore be a significant budget line item in most all project cost estimates. It is important to remember that I/I sources must be located before they can be removed and that this location step alone can be expensive and time consuming. However, the extent of I/I problems in existing collection systems can sometimes render I/I removal projects less effective than expected. “Tightening” one section of sewer lines can, in some cases, result in the creation of new I/I problems in other weak points within the system. It is a complex and significant problem that cannot be completely solved, only controlled. The key is to have an ongoing I/I removal program that is continuously implemented by the owner.

Within this study, we have attempted to approximate the impact of I/I location and removal by including the sum of \$5,000 per new connection in our estimates. An extension to serve 100 new connections must therefore find funding of \$500,000.00 just for I/I location and removal. Our team believes this is probably a reasonable estimate (in 2005 dollars) of the actual cost.

Alternatives

An alternative to I/I correction is the expansion of transport and treatment facilities. Collection and transport systems may need to be enlarged to carry I/I flow. Since many of our existing plants are designed to the secondary treatment assimilative capacity of the receiving stream, expansion can sometimes result in the need to upgrade to provide additional levels of treatment efficiency (tertiary treatment). Not only is the capital outlay for this type work significant, but the increased on-going operation and maintenance cost associated with transporting and treating I/I flow make this alternative unattractive in many cases. The utilization of flow equalization basins can sometimes help minimize the impact of instantaneous flow peaks resulting from I/I events. However, it is certainly not a “cure all” solution.

Summary

In order to achieve the wastewater handling goals of the communities within the study area, I/I must be addressed. Grant and low or zero interest loan funds are critical. As stated in the funding section of this report, solving inflow and infiltration problems that affect every sewer system in Southwest Virginia has virtually no source of funding. The reader is referred to the Funding Section of this study for more information.

VIII. FUNDING

General

The construction of wastewater collection and treatment facilities is an extremely expensive endeavor, requiring significant financial assistance from a variety of funding sources. Financial assistance in the form of loans and grants is available from both the State and Federal Governments. It is difficult to fund a large project solely by relying on these traditional funding sources, as the funding levels are finite, being drawn from pools of money allocated each fiscal year. Significant delays in project implementation can be expected if all project support must come from the traditional funding sources. Therefore, a discussion of some non-traditional, as well as the traditional sources of funding have been included.

The following describes the traditional sources of funding normally used to finance large wastewater projects:

Virginia Department of Housing and Community Development (DHCD)

Using funds from the United States Department of Housing and Urban Development, DHCD in turn funds a variety of project types to benefit Low to Moderate Income (LMI) households, eliminate slum and blight, and provide for urgent community development needs. DHCD will fund on-site community and individual sewage treatment systems as well as off-site community systems that have a direct household benefit. The Community Development Block Grant (CDBG) Program has approximately \$23,000,000 available annually in Virginia. The following grants are available:

1. Planning Grants – Available anytime between January and September 30, DHCD has \$500,000 reserved annually for this purpose. Each local project is eligible for a \$25,000 planning grant, while regional projects can receive up to a \$40,000 planning grant.
2. Indoor Plumbing Rehabilitation (IPR) - \$8,000,000 available annually in Virginia to LMI households that lack complete indoor plumbing.
3. Community Improvement Grants (CIG) – there are four types of Community Improvement Grants as follows pertaining directly to wastewater:
 - a. Construction Ready Water and Sewer - \$1,000,000 is reserved for projects that have been designed and are ready for construction. To be eligible, the project must serve at least 65% LMI households.
 - b. Community Development Innovation – Typically this grant is for “self-help” projects, where the community helps construct the system. There is \$350,000 available per project.
 - c. Urgent Need Open Submission – there is \$2,000,000 reserved annually for projects addressing immediate threats to health and safety. A current declaration of emergency by the Governor of Virginia or a current

declaration of an immediate and severe health threat by the State Commissioner of Health is required.

- d. Competitive Grants – assistance is targeted to projects involving water and wastewater improvements, particularly those involving new services to LMI persons. This project type is eligible for up to \$1,000,000.

Appalachian Regional Commission (ARC)

The ARC's purpose is to create opportunities for self-sustaining economic development and improved quality of life in designated Appalachian localities. The focus is on projects that will retain or create jobs, however, counties designated as "Distressed" can apply for funds for projects that are not job related. In this study region, Dickenson County is designated as Distressed. It should be noted that grantees must contribute matching resources and the maximum grant is \$500,000. ARC funding is administered by DHCD.

Virginia Clean Water Revolving Loan Fund

Since being established, the VCWRLF has contributed over \$1 billion in low interest financing for 250 wastewater projects in Virginia and has recently started the Onsite Pilot Wastewater Treatment and Disposal Program. This program addresses malfunctioning or inadequate on-site wastewater disposal systems where public health or water quality concerns exist and where connection to a public sewer is not feasible. Loans are available to local governments with a 20-year (30-year on lines) maximum loan period. The program is administered by the Virginia Department of Environmental Quality, the Virginia Resource Authority and with the cooperation of the Virginia Department of Health.

USDA Rural Development (RD)

Rural Development typically has between \$9 million and \$14 million available as grant funding annually. RD funding can be used for all types of wastewater projects including new construction, expansion, improvements, line installation, treatment facilities, and related costs (engineering fees, surveying costs, legal fees, etc...). To qualify for grant funding, RD will compare the project service area's median household income (MHI) with the statewide median household income (SMHI). A project qualifies for 75% grant funding if the applicant's MHI is below 80% of the SMHI. A project qualifies for a 45% grant if the applicant's MHI does not exceed 100% SMHI. Rural Development also requires a minimum monthly sewer bill of \$33 for a project to be grant eligible.

Rural Development has three interest rates available for loan funds...poverty, intermediate and market. Loan terms are available for up to 40 years.

Southeast Rural Community Assistance Project, Inc. (SERCAP)

The SERCAP Program provides loan funding for sewer projects in all rural, low-income communities from Florida to Delaware. There are no application deadlines and the maximum loan is \$150,000 for 1 to 10 years at interest rates from 3% to 7%. This funding is available for any type of sewer project, but is typically used for small projects, gap financing or contingency/overrun financing.

Virginia Resources Authority (VRA)

For wastewater projects, VRA issues bonds in the national market and lends the proceeds to localities. The bonds can be General Obligation or Revenue backed dependent on whether the borrower has taxing authority. By using the moral obligation of the State, VRA can offer reasonable interest rates to the small borrower.

VRA may issue up to \$300 million in revenue bonds to localities for improvements to water and/or wastewater facilities. The bonds may be either long or short-term fixed or variable rate debt with each financing structured on current market conditions and investor preference. In general, due to State backing, the VRA can obtain more attractive rates than most local governments. Localities must demonstrate the ability to repay the bonds.

VML/VACo

Sponsored by the Virginia Municipal League and the Virginia Association of Counties, the VML/VACo Finance Program includes the Pooled Bond Program. This program allows localities to take advantage of sharing fixed costs across a group of borrowers and benefits from favorable cost structures due to the size and volume of the program. The Pooled Bond Program funds are available for all types of wastewater projects. The bonds are sold twice per year, in the Spring and Fall.

Non-Traditional Funding Options

As discussed in the preceding paragraphs, there are numerous funding sources available that provide low interest loans for sewer projects and few sources available for grants. There are no grant monies available for addressing the most pervasive wastewater problem in our region...inflow/infiltration (I/I) problems. I/I problems take up valuable wastewater plant capacity that could otherwise be used to serve additional customers. Due to the high cost of the proposed projects presented in this study, funding provided by traditional sources will not be adequate or reduce user costs to an affordable level.

Virginia FY2006 Water Quality Improvement Fund (WQIF)

Administered through the Virginia Department of Conservation and Recreation, the Water Quality Improvement Fund will provide approximately \$4.7 million in funding to support strategic nonpoint source water quality initiatives and cooperative nonpoint

source pollution programs. Proposals from local governments can range from \$50,000 to \$200,000, and pending the availability of future WQIF funding, multi-year requests may total up to \$800,000.

Virginia Tobacco Indemnification and Community Revitalization Commission

The Virginia Tobacco Commission was created in 1999 by the General Assembly of the Commonwealth as a way to re-invest monies from the national tobacco settlement back into tobacco farming areas of Virginia. Although the Commission has seven funding programs, two of those programs are applicable to wastewater infrastructure...the Economic Development Fund and the Special Projects Fund.

The Economic Development Fund may be used for "...utility infrastructure creation or improvements for economic development sites, including acquisition and/or development of land..." and is meant to promote economic growth and development in tobacco-dependent communities in an equitable manner throughout the Southside and Southwest regions of the Commonwealth in order to assist such communities in reducing their dependency on tobacco and tobacco-related business with the following restrictions:

1. The Commission will not entertain any request for which 100% of the cost is expected to be borne by Commission funds.
2. Additions or improvements to any public utility designed solely for residential use are not eligible.

The Special Projects Fund is available for utility infrastructure projects only if the project involves the active participation of three or more tobacco region localities.

U.S. Army Corps of Engineers (COE)

The Corps of Engineers currently administers the Water and Wastewater Resources Development Act for Planning Districts 1 and 2, that can assist both water and wastewater construction. The Commonwealth should work with the administration and federal legislators to gain full appropriation of the \$20 million authorization.

National Oceanographic and Atmospheric Administration (NOAA)

Since 1997, the NOAA has provided \$66 million for PRIDE in southeastern Kentucky. This grant funding is provided to address wastewater projects (straight pipes and failing septic systems), environmental education, illegal trash dumps. The creation and funding of a program of this nature for Southwest Virginia should be pursued.

Private Bond Sales

The Private Bond Market is a legitimate alternative for funding sewer projects studied in this report because: interest rates on bonds are very low and discount rates have fallen, many Virginia investment banking firms offer access to non-rated localities for selling bonds, and combining resources to create regional authorities with large customer bases makes the sale of revenue bonds on the private market a more viable alternative.

It is important to note that the process for selling bonds on the private market is streamlined compared to many of the traditional funding options, and has fewer restrictions on where the proceeds are spent.

Private Activity Bonds

Private activity bonds are securities issued by, or on behalf of a local government to provide debt financing for projects used for the trade or business of a private user. Private activity bonds can be used for water, sewage or solid waste facilities as well as industrial and manufacturing facilities and equipment. Generally speaking, investors purchase the bonds, and then the money is lent to users for the completion of the project. The investor's return comes through the operational proceeds of the project. Private activity bonds do not constitute an obligation of the State or any of its jurisdictions. Because they are exempt from both federal and state taxes, private activity bonds bear interest at a significantly lower rate than do corporate bonds or traditional bank notes, and can generate significant interest savings over the term of the loan.

In Virginia, the Virginia Resources Authority (VRA) can issue private activity bonds for wastewater treatment projects used by private interests.

Design/Build/Finance

There are several private utility companies specializing in the financing, construction, operations and maintenance of de-centralized managed wastewater systems. NCS Wastewater Solutions of Puyallup, WA provides customers in non-sewered areas with affordable wastewater treatment systems that perform. NCS Wastewater Solutions provides design/build and system management services throughout the west coast. Another successful example is Tennessee Wastewater Systems, Inc. Established in 1993; TWS owns, operates, maintains and manages on-site wastewater collection and treatment systems for numerous developments in Tennessee, making them the 4th largest wastewater utility in the state! TWS is a public utility, regulated by the State of Tennessee and could serve as a viable model for ownership and management of decentralized wastewater systems throughout Southwest Virginia.

Privatization

The conversion of government-owned wastewater facilities to private ownership or management is one of the fastest growing areas of privatization at the local government level. The majority of sewer system privatizations are in the form of long-term contracts for the operation and maintenance (O&M) of facilities. Long-term contracts also commonly handle facility upgrades and expansions, as well as customer service. It is important to note that short-term O&M contracts typically do not offer large enough savings to cover capital investment needs. Long-term contracts (10 to 20 years) allow both parties to share and spread risks, implement a broader range of cost savings initiatives and offer greater annual cost savings. With the 1997 changes in IRS rules, long-term contracts do not jeopardize the tax-exempt status of existing bonds and also do not preclude the use of State Revolving Loan Funds.

The objective of a long-term O&M contract is to form a cooperative partnership between the local government and the private management company that will meet current and future wastewater needs, alleviate existing and potential environmental problems, meet State and Federal environmental compliance requirements, reduce costs, reduce potential rate increases, and improve system reliability/performance. Thus far, privatization of wastewater facilities has been very successful for small systems (less than 1500 population) and has a proven track record of reduced injuries, better compliance and reduced costs.

Special Legislation

Currently, specific financing resources are geared towards specific issues, i.e. SERCAP for small projects, Tobacco Commission for economic development projects, Appalachian Regional Commission and Economic Development Administration also for economic development activities, Community Development Block Grant for assistance to low and moderate income persons, the upper limits of serving households and creating new systems in existing communities has been reached using these resources alone. In fact, the greatest need, solving inflow and infiltration problems that affect every sewer system in Southwest Virginia has virtually no source of funding.

Without some kind of unconventional funding, these projects simply cannot be constructed. The Commonwealth of Virginia could make a compelling argument for an investment for state general fund dollars to assist with these important health related projects.

This would require appropriations by the Virginia General Assembly and could not be done in any single year biennium.

A more effective and creative way to generate these construction dollars would be the issuance of bonds by the Virginia Resource Authority (or similar organization authorized

to issue bonds). Debt service for the bonds would be funds appropriated by the General Assembly, The bond proceeds would thus appear as a grant to construct these important projects.

In the short term, the General Assembly might consider a one-time appropriation to finance actual preliminary engineering reports, environmental assessments, intermunicipal agreements and other required technical work. This would accelerate these projects from a conceptual planning stage to readiness for construction. As with this study, the three PDC's would be the fiscal agents to receive and disburse these funds.

Sewer Service and Tax Increment Financing Districts

These districts can be established pursuant to Virginia Code Section 15.1-18.3 and are common in several areas of Virginia. Property owners within the district pay an additional tax per \$100 of assessed valuation annually to amortize the debt incurred for the installation of sewer facilities. The provision of sewer facilities protects the health and safety of the residents and conserves property values within the district.

Canaan Valley Institute (CVI)

The Canaan Valley Institute is a regional non-profit organization that supports watershed groups throughout the Mid Atlantic Highlands Region. They provide technical and limited funding resources for planning and design of water quality projects including alternative wastewater projects, usually decentralized managed treatment options. CVI can provide funding through small grants and resource requests applied through the CVI outreach staff as well as technical assistance including preliminary engineering reports, design, facilitation, outreach education coordination, grant writing assistance and funding research.

Funding Examples

- I. New York State, 1996 Clean Water/Clean Air Bond and the Clean Water Revolving Loan Fund. Administered by the New York State Environmental Facilities Corporation (EFC) and the State Department of Environmental Conservation (DEC), and offers short-term interest-free loans and long-term low interest rate financing. Short-term loans enable municipalities to undertake project design and construction without incurring the interest expenses normally

- associated with commercial loans. CWSRF short-term loans are typically used as bridge financing until the borrower obtains long-term financing.
2. “Co-Funding” initiatives...a model of intergovernmental cooperation that maximizes public resources and keeps wastewater treatment affordable for rural communities.
 3. Loudon County...sewer service districts...additional tax on top of the annual real estate tax.
 4. New Jersey...The New Jersey Environmental Infrastructure Financing Program. This is financed by a Trust bond sale. The financing program is a partnership between the Department of Environmental Protection and the NJ Environmental Infrastructure Trust. It combines the interest-free loans from DEP’s State Revolving Funds with market rate loans from the sale of the Trust bonds. The participants in the Financing program are able to borrow money at half the rate the Trust pays on its AAA-rated bonds.
 5. Pennsylvania...The Pennsylvania Infrastructure Investment Authority, or PennVEST, offers multi-year, low interest loans for sewer projects. Grants are also available through PennVEST.
 6. Kirkland, Washington Emergency Sewer Program.
 7. Portland, Oregon’s mandatory sewer connection program. This program requires developed properties to connect to the sewer system within three years after the sewer service becomes available. The program also provides low interest loans to finance connection costs and gives some property owners the option of delaying connection in case of financial hardship. The program includes a Senior Citizen deferral and a safety net program for eligible low-income homeowners.
 8. Chester Borough, NJ, with a population of just 1,500, entered into a private long-term (20-year) operation and maintenance contract for its wastewater collection and treatment systems in 1997. The Borough has saved approximately 30% per year on operation and maintenance and they receive a fee from the private contractor each year to pay for an independent engineer to monitor their performance and to assure that the facilities are being properly maintained.

IX. IMPLEMENTATION

Education, Enforcement and Enticement

In order to be financially stable, revenue from utility systems must be sufficient to retire debt, create debt reserve, and cover the cost of operation and maintenance. Since revenue is generated from the users of the system in question, the utility provider must have assurance of the participation of a sufficient number of users to create positive cash flow. Most funding agencies, in fact, require signed user agreements or user contracts prior to the issuance of project funding. When the utility being considered is wastewater, the willingness of the public to participate in the project is much less than that experienced when a water system is being constructed. The reasons for this unwillingness to participate may be summarized into three general categories.

Education

First the potential participant may not understand the associated problems of inadequately treated wastewater. Potential health problems are sometimes overlooked if wastewater is not actually “ponding” in populated areas. Also health and environmental impacts of stream degradation may not be related to individuals and many times the old saying “out of sight- out of mind” is prevalent. It is critical therefore, that local governments and regulatory agencies who share the responsibility of protecting health and the environment properly educate the potential participant as to these dangers.

Enticement

Secondly, participation is decreased due to its cost. Funding must be made available which will make sewer service to even low to moderate income residents affordable. Programs such as community development block grants, which pay for connection fees need to be expanded. Please refer to the “funding” section of this report for additional information.

Enforcement

When education and enticement are not sufficient to increase participation by potential users, it may be necessary to enforce existing laws concerning the discharge of raw or improperly treated wastewater. Public Health laws to a large extent have not been enforced due to the lack of alternative methods of wastewater handling and treatment. As alternatives are developed and implemented, these laws and regulations will need to be enforced as an incentive to connection to the approved system. There are existing laws regarding the discharge of raw sewage, or improperly treated wastewater. The Virginia Department of Health is responsible for enforcing these situations once the local health department is made aware of such violations. This is currently a criminal

violation (Class I Misdemeanor). Typically the party may be found guilty in court and fined up to \$2,500, but this is usually reduced and there is no mandated cleanup responsibility on the part of the violator, only guilt of the criminal misdemeanor that may be charged again and brought before the court again if the violation continues. This process is resource intensive on the local health department such that other programs may be adversely impacted. This situation should be changed from a criminal violation to a civil penalty so that it is more efficiently and effectively enforced. It is also recommended that the fine be a larger dollar amount than the hook up fee.

Regional Authority

The implementation of the recommended projects in this study, particularly the decentralized sewer projects, would be helped greatly by the creation of a Regional Authority. This Regional Authority could be established and could cross any political boundary such as planning districts, counties, towns, cities and service authorities. In this option, the local sewer providers could concentrate on the traditional centralized sewer systems that they have knowledge and experience owning and operating, while the Regional Authority would provide management, tracking and maintenance of decentralized systems. The Regional Authority would have board representation from all of the localities it serves, but would own and operate the de-centralized sewer systems throughout Southwest Virginia.

The advantages of a Regional Authority are quite evident. The Current centralized sewer system owners would not have to re-educate/re-train their staffs on decentralized sewer construction, maintenance and record keeping. Sewer rates for decentralized customers would be uniform across the service area, and an economy of scale could be realized by having only one operation and maintenance staff to serve the entire area rather than duplicating staff and services throughout the region. It would also be easier for a regional authority to obtain financing than for individual system owners.

The disadvantages of a regional authority for de-centralized sewer systems is that the rates would be set by the authority with no control by the local governments.

X. CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The Design Team investigated 117 centralized sewer projects, 24 decentralized projects and 4 effluent collection system projects throughout the LENOWISCO, Cumberland Plateau and Mount Rogers Planning Districts. Each project was scored and ranked within the evaluation matrix for each project type. Upon presentation of the final project rankings, the Project Management Team endorsed the further study of the top 44 centralized projects, the top 12 decentralized projects and the top 3 effluent collection system projects. It is important to note that all 145 of the initially considered projects are valid projects, however, the scope of this study did not allow for in-depth analysis of all of the projects.

After further study of the selected projects, it was determined that...

- The 44 centralized projects will serve approximately 47,025 residents (16,500 connections) at a cost of \$302,660,301.
- The 15 decentralized/effluent collection projects will serve an estimated 4,130 residents (1449 connections) at a cost of \$18,565,493. (It has been assumed that there are an average of 2.85 persons per connection).

Recommendations

Based on the information gathered during the course of this study, the following recommendations are made:

- It is imperative that additional grant funding be established to help solve this critical environmental and public health threat, such that Southwest Virginia can benefit from a cleaner, healthier and more economically viable future. There is very little grant funding available for sanitary sewer projects, despite the urgent need that has been identified in this Study.
- Conduct a special informational session with legislators to emphasize the need and garner support.
- Begin the process of implementing the 3 E's...Education, Enforcement and Enticement.
- The three Planning District Commissions should consider joining forces to help local governments put together educational campaigns to help citizens understand the health and environmental benefits of participating in the recommended sewer system projects.
- Change the laws regarding the discharge of raw sewage or improperly treated wastewater (residential only) such that the violation of the law is a civil offense rather than a criminal offense. This will allow the Virginia Department of Health to enforce the law more efficiently and effectively.

- Make the fines for discharging raw sewage, or improperly treated wastewater a higher dollar amount than the cost of the connection or “hook up” fee.
- Encourage the enacting of “mandatory hookup” ordinances within the study area and make sure that the ordinances are enforced.
- Encourage local sewer providers to allow low income users to pay for connection fees over a one year period with no interest.
- Ask local sewer providers to look at revise their rate structures for sewer in low income areas to reflect water rate structures that are more equitable to those in need.
- Supplemental funding will need to be identified to help establish inflow/infiltration control programs throughout the region.
- Foster support for the recommendations set forth in this Study by holding a public presentation including local, state and federal officials.\