Bioenergy from municipal sludge study report

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BIOENERGY FROM MUNICIPAL SLUDGE STUDY REPORT

Prepared for:

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South Carolina (SC) does not produce any coal, oil, or natural gas, requiring it import nearly 98 percent of its energy. Therefore, SC has a tremendous interest in developing new, alternative fuel sources that can be derived within the state and which can help ensure that the state has a supply of energy to sustain itself in the future. A possible alternative fuel source is municipal wastewater sludge, a byproduct of wastewater treatment. The processing and disposal of municipal wastewater biosolids is very expensive for owners of such facilities. Although there are some beneficial uses for it that are currently utilized (i.e., land application as a fertilizer), the vast majority of it is hauled to landfills for disposal where it has no beneficial effect. Consequently, it is in the economic interest of wastewater treatment plants (WWTPs) to use alternative lower cost methods to dispose of its sludge or methods that create a product that has an economic value associated with it such as biofuels. This fact, combined with SC's need to develop energy sources that can be derived within the state, makes the use of wastewater sludge for the production of energy an attractive option for all parties involved.

One possible method to derive energy from biosolids is through anaerobic digestion, a process that has been utilized for many years. Anaerobic digestion is a process whereby bacteria within an oxygen depleted environment convert organic matter into biogas. Biogas is a mixture of predominately methane, carbon dioxide, hydrogen sulfide, and water vapor are the predominant components. Methane can be captured and transported to a gas engine to produce electricity.

Other new, innovative technologies are being developed to harness energy from wastewater sludge. One such process, the Fischer-Tropsch process, produces synthesis gas, a combination of carbon monoxide and hydrogen, which can be used as an alternative fuel source. Other processes are being developed that appear promising as well. Therefore, improved processes to harness energy from municipal sludge will likely be developed in the near future. The question is whether there is enough of this sludge available to make investment in such technologies worthwhile.

It is estimated that WWTPs within SC, excluding purely industrial WWTPs, currently produce approximately 100,000 dry tons of sludge per year that could be available for anaerobic digestion or other process capable of capturing energy. Assuming this sludge has a solids concentration of 0.5 percent, this equates to approximately 4.8 billion gallons. It is also estimated that once these WWTPs reach their current design capacity these plants will produce approximately 210,000 dry tons of sludge per year that could be available for anaerobic digestion or other process capable of capturing energy. Assuming this sludge has a solids concentration of 0.5 percent, this equates to approximately 10 billion gallons.

Based on current flows at these plants, there are 24 "large" plants producing greater than 1000 dry tons of sludge per year (or greater than approximately 48 million gallons of sludge at 0.5 percent solids), 86 "medium" plants producing between 100 and 1000 dry tons of sludge per year (or between approximately 4.8 million and 48 million gallons of sludge at 0.5 percent solids), and 211 "small" plants producing less than 100 dry tons of sludge per year (or less than 4.8 million gallons of sludge at 0.5 percent solids). Based on the permitted flows at these plants (or the maximum flow allowed with current plant design), there will be 55 "large" plants producing greater than 1000 dry tons of sludge per year (or greater than approximately 48 million gallons of sludge at 0.5 percent solids), 95 "medium" plants producing between 100 and 1000 dry tons of sludge per year (or between approximately 4.8 million and 48 million gallons of sludge at 0.5 percent solids), and 168 "small" plants producing less than 100 dry tons of sludge per year (or less than 4.8 million gallons of sludge at 0.5 percent solids). Table A.1 in the Appendix includes detailed flow and sludge production information for each WWTP located in SC.

This analysis includes only WWTPs treating municipal or mixed municipal/industrial (i.e., no industrial only) plant. Therefore, it is assumed that the majority of these plants will have sludge available for anaerobic digestion or other process capable of capturing energy that is of similar quality. However, some variability between WWTPs should be expected.

Within SC, there are currently 3 counties that produce 10,000 dry tons of sludge or more per year that could be available for anaerobic digestion or other process for capturing energy. There are also 19 counties currently produce between 1000 to 10,000 dry tons of sludge per year that could be available for anaerobic digestion or other process for capturing energy and 24 counties will produce less than 1000 dry tons of sludge per year that could be available for anaerobic digestion or other process for capturing energy. Figure 2 presents a map of South Carolina with the estimated solids production for each county based on current flows.

Once the WWTPs within SC reach their design capacity, it is estimated that 5 counties will produce 10,000 dry tons of sludge or more per year that could be available for anaerobic digestion or other process for capturing energy. It is also estimated that 31 counties will produce between 1000 to 10,000 dry tons of sludge per year that could be available for anaerobic digestion or other process for capturing energy and 10 counties will produce less than 1000 dry tons of sludge per year that could be available for anaerobic digestion or other process for capturing energy. Figure 3 presents a map of South Carolina with the estimated solids production for each county based on current design capacity.

The following is a summary of the conclusions from this study.

- Anaerobic digestion produces "biogas" which is a mixture of methane, carbon dioxide, hydrogen sulfide, nitrogen, hydrogen, methylmercaptans, and oxygen.
- Methane comprises between 55 and 80 percent of the biogas, with 65% typical.
- 1 cubic foot of biogas (at 65 percent methane) contains approximately 600 BTUs or approximately 0.180 kWh of energy.
- 1 ton of sludge will generate approximately 25,000 cubic feet of biogas or approximately 15,000,000 BTUs or approximately 4400 kWh of energy.
- 1 gallon of sludge (at 0.5 percent solids) will generate approximately 0.5 cubic feet of biogas or approximately 300 BTUs or approximately 0.09 kWh of energy.
- SC has 321 municipal wastewater treatment plants.

- Based on current flows at these plants, there are 24 plants producing greater than 1000 dry tons of sludge per year, 86 plants producing between 100 and 1000 dry tons of sludge per year, and 211 plants producing less than 100 dry tons of sludge per year.
- Based on the permitted flows at these plants (or the maximum flow allowed with current plant design), there would be 55 plants producing greater than 1000 dry tons of sludge per year, 94 plants producing between 100 and 1000 dry tons of sludge per year, and 172 plants producing less than 100 dry tons of sludge per year.
- Currently, there is approximately 100,000 dry tons of sludge produced in SC annually. This equates to 1.5 trillion BTUs or approximately 0.44 billion kWh of energy. This would produce enough energy for approximately 44,000 households, assuming each household utilizes 10,000 kWh per year.
- At design capacity, there would be approximately 210,000 dry tons of sludge produced in SC annually. This equates to 3.15 trillion BTUs or approximately 0.92 billion kWh of energy. This would produce enough energy to heat approximately 92,000 households, assuming each household utilizes 10,000 kWh per year.
- The following "large" plants were studied in detail.
    - City of Florence – Pee Dee River WWTP
    - City of Sumter – Pocotaligo WWTP
    - City of York – Fishing Creek WWTP
    - City of Camden WWTP
    - Beaufort Jasper Water and Sewer Authority – Cherry Point WWTP
    - Grand Strand Water and Sewer Authority – Schwartz WWTP
    - Chester Sewer District – Rocky Creek WWTP
    - Easley Combined Utilities – Middle Branch WWTP
    - Charleston Commissioners of Public Works – Plum Island WWTP
    - Spartanburg Sanitary Sewer District – Fairforest WWTP

- All WWTPs were possibly interested in anaerobic digestion except for the Grand Strand Water and Sewer Authority's Schwartz WWTP. Ultimate use would be predicated on performance and economics.
- Each WWTP expressed interest in alternative energy production and use. This would be new technologies other than anaerobic digestion and methane collection. Ultimate use would be predicated on performance and economics.
- All WWTPs were very interested in the production of energy from biosolids and the use of that energy at the plant.
- All WWTPs believed that the political environment was such that a regional facility could possibly be created in their areas.
- The Grand Strand area, the greater Charleston area, the Beaufort area, the Spartanburg area, and the greater Greenville/Spartanburg area appeared to be most promising locations for a regional facility due to the number of plants within close proximity. It could be assumed that the greater Columbia area would also be a good candidate location although it was not studied in detail.

I. INTRODUCTION

Within South Carolina (SC), no coal, oil, or natural gas is produced.[1] Therefore, SC must import nearly 98 percent of its energy.[2] With the recent escalation of oil prices worldwide, there has been increased interest in the development of alternative fuel sources that are both abundant and economically competitive. Due to these factors, SC has a tremendous interest in developing new, alternative fuel sources that can be derived within the state and which can help ensure that the state has a supply of energy to sustain itself in the future.

A possible alternative fuel source is municipal wastewater sludge, a byproduct of wastewater treatment. According to the United States Department of Energy, the use of biomass including sewage sludge for the generation of alternative fuels has several benefits. It helps to strengthen rural economies, decreases the nation's reliance on foreign oil, eliminates the use of methyl tertiary butyl ether (MTBE) and other hazardous fuel additives, and reduces pollution and greenhouse gas emissions.[3]

The processing and disposal of municipal wastewater biosolids is very expensive for owners of such facilities. Although there are some beneficial uses for it that are currently utilized (i.e., land application as a fertilizer), the vast majority of it is hauled to landfills for disposal where it has no beneficial effect. In fact, there is a significant cost associated with landfilling it both in transportation cost and in landfill tipping fees. Should the sludge fail a toxicity characteristic leaching procedure (TCLP) test, the cost of disposal increases exponentially as the waste is then characterized as hazardous waste requiring disposal at special facilities usually located much farther from the wastewater treatment plant (WWTP) than typical landfills used for disposal of such material. Consequently, it is in the economic interest of WWTPs to use alternative lower cost methods to dispose of its sludge or methods that create a product that has an economic value associated with it such as biofuels. This fact, combined with SC's need to develop energy sources that can be derived within the state, makes the use of wastewater sludge for the production of energy an attractive option for all parties involved.

One possible method to derive energy from biosolids is through anaerobic digestion, a process that has been utilized for many years. Anaerobic digestion is a process whereby bacteria within an oxygen depleted environment convert organic matter into biogas. Biogas is a mixture of methane, carbon dioxide, hydrogen sulfide, nitrogen, hydrogen, methylmercaptans, oxygen, and water vapor. Methane, carbon dioxide, hydrogen sulfide, and water vapor are the predominant components. This biogas typically contains between approximately 55 and 80 percent methane, with 65 percent being typical. Methane is compressed, purified and stored in a container known as a gasometer, and then transported to a gas engine to produce electricity. An additional process known as methylization can produce methanol from methane. Methanol is much easier to transport and to store than is methane, so this additional step may be important in the ultimate widespread harvesting of energy from biomass through anaerobic digestion. Energy from methanol can be harvested by direct combustion and it can be used to produce biodiesel. Additionally, it can be used as a feedstock for fuel cells. Methanol is an excellent carrier of hydrogen, far better than attempting to transport compressed hydrogen gas. In this way, methanol may be the bridge for the new hydrogen economy.

Other new, innovative technologies are being developed to harness energy from wastewater sludge. One such process, the Fischer-Tropsch process, produces synthesis gas, a combination of carbon monoxide and hydrogen, which can be used as an alternative fuel source. Other processes are being developed that appear promising as well. Therefore, improved processes to harness energy from municipal sludge will likely be developed in the near future. The question is whether there is enough of this sludge available to make investment in such technologies worthwhile.

II. PURPOSE AND SCOPE

The purpose of this study was to determine the amounts and locations of potentially recoverable useful energy from sewage treatment facilities in SC, along with an analysis of economics and other barriers of recovering and utilizing such energy. Such information will enable public and private decision-makers to determine the political and economic desirability to invest public and private resources in efforts to derive useful energy from these sources.

The study included the following scope:

1) The identification of ten large wastewater treatment plants (WWTPs) within South Carolina for initial study and the documentation of the current wastewater treatment processes, the amount of wastewater processed, and the organic content in the wastewater (on a percent basis).
2) The documentation of the current disposition of solid waste disposal after wastewater processing and the content and quantity of the solids waste disposed along with the current disposal method.
3) The documentation of the volume of organic waste available for alternative treatment by anaerobic digestion.
4) The documentation of the potential for onsite production and use of bioenergy derived from available feedstock.
5) The documentation of the potential for offsite production and use of bioenergy derived from available feedstock.
6) The collection of data on all WWTPs within the state sufficient to determine accurate estimates of the total quantity and quality of WWTP material potentially available for biofuel feedstock.
7) The tabulation of the total amount of organic waste potentially available for anaerobic digestion.

III. SURVEY OF TEN LARGE WASTEWATER TREATMENT PLANTS

Ten large WWTPs within SC were chosen for detailed analysis. The ten large WWTPs selected for this study were:

- Beaufort Jasper Water and Sewer Authority – Cherry Point WWTP,
- Charleston Commissioners of Public Works – Plum Island WWTP,
- City of Camden WWTP,
- City of Florence – Pee Dee River WWTP,
- City of Sumter – Pocotaligo WWTP,
- City of York – Fishing Creek WWTP,
- Chester Sewer District – Rocky Creek WWTP,
- Easley Combined Utilities – Middle Branch WWTP,
- Grand Strand Water and Sewer Authority – Schwartz WWTP, and
- Spartanburg Sanitary Sewer District – Fairforest WWTP.

WWTPs were considered large if they have a design capacity of more than 1 million gallons per day (mgd). WWTPs across the state were chosen for analysis. Figure 1 presents a location map for the ten WWTPs participating in the study.

The organic content (on a percent basis) of each of these ten WWTPs was less than 0.1 percent. An analysis of one sample indicated that the organic content is approximately 250 mg/L. It is likely that the majority of the WWTPs have similar characteristics, although some plants will have less organic content due to such factors as high infiltration and inflow and others will have more organic content due to such factors as high BOD industrial dischargers.

A. Beaufort Jasper Water and Sewer Authority – Cherry Point WWTP

1.) Wastewater Treatment Processes

The Beaufort Jasper Water and Sewer Authority (BJWSA)/Cherry Point WWTP is currently permitted for a capacity of 3.2 mgd and is expandable to a capacity of 7.5 mgd. The Cherry Point WWTP currently treats approximately 2.7 mgd of wastewater. The original extended aeration WWTF was constructed in 1994. Wastewater currently enters the plant by gravity. The influent wastewater passes through a mechanical bar screen to remove paper, plastics, and other foreign material that may interfere with downstream processes. The wastewater then flows through a grit removal system to remove sand and other particles. Following screening and grit removal, the wastewater flows to one of two oxidation ditch basins (EIMCO Caroussel™) equipped with vertical shaft aerators that provide aeration and mixing of the wastewater. Each of these aeration basins is approximately 1.2 million gallons. Following treatment in the oxidation ditch basins, the wastewater enters one of two secondary clarifiers where solids are allowed to settle. The settled solids are returned to the aeration basin or wasted to the aerobic digester. The clarified wastewater then flows to a cloth media filter system for tertiary filtration. Following filtration, the wastewater flows to a chlorine contact chamber where chlorine is injected into the wastewater and allowed to be in contact with the wastewater for a sufficient period for disinfection to occur. Following the chlorine contact chamber, the wastewater is injected with sodium bisulfite to remove the residual chlorine. The wastewater then flows to a holding pond prior to discharge. During the summer months (March to September), nearly 1 mgd is discharged to area golf courses for irrigation, while the remainder is discharge to the Great Swamp. During the remainder of the year, all of the wastewater effluent is discharged to the Great Swamp.

2.) Sludge Handling Processes and Sludge Characteristics

The Cherry Point WWTP is currently the regional septage and regional sludge processing facility. The Cherry Point WWTP currently processes sludge produced at the WWTP as well as sludge produced by the other WWTPs operated by the BJWSA. Sludge from the Beaufort County Board of Education, Callawassee, Fripp Island, and Harbor Island as well as sludge from all septage haulers operating within Beaufort and Jasper counties is also processed at the Cherry Point WWTP. Sludge is stored in one of two 150,000 gallon sludge holding tanks. The sludge is aerated and mixed in these tanks until it is removed for dewatering. The sludge are dewatered by a belt filter press and trucked to an approved landfill for final disposal. Since the solids are landfilled, they are not required to meet Class A or Class B biosolids requirements.

3.) Volume of Waste Available for Anaerobic Digestion

Approximately 720 dry tons of sludge per year are currently produced at the Cherry Point WWTP that could be available for anaerobic digestion or other process for capturing energy. This estimate is based on the current flow rate of approximately 2.7 mgd and does not include sludge from the other locations. It is estimated that the Cherry Point WWTP produces approximately 75 percent of the sludge that is processed at the plant. Once flows reach the current design capacity of 3.2 mgd, the plant will produce approximately 850 dry tons of sludge per year. Assuming the sludge available for anaerobic digestion or other process for capturing energy is at a solids concentration of 0.5 percent, this equates to approximately 35 million gallons at the current flow rate and approximately 41 million gallons at design flow.

4.) Potential for Onsite Production and Use of Bioenergy Derived from Available Feedstock

The BJWSA is interested in anaerobic digestion as well as new, innovative processes for capturing energy from biosolids as long as these are proven to be reliable and perform well. In either case, the economics of their construction and use will play a huge role in any decision on whether or not to adopt these technologies.

There is a high potential for the onsite production of energy from municipal wastewater sludge at the Cherry Point WWTP. Due to the size of the Cherry Point WWTP (3.2 mgd), it is not likely to be economical to build a system to derive energy from biosolids produced by the Cherry Point WWTP alone especially since the BJWSA has a contract with a landfill that includes a very low tipping fee. The economics do change somewhat once other WWTPs are included; but, the low tipping fee may prevent the conversion to an energy capturing process from making economic sense.

In addition to the entities already partnered with, there are three wastewater treatment system located on Hilton Head Island, the Hilton Head PSD #1, South Island, and the Broad Creek PSD, which could be partnered with to form a regional bioenergy production partnership. The current political environment is suitable for such a regional biosolids facility to occur as indicated by the fact that the Cherry Point WWTP already acts as a regional biosolids disposal plant. The economics of such a regional bioenergy production facility will play a major role and, therefore, economic incentives would help the establishment of a partnership.

At the Cherry Point WWTP there is considerable land owned by the BJWSA that could be suitable for a regional biosolids facility. The Cherry Point WWTP is located on an approximately 200 acre parcel of land. Current operations only utilize approximately 40 acres. Since this available land is located on the current WWTP site, there should be fewer secondary concerns, such as noise, traffic, and odor, that may be associated with locating a regional bioenergy production facility elsewhere.

5.) Potential for Offsite Production and Use of Bioenergy Derived from Available Feedstock

As previously mentioned, the BJWSA is interested in anaerobic digestion as well as new, innovative processes for capturing energy from biosolids as long as these are proven to be reliable and perform well. The BJWSA would be interested in the offsite production of bioenergy and the use of energy from such a facility. The BJWSA does not own any large tracts of land suitable for a regional biosolids facility. However, the BJWSA does own several small (generally between 5 and 10 acres) tracts of land within Beaufort and Jasper counties. These tracts of land are associated with former WWTPs. The use of these tracts of land would be dependent on the land requirements, noise concerns, traffic issues, and odor issues.

B. Charleston Commissioners of Public Works – Plum Island WWTP

1.) Wastewater Treatment Processes

The Charleston Commissioners of Public Works (Charleston CPW)/Plum Island WWTP is currently permitted for a capacity of 36 mgd. The Plum Island WWTP currently treats approximately 21 mgd of wastewater. Wastewater flows to the Plum Island WWTP from one of two deep tunnels, the Harbor Tunnel and the West Ashley Tunnel. The Harbor Tunnel transports all of the wastewater from the Charleston Peninsula to the treatment plant and the West Ashley Tunnel transports all of the wastewater from the West Ashley area to the treatment plant. Upon arrival at the plant through the tunnel system, the wastewater is pumped to the surface. The wastewater then flows through a mechanical grinder to grind large debris such as paper and plastics and then through a mechanical screen to remove this ground material. The wastewater then flows into a grit removal system, where sand and other inorganic material is removed. The wastewater flows from the grit removal system into a group of rectangular primary clarifiers, where additional settling of solid particles occurs and mechanical devices skim oil and solids from the wastewater. The wastewater then flows into one of nine aeration basins equipped with a diffused aeration system. Following treatment in the aeration basins, wastewater flows to one of six rectangular secondary clarifiers. The settled solids are returned to the aeration basins. The clarified wastewater flows to a chlorine contact chamber where sodium hypochlorite is added into the wastewater and allowed to be in contact with the wastewater for a sufficient period for disinfection to occur. Following the chlorine contact chamber, the wastewater is injected with sulfur dioxide to remove the residual chlorine. The wastewater then flows through a flow measurement device and is discharged into the Ashley River through a diffuser.

2.) Sludge Handling Processes and Sludge Characteristics

Sludge from the treatment process is wasted directly from the aeration basin and not from the bottom of the secondary clarifiers. The wasted sludge is thickened in one of two gravity thickeners and then stored in a 280,000 gallon sludge holding tank, where it is aerated and mixed prior to dewatering. The Plum Island WWTP utilizes centrifuges and rotary presses to dewater sludge, achieving a cake solids concentration of between 22 to 25 percent. Dewatered sludge is trucked to an approved landfill for final disposal.

Sludge produced at the plant is not required to meet Class B biosolids requirements since the sludge is disposed of in a landfill.

3.) Volume of Waste Available for Anaerobic Digestion

Approximately 5600 dry tons of sludge per year are currently produced at the Plum Island WWTP that could be available for anaerobic digestion or other process for capturing energy. This estimate is based on the current flow rate of approximately 21 mgd. Once flows reach the current design capacity of 36 mgd, the plant will produce approximately 9600 dry tons of sludge per year. Assuming the sludge available for anaerobic digestion or other process for capturing energy is at a solids concentration of 0.5 percent, this equates to approximately 269 million gallons at the current flow rate and approximately 460 million gallons at design flow.

4.) Potential for Onsite Production and Use of Bioenergy Derived from Available Feedstock

The Charleston CPW is interested in anaerobic digestion. A previous study prepared for the Charleston CPW indicated that anaerobic digestion with energy recovery was the best option for solids processing at the plant; however, the process has not been adopted. The Charleston CPW is also interested in the use of new, innovative processes for capturing energy from biosolids as long as these are proven to be reliable and perform well. In either case, the economics of their construction and use will play a huge role in any decision on whether or not to adopt these technologies.

The Plum Island WWTP due to its large size and high power costs is well suited for using bioenergy onsite. Since power costs are so high, the Charleston CPW is very interested in the possibility of using energy derived from biosolids at the plant in an effort to offset the high energy costs required to run the plant. Accommodating new equipment for the purpose of energy recovery may be difficult due to the limited space available at the plant. It is more likely that the Plum Island WWTP could accommodate such equipment to process sludge generated onsite only or sludge generated onsite and at the Charleston CPW's 0.75 mgd Daniel Island WWTP. Regardless, the location of any such equipment will be a key factor in the decision-making process. Due to its location along the Charleston Harbor, aesthetic concerns are very important for the Plum Island WWTP. The limited space available at the plant is also an issue.

Around the Charleston area, there are numerous entities that could form a partnership to establish a regional bioenergy production facility. The North Charleston Sewer District, Dorchester County, the Berkeley County Water and Sanitation Authority, the Mt. Pleasant Water Authority, and the Summerville CPW are all located within the Greater Charleston area. The magnitude of biosolids generated within the Charleston area makes Charleston an ideal candidate location for a bioenergy production facility.

In addition to the limited space available at the Plum Island WWTP for such a regional facility, there are other issues that would need to be addressed such as the cost of transportation, the choice over which technology to use, and the choice over which entities to include and which to exclude. Due to the number of entities involved, it may be difficult to form a partnership agreement with all entities. However, economic incentives should help the formation of a partnership.

5.) Potential for Offsite Production and Use of Bioenergy Derived from Available Feedstock

As previously mentioned, the Charleston CPW is interested in anaerobic digestion and a previous study indicated that anaerobic digestion with energy recovery was the best option for solids processing at the Plum Island WWTP. Also, as previously mentioned, the Charleston CPW is interested in the use of new, innovative processes for capturing energy from biosolids as long as these are proven to be reliable and perform well. However, the limited space and aesthetic concerns at the Plum Island WWTP could limit the adoption of such processes at the Plum Island WWTP. Therefore, it is more likely that an offsite location would be the best choice for a bioenergy production facility. The Charleston CPW would be interested in the use of energy from such a facility.

The Charleston CPW owns numerous small tracts of land around Charleston, but it does not own any large tracts of land suitable for a bioenergy production facility. Land would need to be purchased for such a facility to be located with the Charleston CPW service area. Therefore, forming a partnership with the previously mentioned entities to help offset the cost of purchasing land and the cost of constructing a bioenergy production facility would improve the economics and, thus, improve the chances that such a facility would be built. Further, one or more of these potential partners may own land that would be suitable for a regional bioenergy production facility. Issues, such as cost, location, choice over technology, and choice over which entities to include and which to exclude, would still need to be addressed.

C. City of Camden WWTP

1.) Wastewater Treatment Processes

The City of Camden WWTP is currently permitted for a capacity of 3 mgd. The Camden WWTP currently treats approximately 1.5 mgd of wastewater. Wastewater currently enters the plant by gravity. The influent wastewater passes through a mechanical grinder to grind paper, plastics, and other foreign material. The wastewater then flows through a screen to remove the ground material. Following grinding and screening, the wastewater flows into one of two aerated lagoons, which have 5 cells each. Only one lagoon is currently utilized for treatment. The other is used for overflow only. Following treatment in the lagoon, the wastewater enters a pump station wet well. The wastewater is then pumped to a chlorine contact chamber where chlorine is injected into the wastewater and allowed to be in contact with the wastewater for a sufficient period for disinfection to occur. Following the chlorine contact chamber, the wastewater is injected with sulfur dioxide to remove the residual chlorine. The wastewater then flows to the Wateree River for discharge.

2.) Sludge Handling Processes and Sludge Characteristics

As previously mentioned, the City of Camden WWTP is an aerated lagoon treatment system. Solids produced by this type of treatment process settle and are slowly digested within the system. Routine sludge wasting is, therefore, not required. However, sludge must be periodically removed from the system in order for efficient wastewater treatment to occur. When required approximately every 6 to 8 years, the sludge is dredged from the lagoon and trucked to an approved landfill for final disposal. Since the sludge is landfilled, it does not have to meet Class A or B biosolids requirements.

3.) Volume of Waste Available for Anaerobic Digestion

Approximately 400 dry tons of sludge per year are currently produced at the City of Camden WWTP that could be available for anaerobic digestion or other process for capturing energy. This estimate is based on the current flow rate of approximately 1.5 mgd. Once flows reach the current design capacity of 3 mgd, the plant will produce approximately 800 dry tons of sludge per year. Assuming the sludge available for anaerobic digestion or other process for capturing energy is at a solids concentration of 0.5 percent, this equates to approximately 19 million gallons at the current flow rate and approximately 38 million gallons at design flow.

4.) Potential for Onsite Production and Use of Bioenergy Derived from Available Feedstock

The City of Camden is interested in anaerobic digestion as well as new, innovative processes for capturing energy from biosolids as long as these are proven to be reliable and perform well. In either case, the economics of their construction and use will play a huge role in any decision on whether or not to adopt these technologies.

The City is very interested in the possibility of using energy derived from biosolids at the plant in an effort to offset energy costs. At the WWTP, there are approximately 11 acres of available land that could be used for a bioenergy production facility. This is likely enough land to accommodate a regional facility, which would help improve the economics. Around the Camden area, there are other wastewater entities including Kershaw County that could form a partnership to establish a regional bioenergy production facility. These entities have worked together in the past, so it is possible that such a partnership could be formed. Economics will play a major role in ability to obtain partners for a bioenergy production facility and, therefore, incentives would help the establishment of a partnership. The City would be willing to consider constructing the regional facility on available land at its WWTP.

5.) Potential for Offsite Production and Use of Bioenergy Derived from Available Feedstock

As previously mentioned, the City of Camden is interested in anaerobic digestion and new, innovative processes for capturing energy from biosolids as long as these are proven to be reliable and perform well. The City does not own tracts of land suitable for a bioenergy production facility other than the WWTP site. Land would have to be purchased for such a facility to be built elsewhere. Therefore, there is a better potential for onsite production rather than offsite production.

D. City of Florence – Pee Dee River WWTP

1.) Wastewater Treatment Processes

The wastewater at the City of Florence/Pee Dee River WWTP enters the plant by gravity. The wastewater flows through a mechanical bar screen to remove paper, plastics, and other trash. From the bar screen, the wastewater flows through a grit removal system to remove sand and other inorganic particles. The flow then splits to two different sides of the plant. Wastewater treated on the first side of the plant flows to one of four primary clarifiers to settle some additional solids. From the primary clarifiers, the flow enters one of four trickling filters and then to one of two intermediate clarifiers. The clarified effluent flows to one of two Orbal treatment basins for additional treatment. The Orbal treatment basins are equipped with discs on horizontal shafts which mix and aerate the wastewater. Following treatment, the wastewater enters one of two final clarifiers where the solids settle to the bottom. The settled solids are either returned to the Orbal treatment basins or wasted to the aerobic digesters. The clarified effluent flows to the ultraviolet light (UV) disinfection system. Wastewater treated on the second side of the plant flows to oxidation ditch basin (EIMCO Caroussel™) equipped with vertical shaft aerators for treatment. Following treatment, the wastewater enters one of two final clarifiers where the solids settle to the bottom. The settled solids are either returned to the oxidation ditch treatment basin or wasted to the aerobic digesters. The clarified effluent flows to the UV disinfection system. Following UV disinfection, the wastewater is pumped to the Great Pee Dee River for discharge.

2.) Sludge Handling Processes and Sludge Characteristics

The sludge produced in the plant is wasted from the bottom of the secondary clarifiers to one of four 360,000 gallon aerobic digesters. The sludge from the aerobic digesters is dewatered by a belt filter press to achieve a solids concentration between 17 and 18 percent. The dewatered sludge is either composted or landfilled. Approximately, 30 percent of the sludge generated at the WWTP is composted and approximately 70 percent is landfilled. Composting consists of mixing the sludge with wood chips, forming piles with the mixture, and applying air. The process warms the mixture and following a sufficient period of time at the required minimum temperature the material will meet Class A biosolids requirements. After meeting Class A biosolids requirements, the compost is given to the local community for use as a soil amendment. Since demand for the compost material is less than the amount of compost that would be produced is all of the solids produced at the plant were composted, the remainder of the sludge is trucked to an approved landfill for final disposal. The landfilled solids are not required to meet Class A or B biosolids requirements.

3.) Volume of Waste Available for Anaerobic Digestion

Approximately 2400 dry tons of sludge per year are currently produced at the Pee Dee River WWTP that could be available for anaerobic digestion or other process for capturing energy. This estimate is based on the current flow rate of approximately 9 mgd. Once flows reach the current design capacity of 15 mgd, the plant will produce approximately 4000 dry tons of sludge per year. Assuming the sludge available for anaerobic digestion or other process for capturing energy is at a solids concentration of 0.5 percent, this equates to approximately 115 million gallons at the current flow rate and approximately 192 million gallons at design flow.

4.) Potential for Onsite Production and Use of Bioenergy Derived from Available Feedstock

The City of Florence is not interested in anaerobic digestion due to the hazards and odors associated with it. The City also has concerns over the performance of anaerobic digestion. The City is interested in new, innovative processes for capturing energy from biosolids as long as these are proven to be reliable and perform well. Reliability and performance will be a major factor in the decision-making process. The City is wary of "innovative" processes due to past experiences. Economics will also play a major role in any decision on whether or not to adopt a new technology.

The City of Florence is very interested in the possibility of using energy derived from biosolids at the plant in an effort to offset energy costs. At the WWTP, there are between 30 and 40 acres of available land that could be used for a bioenergy production facility. This is enough land to accommodate a regional facility, which would help improve the economics. Around the Florence area, there are other wastewater entities, such as Darlington County Water and Sewer Authority, the City of Darlington, the City of Marion, and the City of Lake City, that could form a partnership to establish a regional bioenergy production facility and it appears that the political climate is such that a partnership could be formed. Economics will play a major role in ability to obtain partners for a bioenergy production facility and, therefore, economic incentives would help the establishment of a partnership. The City of Florence would be willing to consider constructing the regional facility on available land at its WWTP.

5.) Potential for Offsite Production and Use of Bioenergy Derived from Available Feedstock

As previously mentioned, the City of Florence is not interested in anaerobic digestion. However, the City is interested in new, innovative processes for capturing energy from biosolids as long as these are proven to be reliable and perform well. The City of Florence owns numerous tracts of land around the City but none suitable for a bioenergy production facility other than the WWTP site. This is due to such factors as odors and traffic. Land would have to be purchased for such a facility to be built elsewhere. Therefore, there is a better potential for onsite production rather than offsite production.

E. City of Sumter – Pocotaligo River WWTP

1.) Wastewater Treatment Processes

The City of Sumter/Pocotaligo River WWTP is currently permitted for a capacity of 15 mgd. Plants are underway to expand it to 18 mgd. The Pocotaligo River WWTP currently treats approximately 9 mgd of wastewater. Wastewater currently enters the plant by gravity and is pumped to a mechanical bar screen to remove paper, plastics, and other foreign material. The wastewater then flows through an aerated grit removal system to remove sand and other inorganic particles. Following screening and grit removal, the wastewater flows to an equalization basin to equalize flow and concentration. The wastewater then flows one of three extended aeration basins equipped with diffused aeration systems. Following treatment in the aeration basins, the wastewater enters one of eight secondary clarifiers where solids are allowed to settle. The settled solids are returned to the aeration basin or wasted to the aerobic digester. The clarified wastewater then flows to a chlorine contact chamber where chlorine is injected into the wastewater and allowed to be in contact with the wastewater for a sufficient period for disinfection to occur. Following the chlorine contact chamber, the wastewater is injected with sulfur dioxide to remove the residual chlorine. The wastewater is then pumped to the Pocotaligo River for discharge.

2.) Sludge Handling Processes and Sludge Characteristics

Sludge from the treatment process is wasted directly from the bottom of the secondary clarifiers and transferred to the aerobic digesters. Sludge is treated in one of two 2.25 million gallon aerobic digesters. Aeration and mixing is supplied by fixed mechanical aerators. Following digestion, solids are conveyed to belt filter presses for dewatering. Following dewatering, the sludge is conveyed to a biosolids dryer (heat drying) that produces a "Class A" biosolid product that is suitable for use as an organic fertilizer.

This product is marketed under the name "Poconite." The product is utilized by local farmers as well as other entities across the southeast.

3.) Volume of Waste Available for Anaerobic Digestion

Approximately 2400 dry tons of sludge per year are currently produced at the Pocotaligo River WWTP that could be available for anaerobic digestion or other process for capturing energy. This estimate is based on the current flow rate of approximately 9 mgd. Once flows reach the current design capacity of 15 mgd, the plant will produce approximately 4000 dry tons of sludge per year. Assuming the sludge available for anaerobic digestion or other process for capturing energy is at a solids concentration of 0.5 percent, this equates to approximately 115 million gallons at the current flow rate and approximately 192 million gallons at design flow.

4.) Potential for Onsite Production and Use of Bioenergy Derived from Available Feedstock

The City of Sumter would consider anaerobic digestion, but the City is concerned over their safe and effective operation. The City is concerned over the hazards associated with the methane gas as well as over the reliable performance of anaerobic digestion. The City is interested in new, innovative processes for capturing energy from biosolids as long as these are proven to be reliable and perform well. In either case, the economics of their construction and use will play a huge role in any decision on whether or not to adopt these technologies.

The City of Sumter is very interested in the possibility of using energy derived from biosolids at the plant in an effort to offset energy costs. At the WWTP, there is approximately 50 acres of available land that could be used for a bioenergy production facility. This is enough land to accommodate a regional facility, which would help improve the economics. Around the Sumter area, there are other wastewater entities such as Manning and Shaw AFB that could form a partnership to establish a regional bioenergy production facility. These entities have worked together in the past, so it is possible that such a partnership could be formed. Economics will play a major role in the ability to obtain partners for a bioenergy production facility and, therefore, economic incentives would help the establishment of a partnership. If a partnership was formed, the City of Sumter would want to take the lead and construct the regional facility on available land at its WWTP.

5.) Potential for Offsite Production and Use of Bioenergy Derived from Available Feedstock

As previously mentioned, the City of Sumter would consider anaerobic digestion, but it does have concerns. The City is very interested in new, innovative processes for capturing energy from biosolids as long as these are proven to be reliable and perform well. The City owns an approximately 200 acre tract of land that is suitable for a bioenergy production facility. However, this tract of land is located adjacent to its WWTP. Since the existing WWTP site has sufficient available land to accommodate a bioenergy production facility, it is more likely that the facility would be located at the existing WWTP site to take advantage of existing infrastructure such as roads and to take advantage of staff already located at the WWTP.

F. City of York – Fishing Creek WWTP

1.) Wastewater Treatment Processes

The City of York/Fishing Creek WWTF is currently permitted for a capacity of 2 mgd; however, plans are underway to expand the plant's capacity to 4 mgd. The Fishing Creek WWTF currently treats approximately 1.2 mgd of wastewater. The original extended aeration WWTF was constructed in 1979. Wastewater currently enters the plant by gravity. The influent wastewater passes through a mechanical bar screen to remove paper, plastics, and other debris and enters the influent pump station. Wastewater is then pumped to the grit removal system where sand and other inorganic particles are removed and flows by gravity through the remainder of the plant. Any flow above 2 mgd is diverted to an equalization basin for storage until flows return below 2 mgd. The equalization basin is capable of storing and aerating/mixing 4 million gallons of wastewater. All wastewater flow below 2 mgd passes from the grit removal system to one of four extended aeration basins equipped with a diffused aeration system. Each of these aeration basins is approximately 400,000 gallons. Following treatment in the aeration basins the wastewater enters one of two secondary clarifiers where solids are allowed to settle. The settled solids are returned to the aeration basin or wasted to the aerobic digester by a submersible pump station. The clarified wastewater then flows to a one of four tertiary filters. Prior to entering the filters, alum is added to the wastewater to precipitate phosphorus, allowing it to be removed by the filters. Following filtration, the wastewater flows to one of two chlorine contact chambers where chlorine is injected into the wastewater and allowed to be in contact with the wastewater for a sufficient period for disinfection to occur. Following the chlorine contact chamber the wastewater is injected with sulfur dioxide to remove the residual chlorine. The wastewater then flows through another Parshall flume to measure the effluent flow prior to discharge into Fishing Creek.

2.) Sludge Handling Processes and Sludge Characteristics

Sludge from the treatment process is wasted from the bottom of the secondary clarifiers to the aerobic digester. Sludge is treated in an approximately 400,000 gallon aerobic digester. Aeration and mixing is supplied by a diffused aeration system. During the summer months, sludge from the WWTF is dewatered on the sludge drying beds. A belt filter press is used to dewater sludge during the remaining nine (9) months of the year. The City is able to achieve high cake solids concentrations with the sludge drying beds. Solids concentrations generally approach 40 percent following dewatering in the sludge drying beds and 21 percent following dewatering by the belt filter press. Dewatered sludge is trucked to an approved landfill for final disposal. Sludge produced at the plant is not required to meet Class B biosolids requirements since the sludge is disposed of in a landfill.

3.) Volume of Waste Available for Anaerobic Digestion

Approximately 320 dry tons of sludge per year are currently produced at the Fishing Creek WWTF that could be available for anaerobic digestion or other process for capturing energy. This estimate is based on the current flow rate of approximately 1.2

mgd. Once flows reach the current design capacity of 2 mgd, the plant will produce approximately 530 dry tons of sludge per year. Following the proposed expansion to 4 mgd, the plant will produce more than 1000 dry tons of sludge per year. Assuming the sludge available for anaerobic digestion or other process for capturing energy is at a solids concentration of 0.5 percent, this equates to approximately 15 million gallons at the current flow rate and approximately 25 million gallons at design flow. This also equates to approximately 50 million gallons following the proposed expansion.

4.) Potential for Onsite Production and Use of Bioenergy Derived from Available Feedstock

The City of York supports the beneficial use of biosolids as long as it is economically feasible. The City would be interested in anaerobic digestion assuming the economics of a conversion to it make sense. Performance would also be a key factor in the decision making process. The City would want to be assured that anaerobic digestion would perform better than the current aerobic digestion process before converting to it. The City would also be interested in the use of new, innovative energy from biosolids production technologies. The use of innovative technologies at the Fishing Creek WWTF would be dependent on proven performance and reliability in addition to the economics of its use.

There is a potential for onsite production and use of bioenergy at the Fishing Creek WWTF. The amount of space required for such a facility will be key in determining if it can be done at the WWTP site. Although there is available land around the existing WWTP, the plant will soon undergo an expansion to 4 mgd, which will utilize a considerable portion of the currently available space. Some additional land is available around the plant particularly adjacent to Fishing Creek, but flooding concerns would have to be addressed before any such facility could be located within this area.

Around the York area, there are other wastewater entities such as the City of Rock Hill and Fort Mill that could form a partnership to establish a regional bioenergy production facility and it appears that the political climate is such that a partnership could be formed.

Economics will play a major role in ability to obtain partners for a bioenergy production facility and, therefore, economic incentives would help the establishment of a partnership. The City of York would be willing to consider constructing the regional facility on available land at its WWTP, if the available land is sufficient in size and suitable for such a facility.

5.) Potential for Offsite Production and Use of Bioenergy Derived from Available Feedstock

As previously mentioned, the City of York is interested in anaerobic digestion as well as new, innovative processes for capturing energy from biosolids as long as these are proven to be reliable and perform well. The City of York would be interested in the offsite production of bioenergy and the use of energy from such a facility. The City of York does own some additional land around the area that may be suitable for a bioenergy production facility. Odor and traffic concerns would have to be addressed before such a facility could be built on one of these tracts of land.

G. Chester Sewer District – Rocky Creek WWTP

1.) Wastewater Treatment Processes

The Chester Sewer District (CSD)/Rocky Creek WWTF is currently permitted for a capacity of 1.36 mgd. The Rocky Creek WWTF currently treats approximately 0.5 mgd of wastewater. Wastewater is pumped to the plant by an influent pump station. The influent wastewater passes through a mechanical bar screen to remove paper, plastics, and other debris and enters an equalization basin to equalize flow and concentration. Wastewater then flows by gravity to one of two aeration basins equipped with diffused aeration systems. Following treatment in the aeration basins, the wastewater enters one of three secondary clarifiers where solids are allowed to settle. The settled solids are returned to the aeration basin or wasted to the aerobic digester by a pump station. The clarified wastewater then flows to one of two chlorine contact chambers where chlorine is injected into the wastewater and allowed to be in contact with the wastewater for a sufficient period for disinfection to occur. Following the chlorine contact chamber, the wastewater is injected with sulfur dioxide to remove the residual chlorine. Following dechlorination, the wastewater flows into one of four tertiary filters. Prior to entering the filters, alum is added to the wastewater to precipitate phosphorus, allowing it to be removed by the filters. Following filtration, the wastewater passes over a cascade aerator to reoxygenate the effluent prior to discharge into Rocky Creek.

2.) Sludge Handling Processes and Sludge Characteristics

Sludge from the treatment process is wasted from the bottom of the secondary clarifiers to the aerobic digester. Sludge is treated in an approximately 375,000 gallon aerobic digester. Aeration and mixing is supplied by a diffused aeration system. A belt filter press is used to dewater sludge to a solids concentration of approximately 17 percent. Dewatered sludge is trucked to an approved landfill for final disposal. Sludge produced at the plant is not required to meet Class B biosolids requirements since the sludge is disposed of in a landfill.

3.) Volume of Waste Available for Anaerobic Digestion

Approximately 130 dry tons of sludge per year are currently produced at the Fishing Creek WWTF that could be available for anaerobic digestion or other process for capturing energy. This estimate is based on the current flow rate of approximately 0.5 mgd. Once flows reach the current design capacity of 1.36 mgd, the plant will produce approximately 360 dry tons of sludge per year. Assuming the sludge available for anaerobic digestion or other process for capturing energy is at a solids concentration of 0.5 percent, this equates to approximately 6 million gallons at the current flow rate and approximately 17 million gallons at design flow.

4.) Potential for Onsite Production and Use of Bioenergy Derived from Available Feedstock

The CSD would be interested in anaerobic digestion assuming the economics of a conversion to it make sense. The City would also be interested in the use of new, innovative energy from biosolids production technologies. The use of innovative technologies at the Rocky Creek WWTF would be dependent on proven performance and reliability in addition to the economics of its use.

There is a potential for onsite production and use of bioenergy at the Rocky Creek WWTF. The amount of space required for such a facility will be key in determining if it can be done at the WWTP site. There is approximately 10 acres of available land at the plant which includes a portion adjacent to Rocky Creek; therefore, flooding concerns would have to be addressed before any such facility could be located within this area.

Around the Chester area, there are other wastewater entities that could form a partnership to establish a regional bioenergy production facility. The City of Rock Hill, the City of Lancaster, the Town of Fort Mill, and the Lancaster County Water and Sewer District are all located in close proximity to the Chester area. It appears that the political climate is such that a partnership could be formed. Economics and reliability will play a major role in ability to obtain partners for a bioenergy production facility. Economic incentives would likely help the establishment of a partnership. The Chester Sewer District would be willing to consider constructing the regional facility on available land at its WWTP, if the available land is sufficient in size and suitable for such a facility.

5.) Potential for Offsite Production and Use of Bioenergy Derived from Available Feedstock

As previously mentioned, the CSD is interested in anaerobic digestion as well as new, innovative processes for capturing energy from biosolids as long as these are proven to be reliable and perform well. The CSD would be interested in the offsite production of bioenergy and the use of energy from such a facility. The CSD does own some additional land around the area that may be suitable for a bioenergy production facility. These areas are located adjacent to the other two WWTPs owned and operated by the CSD. The Sandy River WWTP has approximately 40 acres of available land and the Lando-Manetta WWTP has approximately 10 acres of available land that could be used for a bioenergy production facility.

H. Easley Combined Utilities – Middle Branch WWTP

1.) Wastewater Treatment Processes

The Easley Combined Utilities/Middle Branch WWTP is currently permitted for a capacity of 3.5 mgd. The Rocky Creek WWTF currently treats approximately 2 mgd of wastewater. Wastewater is pumped to the plant by an influent pump station. The influent wastewater passes through a static screen to remove paper, plastics, and other debris. Wastewater then flows by gravity to into an anoxic selector and then into one of two 1.5 million gallon aeration basins. Following treatment in the aeration basins, the wastewater enters one of two secondary clarifiers where solids are allowed to settle. The settled solids are returned to the aeration basin or wasted to the aerobic digester by a pump station. The clarified wastewater then flows into a UV disinfection system. Following UV disinfection, the wastewater is discharged to Middle Branch.

2.) Sludge Handling Processes and Sludge Characteristics

The sludge produced in the plant is wasted from the bottom of the secondary clarifiers to a 1 million gallon aerobic digester. The sludge is treated within the aerobic digester for a sufficient period of time to meet Class B biosolids requirements. After meeting Class B biosolids requirements, the solids are land applied in liquid form.

3.) Volume of Waste Available for Anaerobic Digestion

Approximately 550 dry tons of sludge per year are currently produced at the Middle Branch WWTP that could be available for anaerobic digestion or other process for capturing energy. This estimate is based on the current flow rate of approximately 2 mgd. Once flows reach the current design capacity of 3.5 mgd, the plant will produce approximately 930 dry tons of sludge per year. Assuming the sludge available for anaerobic digestion or other process for capturing energy is at a solids concentration of 0.5 percent, this equates to approximately 26 million gallons at the current flow rate and approximately 45 million gallons at design flow.

4.) Potential for Onsite Production and Use of Bioenergy Derived from Available Feedstock

Easley Combined Utilities is interested in anaerobic digestion as well as new, innovative processes for capturing energy from biosolids as long as these are proven to be reliable and perform well. In either case, the economics of their construction and use will play a major role in any decision on whether or not to adopt these technologies. In fact, Easley Combined Utilities would not be interested in any technology that would cost more money, no matter what other benefits may be derived.

Easley Combined Utilities is very interested in the possibility of using energy derived from biosolids at the plant in an effort to offset the high energy costs required to run the plant. There are approximately 30 acres of available land at the Middle Branch WWTP that would be suitable for a bioenergy production facility. Easley Combined Utilities operates several other WWTPs in the area. If a bioenergy production facility were built at the Middle Branch WWTP, solids from these facilities would likely be processed in this plant as well to help improve the economics.

Around the Easley area, there are numerous entities that could form a partnership to establish a regional bioenergy production facility. Western Carolina Water Authority, Pickens County, the City of Pickens, the Town of Clemson are all located in close proximity to Easley. Solids from these entities could be trucked to the Middle Branch WWTP for processing through a bioenergy production facility. The political climate in the area is such that a partnership could likely be formed and, in fact, Easley Combined Utilities is more interested in a regional bioenergy production facility plant than such a facility processing sludge from its plants alone. Economic incentives should help the formation of a partnership.

5.) Potential for Offsite Production and Use of Bioenergy Derived from Available Feedstock

As previously mentioned, Easley Combined Utilities is interested in anaerobic digestion and new, innovative processes for capturing energy from biosolids as long as these are proven to be reliable and perform well. Easley Combined Utilities would be interested in the offsite production of bioenergy and the use of energy from such a facility. Easley Combined Utilities does own some additional land around the area that may be suitable for a bioenergy production facility. One tract of land is approximately 20 acres and another is approximately 50 acres. Odor and traffic concerns would have to be addressed before such a facility could be built on one of these tracts of land.

I. Grand Strand Water and Sewer Authority – Schwartz WWTP

1.) Wastewater Treatment Processes

The wastewater at the Grand Strand Water and Sewer Authority (GSWSA)/Schwartz WWTP is pumped to the plant. The wastewater flows through a mechanical bar screen to remove paper, plastics, and other trash. From the bar screen, the wastewater flows through an aerated grit removal system to remove sand and other inorganic particles. The flow then splits to two different sides of the plant. Wastewater treated on the old side of the plant flows to a pre-aeration basin and then into one of two primary clarifiers to settle some additional solids. From the primary clarifiers, the wastewater flows into the rotating biological contactor (RBC) portion of the plant and then to one of two secondary clarifiers. The clarified effluent flows to an effluent structure and then through a sand filter for further polishing. The filtered effluent is then pumped to the GSWSA's tree farm for application. Flow from the effluent structure and the tree farm pump station can be diverted to the new side of the plant. Wastewater treated on the new side of the plant flows to an Orbal aeration basin for treatment. Following treatment, the wastewater enters a secondary clarifier where the solids settle to the bottom. The settled solids are either returned to the Orbal treatment basin or wasted to the aerobic digesters. The clarified effluent flows to the UV disinfection system. Following UV disinfection, the wastewater is aerated and pumped to the Waccamaw River for discharge.

2.) Sludge Handling Processes and Sludge Characteristics

All of the sludge produced in the plant is wasted from the primary clarifiers, which are located on the RBC side of the plant. The sludge is thickened in one of two rotary drum thickeners and then discharged into an 800,000 gallon aerobic digester. The sludge can bypass the drum thickeners to allow for control over the percent solids concentration going to the aerobic digester. Solids are periodically transferred to two 400,000 gallon aerobic digesters to allow sufficient digestion to meet Class B biosolids requirements. After meeting Class B biosolids requirements, a portion of the sludge is applied to the GSWSA's sod form in liquid form. The remaining portion of solids produced at the Schwartz WWTP are dewatered with a belt filter press and spread on the GSWSA's tree farm.

3.) Volume of Waste Available for Anaerobic Digestion

Approximately 2100 dry tons of sludge per year are currently produced that could be available for anaerobic digestion or other process for capturing energy. This estimate is based on the current flow rate of approximately 8 mgd. Once flows reach the current design capacity of 14.35 mgd, the plant will produce approximately 3800 dry tons of sludge per year. Assuming the sludge available for anaerobic digestion or other process for capturing energy is at a solids concentration of 0.5 percent, this equates to approximately 101 million gallons at the current flow rate and approximately 182 million gallons at design flow.

4.) Potential for Onsite Production and Use of Bioenergy Derived from Available Feedstock

There is not a high potential for onsite production of bioenergy at the Schwartz WWTP. Space is extremely limited at this plant. An expansion of any sort would be difficult to accomplish at this time. There is a possibility that some land adjacent to the plant could be purchased to allow for some modest expansion. However, the area that could be purchased is only approximately 15 acres and would be very expensive since it is located along the Grand Strand. Furthermore, the type of process used to derive the bioenergy would need to be carefully evaluated. The plant used to have anaerobic digesters; however, these were removed due to operational difficulties and odor problems. The plant operators indicated that they would not want anaerobic digesters at the plant again. Some other type of process would need to be used at this plant. The GSWSA would be interested in the use of new, innovative energy from biosolids production technologies. The use of innovative technologies at the Schwartz WWTP would be dependent on proven performance and reliability in addition to the economics of its use.

5.) Potential for Offsite Production and Use of Bioenergy Derived from Available Feedstock

There is a high potential for offsite production of bioenergy in this area. The Grand Strand Water and Sewer Authority currently owns approximately 5000 acres in the Bucksport area. The relatively rural character of this area makes it attractive for bioenergy production as the population is not highly dense and the land is not overly priced at this time. The GSWSA currently owns and operates 8 wastewater treatment plants. Sludge from these plants could be taken to a bioenergy production facility for processing.

The sheer number of plants owned and operated by the GSWSA makes them an obvious candidate for a bioenergy production facility. In addition, there are several entities within the area that could form a partnership to establish a regional bioenergy production facility. The City of Georgetown, Georgetown County Water and Sewer District, and North Myrtle Beach are all located within the Grand Strand. The magnitude of biosolids generated within the Grand Strand makes it an ideal candidate location for a bioenergy production facility. It is anticipated that a partnership could be formed assuming the economics are favorable. Economic incentives would certainly assist in the formation of a partnership and the ultimate construction of a bioenergy production facility. The City of Georgetown and Georgetown County Water and Sewer District have formed partnerships in the past. Other issues such as transportation costs and how that relates to which entities to form a partnership with would need to be addressed.

J. Spartanburg Sanitary Sewer District – Fairforest WWTP

1.) Wastewater Treatment Processes

The Spartanburg Sanitary Sewer District (SSSD)/Fairforest WWTP is currently permitted for a capacity of 12 mgd. Plans are underway to expand it to 25 mgd. The Fairforest WWTP currently treats approximately 7.7 mgd of wastewater. Wastewater currently enters the plant by gravity. The influent wastewater passes through a mechanical bar screen to remove paper, plastics, and other foreign material. The wastewater then flows through a grit removal system to remove sand and other inorganic particles. Following screening and grit removal, the wastewater flows through a drum screen to remove additional material. The wastewater then flows into one of four extended aeration basins. Two of these basins have diffused aeration systems to provide aeration and mixing of the wastewater and two have mechanical surface aerators to provide aeration and mixing. Following treatment in the aeration basins, the wastewater enters one of five secondary clarifiers where solids are allowed to settle. The settled solids are returned to the aeration basin or wasted to the aerobic digester. The clarified wastewater then flows to a chlorine contact chamber where chlorine is injected into the wastewater and allowed to be in contact with the wastewater for a sufficient period for disinfection to occur. Following the chlorine contact chamber, the wastewater is injected with sulfur dioxide to remove the residual chlorine. The wastewater is then pumped to the Pacolet River for discharge.

2.) Sludge Handling Processes and Sludge Characteristics

Sludge produced in the treatment process is wasted from the bottom of the secondary clarifiers to an approximately 2.6 million gallon aerobic digester. In order to meet Class B biosolids requirements, the sludge from the digester is alkaline stabilized. Following stabilization, the sludge is dewatered using a centrifuge and the dewatered solids is land applied.

3.) Volume of Waste Available for Anaerobic Digestion

Approximately 2100 dry tons of sludge per year are currently produced at the Fairforest WWTP that could be available for anaerobic digestion or other process for capturing energy. This estimate is based on the current flow rate of approximately 7.7 mgd. Once flows reach the current design capacity of 10 mgd, the plant will produce approximately 2700 dry tons of sludge per year. Following the proposed expansion to 25 mgd, the plant will produce approximately 6700 dry tons of sludge per year. Assuming the sludge available for anaerobic digestion or other process for capturing energy is at a solids concentration of 0.5 percent, this equates to approximately 101 million gallons at the current flow rate and approximately 129 million gallons at design flow. This also equates to 321 million gallons following the proposed expansion.

4.) Potential for Onsite Production and Use of Bioenergy Derived from Available Feedstock

The SSSD is interested in anaerobic digestion as well as new, innovative processes for capturing energy from biosolids as long as these are proven to be reliable and perform well. In either case, the economics of their construction and use will play a major role in any decision on whether or not to adopt these technologies.

The SSSD is very interested in the possibility of using energy derived from biosolids at the plant in an effort to offset the high energy costs required to run the plant. There is some available land at the Fairforest WWTP that would be suitable for a bioenergy production facility. The SSSD operates 13 other WWTPs in the area. If a bioenergy production facility were built at the Fairforest WWTP, solids from these facilities would likely be processed in this plant as well to help improve the economics. The SSSD is very interested in a regional approach within its own organization.

Around the Spartanburg area, there are numerous entities that could form a partnership to establish a regional bioenergy production facility. Western Carolina Water Authority, Greer CPW, the Town of Lyman all located in close proximity to the Spartanburg area. Solids from these entities could be trucked to the Fairforest WWTP for processing through a bioenergy production facility. The political climate in the area is such that a partnership could likely be formed, but economics will drive the decision. Economic incentives should help the formation of a partnership.

5.) Potential for Offsite Production and Use of Bioenergy Derived from Available Feedstock

As previously mentioned, the SSSD is interested in anaerobic digestion and new, innovative processes for capturing energy from biosolids as long as these are proven to be reliable and perform well. The SSSD would be interested in the offsite production of bioenergy and the use of energy from such a facility. The SSSD does own some additional land around the area that may be suitable for a bioenergy production facility. One tract of land is approximately 60 acres. The SSSD owns numerous other small tracts of land associated with the closure of former wastewater facilities. Odor and traffic concerns would have to be addressed before such a facility could be built on one of these tracts of land.

IV. STATE WIDE ORGANIC WASTE ESTIMATES

It is estimated that WWTPs within SC, excluding purely industrial WWTPs, currently produce approximately 100,000 dry tons of sludge per year that could be available for anaerobic digestion or other process capable of capturing energy. Assuming this sludge has a solids concentration of 0.5 percent, this equates to approximately 4.8 billion gallons. It is also estimated that once these WWTPs reach their current design capacity these plants will produce approximately 210,000 dry tons of sludge per year that could be available for anaerobic digestion or other process capable of capturing energy. Assuming this sludge has a solids concentration of 0.5 percent, this equates to approximately 10 billion gallons.

Based on current flows at these plants, there are 24 "large" plants producing greater than 1000 dry tons of sludge per year (or greater than approximately 48 million gallons of sludge at 0.5 percent solids), 86 "medium" plants producing between 100 and 1000 dry tons of sludge per year (or between approximately 4.8 million and 48 million gallons of sludge at 0.5 percent solids), and 211 "small" plants producing less than 100 dry tons of sludge per year (or less than 4.8 million gallons of sludge at 0.5 percent solids). Based on the permitted flows at these plants (or the maximum flow allowed with current plant design), there will be 55 "large" plants producing greater than 1000 dry tons of sludge per year (or greater than approximately 48 million gallons of sludge at 0.5 percent solids), 94 "medium" plants producing between 100 and 1000 dry tons of sludge per year (or between approximately 4.8 million and 48 million gallons of sludge at 0.5 percent solids), and 172 "small" plants producing less than 100 dry tons of sludge per year (or less than 4.8 million gallons of sludge at 0.5 percent solids). Table A.1 in the Appendix includes detailed flow and sludge production information for each WWTP located in SC.

This analysis includes only WWTPs treating municipal or mixed municipal/industrial (i.e., no industrial only) plant. Therefore, it is assumed that the majority of these plants will have sludge available for anaerobic digestion or other process capable of capturing energy that is of similar quality. However, some variability between WWTPs should be expected.

Within SC, there are currently 3 counties that produce 10,000 dry tons of sludge or more per year that could be available for anaerobic digestion or other process for capturing energy. There are also 19 counties currently produce between 1000 to 10,000 dry tons of sludge per year that could be available for anaerobic digestion or other process for capturing energy and 24 counties will produce less than 1000 dry tons of sludge per year that could be available for anaerobic digestion or other process for capturing energy. Figure 2 presents a map of South Carolina with the estimated solids production for each county based on current flows.

Once the WWTPs within SC reach their design capacity, it is estimated that 5 counties will produce 10,000 dry tons of sludge or more per year that could be available for anaerobic digestion or other process for capturing energy. It is also estimated that 31 counties will produce between 1000 to 10,000 dry tons of sludge per year that could be available for anaerobic digestion or other process for capturing energy and 10 counties will produce less than 1000 dry tons of sludge per year that could be available for anaerobic digestion or other process for capturing energy. Figure 3 presents a map of South Carolina with the estimated solids production for each county based on current design capacity.

V. CONCLUSIONS

The following is a summary of the conclusions from this study.

- Anaerobic digestion produces "biogas" which is a mixture of methane, carbon dioxide, hydrogen sulfide, nitrogen, hydrogen, methylmercaptans, and oxygen.
- Methane comprises between 55 and 80 percent of the biogas, with 65% typical.
- 1 cubic foot of biogas (at 65 percent methane) contains approximately 600 BTUs or approximately 0.180 kWh of energy.
- 1 ton of sludge will generate approximately 25,000 cubic feet of biogas or approximately 15,000,000 BTUs or approximately 4400 kWh of energy.
- 1 gallon of sludge (at 0.5 percent solids) will generate approximately 0.5 cubic feet of biogas or approximately 300 BTUs or approximately 0.09 kWh of energy.
- SC has 321 municipal wastewater treatment plants.
- Based on current flows at these plants, there are 24 plants producing greater than 1000 dry tons of sludge per year, 86 plants producing between 100 and 1000 dry tons of sludge per year, and 211 plants producing less than 100 dry tons of sludge per year.
- Based on the permitted flows at these plants (or the maximum flow allowed with current plant design), there would be 55 plants producing greater than 1000 dry tons of sludge per year, 94 plants producing between 100 and 1000 dry tons of sludge per year, and 172 plants producing less than 100 dry tons of sludge per year.
- Currently, there is approximately 100,000 dry tons of sludge produced in SC annually. This equates to 1.5 trillion BTUs or approximately 0.44 billion kWh of energy. This would produce enough energy for approximately 44,000 households, assuming each household utilizes 10,000 kWh per year.
- At design capacity, there would be approximately 210,000 dry tons of sludge produced in SC annually. This equates to 3.15 trillion BTUs or approximately 0.92 billion kWh of energy. This would produce enough energy to heat approximately 92,000 households, assuming each household utilizes 10,000 kWh per year.

- The following "large" plants were studied in detail.
  - City of Florence – Pee Dee River WWTP
  - City of Sumter – Pocotaligo WWTP
  - City of York – Fishing Creek WWTP
  - City of Camden WWTP
  - Beaufort Jasper Water and Sewer Authority – Cherry Point WWTP
  - Grand Strand Water and Sewer Authority – Schwartz WWTP
  - Chester Sewer District – Rocky Creek WWTP
  - Easley Combined Utilities – Middle Branch WWTP
  - Charleston Commissioners of Public Works – Plum Island WWTP
  - Spartanburg Sanitary Sewer District – Fairforest WWTP
- All WWTPs were possibly interested in anaerobic digestion except for the Grand Strand Water and Sewer Authority's Schwartz WWTP. Ultimate use would be predicated on performance and economics.
- Each WWTP expressed interest in alternative energy production and use. This would be new technologies other than anaerobic digestion and methane collection. Ultimate use would be predicated on performance and economics.
- All WWTPs were very interested in the production of energy from biosolids and the use of that energy at the plant.
- All WWTPs believed that the political environment was such that a regional facility could possibly be created in their areas.
- The Grand Strand area, the greater Charleston area, the Beaufort area, the Spartanburg area, and the greater Greenville/Spartanburg area appeared to be most promising locations for a regional facility due to the number of plants within close proximity. It could be assumed that the greater Columbia area would also be a good candidate location although it was not studied in detail.

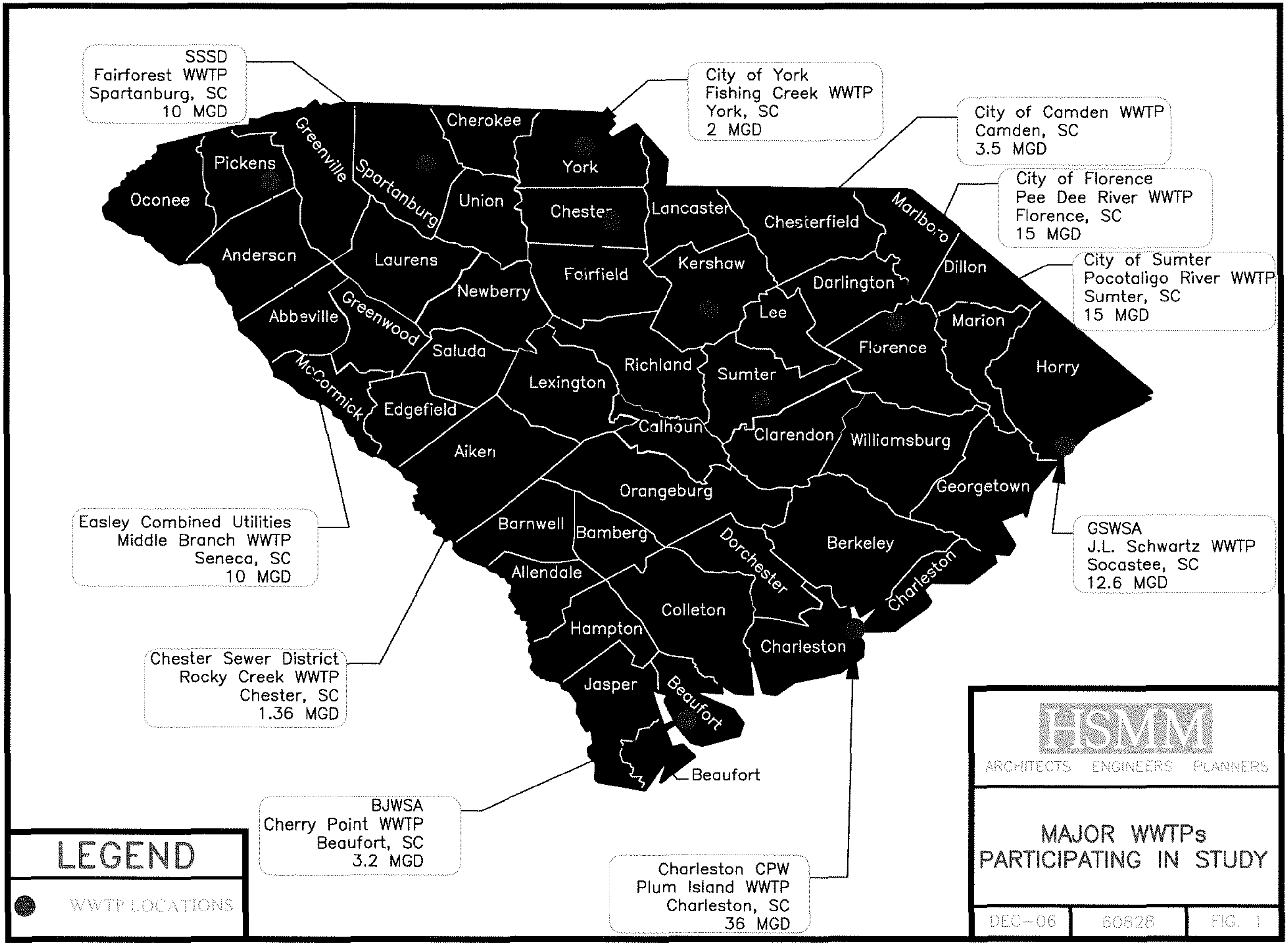
VI. REFERENCES

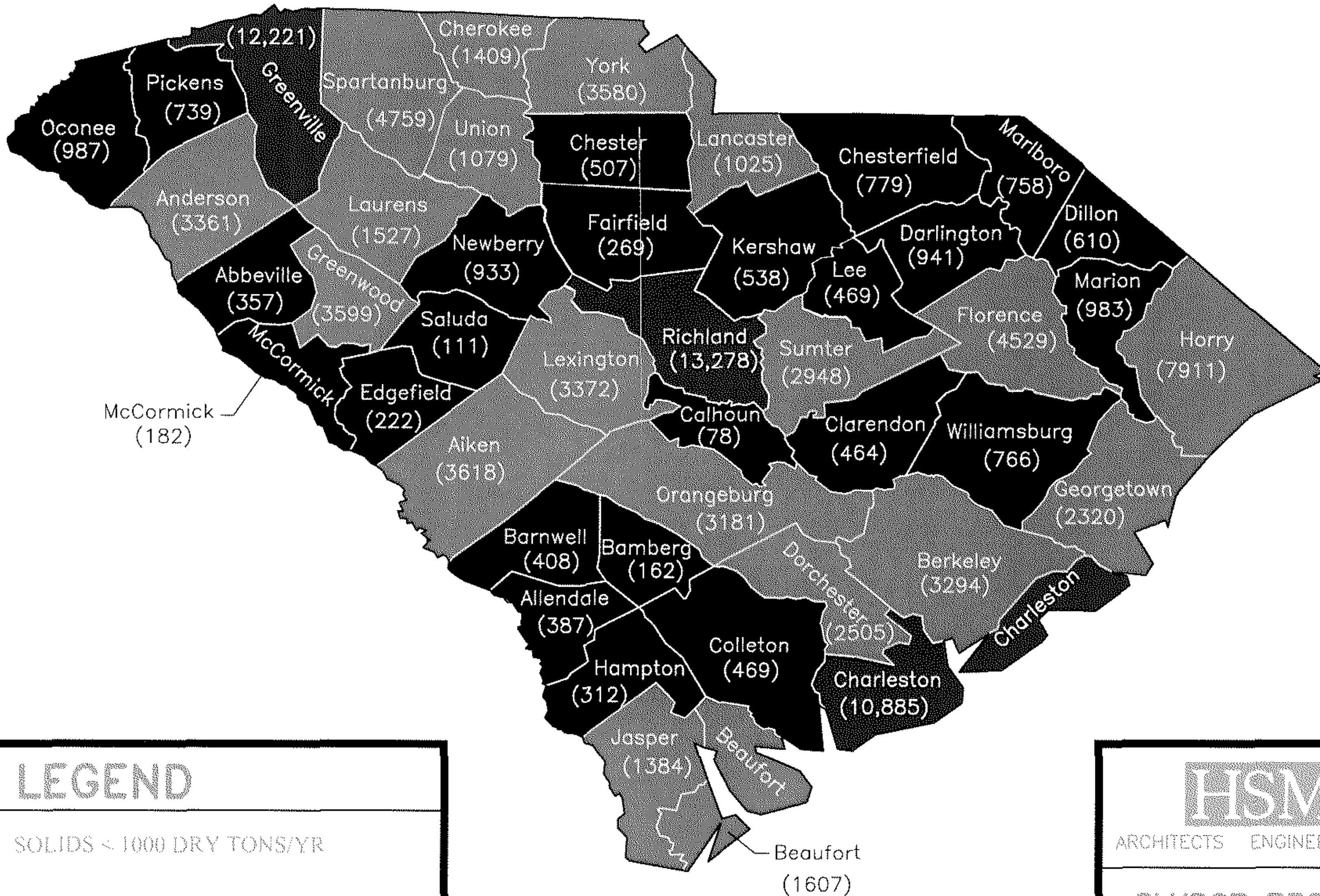
1. SC Office of Energy Website. <http://www.energy.sc.gov/PDFs/South%20Carolina%20Biomass%20Committee.ppt%20-%20Rigas%20III.ppt#262,1,South Carolina Biomass Council>. Accessed July 17, 2006.

2. SC Office of Energy Website. <http://www.energy.sc.gov/Renewable%20energy/renewable_index.htm>. Accessed July 17, 2006.

3. US Department of Energy Website. http://www1.eere.energy.gov/biomass/. Accessed July 17, 2006.

FIGURES


SSSD
Fairforest WWTP
Spartanburg, SC
10 MGD
City of York
Fishing Creek WWTP
York, SC
2 MGD
City of Camden WWTP
Camden, SC
3.5 MGD
City of Florence
Pee Dee River WWTP
Florence, SC
15 MGD
City of Sumter
Pocotaligo River WWTP
Sumter, SC
15 MGD
GSWSA
J.L. Schwartz WWTP
Socastee, SC
12.6 MGD
Easley Combined Utilities
Middle Branch WWTP
Seneca, SC
10 MGD
Chester Sewer District
Rocky Creek WWTP
Chester, SC
1.36 MGD
BJWSA
Cherry Point WWTP
Beaufort, SC
3.2 MGD
Charleston CPW
Plum Island WWTP
Charleston, SC
36 MGD
Oconee
Pickens
Greenville
Spartanburg
Cherokee
York
Union
Chester
Lancaster
Chesterfield
Marlboro
Dillon
Anderson
Laurens
Fairfield
Kershaw
Darlington
Newberry
Abbeville
Greenwood
Lee
Marion
Saluda
Florence
Richland
Horry
McCormick
Lexington
Sumter
Edgefield
Calhoun
Clarendon
Williamsburg
Aiken
Orangeburg
Georgetown
Barnwell
Bamberg
Dorchester
Berkeley
Allendale
Charleston
Colleton
Hampton
Charleston
Jasper
Beaufort
Beaufort
LEGEND
WWTP LOCATIONS
HSMM
ARCHITECTS ENGINEERS PLANNERS
MAJOR WWTPs
PARTICIPATING IN STUDY
DEC-06
60828
FIG. 1



LEGEND

- SOLIDS < 1000 DRY TONS/YR
- 1,000 ≤ SOLIDS < 10,000 DRY TONS/YR
- SOLIDS ≥ 10,000 DRY TONS/YR

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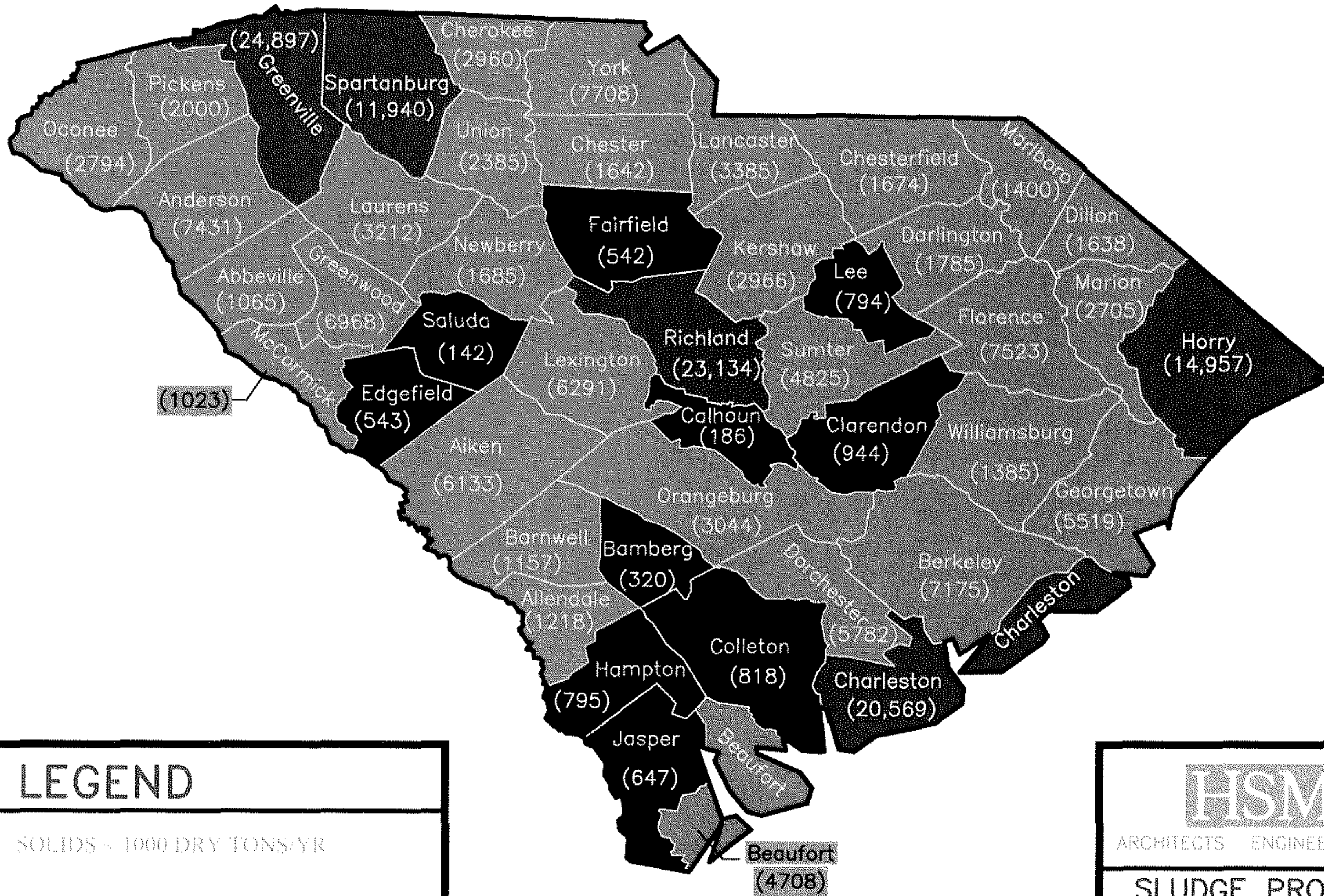
ARCHITECTS ENGINEERS PLANNERS

SLUDGE PRODUCTION BASED ON CURRENT FLOW (DRY TONS)

DEC-06	60828	FIG. 2



LEGEND

- SOLIDS < 1000 DRY TONS/YR
- 1,000 ≤ SOLIDS < 10,000 DRY TONS/YR
- SOLIDS ≥ 10,000 DRY TONS/YR

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ARCHITECTS ENGINEERS PLANNERS

SLUDGE PRODUCTION BASED ON DESIGN CAPACITY (DRY TONS)

DEC-06	60828	FIG. 3

APPENDIX

Table A.1 - Detailed Flow And Sludge Production Information For WWTPs

NPDES Permit No.	County	Facility Name	Design Capacity (mgd)	Average Daily Flow (mgd)	Sludge Production Based on Design Capacity (dry tons)	Sludge Production Based on Current Flow (dry tons)
SC0040614	Abbeville	Abbeville/Long Cane Creek WWTP	1.70	0.65	517.50	198.48
SC0025721	Abbeville	Town of Calhoun Falls WWTP	1.50	0.44	456.62	134.38
SC0022403	Abbeville	Due West WWTF	0.30	0.08	91.32	23.80
			3.50	1.17	1065.44	356.65
SC0024457	Aiken	Aiken PSA/Horse Creek WWTF	20.00	11.84	6088.20	3603.45
SC0026204	Aiken	Town of Wagener WWTP	0.13	0.04	39.57	11.06
SC0032638	Aiken	GTX Prop, LLC/Castlewood MH Est	0.02	0.01	5.27	3.16
			20.15	11.88	6133.04	3617.68
SC0039918	Allendale	Allendale WWTF	4.00	1.27	1217.64	386.60
			4.00	1.27	1217.64	386.60
SC0023752	Anderson	Anderson/Generostee Creek WWTP	6.20	3.81	1887.34	1159.53
SC0023744	Anderson	Anderson/Rocky River WWTP	6.10	2.66	1856.90	809.45
SC0039853	Anderson	Easley/Middle Branch WWTP	3.50	1.96	1065.44	595.16
SC0045896	Anderson	Belton Ducworth Saluda WWTP	2.50	0.28	761.03	86.45
SC0035700	Anderson	Pendleton-Clemson Reg WWTF	2.00	0.88	608.82	267.23
SC0023906	Anderson	WCRSA/Piedmont WWTP	1.20	0.18	365.29	54.63
SC0046841	Anderson	Williamston/Big Creek East WWTP	1.00	0.56	304.41	170.22
SC0040193	Anderson	Anderson Co WW Management/6&20 WWTP	0.50	0.10	152.21	31.62
SC0025828	Anderson	Iva/Westside WWTF B	0.38	0.12	115.07	36.28
SC0048372	Anderson	Jacabb Utils/Rocky Ford SD	0.30	0.15	91.32	45.66
SC0025810	Anderson	Iva/Eastside WWTF A	0.25	0.05	74.58	14.05
SC0040797	Anderson	Town of Pelzer WWTP	0.20	0.13	60.88	39.43
SC0025194	Anderson	West Pelzer WWTF	0.20	0.11	60.88	33.35
SC0021849	Anderson	Harbor Gate Condos	0.04	0.01	11.42	3.19
SC0023311	Anderson	Shanti Hospitality Inc (Econo Lodge WWTF)	0.03	0.01	7.61	4.45
SC0021873	Anderson	Shoals Sewer Company	0.02	0.02	5.78	5.90
SC0028525	Anderson	Jacabb Utils/Forest Hills SD	0.01	0.00	2.44	0.16
SC0024716	Anderson	United Util/Chambert Forest SD	ND	0.01	ND	4.12
			24.41	11.04	7431.41	3360.39
SC0040215	Bamberg	City of Denmark	1.00	0.51	304.41	156.08
SC0042099	Bamberg	Ehrhardt WWTP	0.05	0.02	15.22	5.82

Table A.1 - Detailed Flow And Sludge Production Information For WWTPs

NPDES Permit No.	County	Facility Name	Design Capacity (mgd)	Average Daily Flow (mgd)	Sludge Production Based on Design Capacity (dry tons)	Sludge Production Based on Current Flow (dry tons)
			1.06	0.53	319.63	161.90
SC0047872	Barnwell	City of Barnwell WWTP	3.00	1.07	913.23	326.49
SC0026417	Barnwell	Blackville WWTF	0.80	0.27	243.53	81.07
			3.80	1.34	1156.76	497.56
SC0042501	Beaufort	South Island PSD WWTP	5.00	2.82	1522.05	857.45
SC0048348	Beaufort	BJW&SA/Port Royal Water Reclamation Facility	4.80	0.00	1461.17	0.00
SC0046191	Beaufort	Hilton Head No 1 PSD WWTP	3.20	0.81	974.11	245.32
SC0021016	Beaufort	BJW&SA/Southside WWTP	2.00	1.33	608.82	404.74
SC0042609	Beaufort	BJW&SA/Shell Point WWTP	0.40	0.32	121.76	96.09
SC0047228	Beaufort	Brays Island Plantation WWTP	0.06	0.01	17.96	2.46
SC0027481	Beaufort	James J Davis Elem School	0.01	0.00	2.44	0.96
			15.47	5.28	4708.31	1607.02
SC0046060	Berkeley	BCW&SA/Lower Berkeley WWTF	18.00	8.67	5479.38	2640.71
SC0047074	Berkeley	Charleston CPW/Daniel Island	2.00	0.42	608.82	128.82
SC0021598	Berkeley	Moncks Corner WWTF	1.60	1.16	487.06	353.12
SC0039764	Berkeley	BCW&SA/Central Berkeley WWTP	0.98	0.11	296.80	34.22
SC0025259	Berkeley	BCW&SA/St. Stephens WWTP	0.90	0.41	273.97	125.56
SC0027090	Berkeley	Macedonia Elem & Middle School	0.03	0.01	9.07	3.16
SC0027103	Berkeley	Cross High School	0.02	0.00	4.81	1.40
SC0034479	Berkeley	Berkeley Co. Schools/Cross Elementary	0.02	0.01	4.57	2.19
SC0032859	Berkeley	Strawberry MHP	0.02	0.01	4.57	2.46
SC0033073	Berkeley	Carolina Low Country Girl Scouts	0.01	0.01	3.65	1.83
SC0026867	Berkeley	Oakley Maintenance Facility	0.01	0.00	2.28	0.24
			23.57	10.82	7174.97	3293.70
SC0028801	Calhoun	St Matthews/South WWTP	0.55	0.23	167.43	70.71
SC0040339	Calhoun	SC Dept of Trans/I-26 Rest Stop	0.06	0.02	18.26	6.97
			0.61	0.26	185.69	77.68
SC0021229	Charleston	Charleston CPW/Plum Island	36.00	21.45	10958.76	6530.98
SC0024783	Charleston	NCSD/Felix C Davis WWTP	27.00	12.39	8219.07	3770.12
SC0040771	Charleston	Mt. Pleasant/ Rifle Range WWTF	3.70	1.21	1126.32	369.83
SC0020052	Charleston	Sullivans Island WWTF	0.57	0.55	173.51	167.67

Table A.1 - Detailed Flow And Sludge Production Information For WWTPs

NPDES Permit No.	County	Facility Name	Design Capacity (mgd)	Average Daily Flow (mgd)	Sludge Production Based on Design Capacity (dry tons)	Sludge Production Based on Current Flow (dry tons)
SC0025283	Charleston	Isle of Palms/Forest Trail SD	0.30	0.15	91.32	46.69
			67.57	35.76	20568.98	10885.28
SC0031551	Cherokee	Gaffney/Clary WWTF	5.00	2.69	1522.05	817.70
SC0047091	Cherokee	Gaffney/Peoples Creek-Broad River WWTP	4.00	1.66	1217.64	505.78
SC0047457	Cherokee	Blacksburg/Canoe Creek WWTP	0.68	0.26	207.00	79.31
SC0023736	Cherokee	United Util/Briarcreek S/D #1	0.02	0.01	6.94	4.05
SC0026409	Cherokee	United Util/Briarcreek SD #2	0.02	0.01	6.09	2.35
			9.72	4.63	2959.72	1409.19
SC0036081	Chester	Chester/Sandy River WWTF	2.13	0.86	649.31	262.06
SC0021211	Chester	Great Falls WWTF	1.40	0.23	426.17	68.91
SC0036056	Chester	Chester/Rocky Creek Plant	1.36	0.48	414.00	146.91
SC0001741	Chester	Chester/Lando-Manetta Plant	0.50	0.10	152.21	29.56
			5.39	1.67	1641.68	507.44
SC0020249	Chesterfield	Cheraw WWTF	4.00	1.84	1217.64	560.23
SC0021539	Chesterfield	Pageland/Southeast WWTF	0.60	0.37	182.65	112.67
SC0025232	Chesterfield	Chesterfield/Thompson Creek WWTP	0.45	0.12	136.98	37.40
SC0021504	Chesterfield	Pageland/Northwest WWTF	0.30	0.14	91.32	42.51
SC0024767	Chesterfield	Jefferson WWTF	0.15	0.09	45.66	26.62
			5.50	2.56	1674.26	779.43
SC0020419	Clarendon	Manning WWTF	2.50	1.26	761.03	383.04
SC0025755	Clarendon	Turbeville WWTF	0.60	0.26	182.65	80.53
			3.10	1.52	943.67	463.57
SC0040436	Colleton	Walterboro WWTF	2.64	1.52	803.64	463.53
SC0048305	Colleton	Bonnie Doone Plantation	0.02	0.01	5.57	2.79
SC0033766	Colleton	Ruffin High School/Colleton BD ED	0.02	0.00	4.57	0.96
SC0037788	Colleton	Bolen Point SD/Cargilsell	0.01	0.01	3.04	1.52
SC0038989	Colleton	James W Williams Facility (Ivenia Brown Elem School)	0.00	0.00	1.22	0.61
			2.69	1.54	818.04	469.41
SC0021580	Darlington	Hartsville WWTF	3.50	1.58	1065.44	481.52
SC0039624	Darlington	Darlington/Black Creek WWTF	1.60	1.04	487.06	316.66

Table A.1 - Detailed Flow And Sludge Production Information For WWTPs

NPDES Permit No.	County	Facility Name	Design Capacity (mgd)	Average Daily Flow (mgd)	Sludge Production Based on Design Capacity (dry tons)	Sludge Production Based on Current Flow (dry tons)
SC0043702	Darlington	Lamar WWTF	0.65	0.43	197.87	131.15
SC0043231	Darlington	DCW&SA/Swift Creek WWTF	0.11	0.04	34.70	11.44
			5.86	**3.09**	**1785.06**	**940.78**
SC0021776	Dillon	Dillon/Little Pee Dee WWTP	4.00	1.26	1217.64	382.04
SC0025402	Dillon	Town of Latta WWTP	1.00	0.45	304.41	136.79
SC0022284	Dillon	Lake View WWTF	0.20	0.20	60.88	61.00
SC0031801	Dillon	South of the Border Motel	0.18	0.10	54.79	30.50
			5.38	**2.00**	**1637.73**	**610.33**
SC0037541	Dorchester	Summerville WWTF	10.00	5.59	3044.10	1701.93
SC0038822	Dorchester	Dorchester Co/ Lower Dorchester WWTP	8.00	1.86	2435.28	565.93
SC0025844	Dorchester	Town of St. George WWTP	0.80	0.57	243.53	173.18
SC0038504	Dorchester	Town of Harleyville WWTP	0.15	0.07	45.66	20.36
SC0030350	Dorchester	CWS/Teal-on-the-Ashley	0.03	0.03	9.13	7.68
SC0039063	Dorchester	Middleton Inn	0.01	0.00	4.26	0.47
SC0021911	Dorchester	CWS/Kings Grant on the Ashley	ND	0.12	ND	35.70
			18.99	**8.23**	**5781.96**	**2505.24**
SC0025691	Edgefield	ECW&SA/ Johnston #1 Plant	0.97	0.42	294.67	126.66
SC0025330	Edgefield	ECW&SA/Brooks Street WWTP	0.73	0.27	220.70	83.10
SC0025682	Edgefield	ECW&SA/Trenton WWTF	0.08	0.04	22.83	11.42
SC0032492	Edgefield	ECW&SA/ Land-O-Lakes SD	0.02	0.00	4.57	0.82
SC0047813	Edgefield	Federal Pacific Electric	ND	ND	ND	ND
			1.78	**0.73**	**542.76**	**222.00**
SC0020125	Fairfield	Winnsboro/Jackson Creek WWTP	1.60	0.79	487.06	238.96
SC0022900	Fairfield	Town of Ridgeway WWTP	0.12	0.08	36.53	24.33
SC0035980	Fairfield	White Oak Conference Center	0.06	0.02	18.26	5.39
			1.78	**0.88**	**541.85**	**268.68**
SC0045462	Florence	Florence/Pee Dee River WWTP	15.00	9.04	4566.15	2751.87
SC0046311	Florence	Lake City/Lake Swamp WWTP	5.20	2.96	1582.93	900.26
SC0025933	Florence	Johnsonville/East WWTP	3.00	1.85	913.23	562.59
SC0025356	Florence	Town of Timmonsville WWTP	1.29	0.74	392.69	225.10

Table A.1 - Detailed Flow And Sludge Production Information For WWTPs

NPDES Permit No.	County	Facility Name	Design Capacity (mgd)	Average Daily Flow (mgd)	Sludge Production Based on Design Capacity (dry tons)	Sludge Production Based on Current Flow (dry tons)
SC0021351	Florence	Town of Pamplico WWTP	0.20	0.28	60.88	84.75
SC0034703	Florence	Commander Nursing Center	0.03	0.01	7.61	3.99
			24.72	14.88	7523.49	4528.56
SC0040029	Georgetown	City of Georgetown WWTP	12.00	4.35	3652.92	1323.44
SC0039951	Georgetown	GCW&SD/Pawley's Area WWTP	3.50	2.15	1065.44	652.96
SC0040959	Georgetown	GCW&SD/Murrells Inlet WWTF	2.00	0.87	608.82	264.10
SC0029505	Georgetown	GCW&SD/Wedgefield WWTF	0.40	0.09	121.76	26.08
SC0030732	Georgetown	CWS/Whites Creek-Lincolnshire	0.13	0.14	38.05	42.49
SC0042439	Georgetown	GCW&SD/North Santee WWTP	0.05	0.03	15.83	8.23
SC0039101	Georgetown	Georgetown County School District/Pleasant Hill Elem	0.02	0.00	5.48	0.87
SC0039110	Georgetown	Georgetown County School District/Sampit Elem School	0.02	0.00	4.57	0.47
SC0033081	Georgetown	Georgetown County School District/Choppee School	0.01	0.00	3.04	0.32
SC0039195	Georgetown	GCSD/Deep Creek Elem School	0.01	0.00	2.74	1.37
			18.13	7.62	5518.65	2320.34
SC0041211	Greenville	WCRS/Mauldin Road WWTP	29.00	18.84	8827.89	5734.92
SC0033804	Greenville	WCRSA/Pelham WWTF	22.50	5.98	6849.23	1819.54
SC0024261	Greenville	WCRSA/Lower Reedy River WWTP	11.50	5.14	3500.72	1564.94
SC0024309	Greenville	WCRSA/Taylors Area WWTP	7.50	3.50	2283.08	1065.44
SC0040525	Greenville	WCRSA/Gilder Creek WWTP	5.00	3.78	1522.05	1151.22
SC0047309	Greenville	WCRSA/Georges Creek WWTP	3.00	1.15	913.23	350.14
SC0024317	Greenville	WCRSA/Grove Creek WWTP	2.00	1.11	608.82	339.21
SC0026883	Greenville	WCRSA/Marietta WWTP	0.67	0.29	204.56	87.82
SC0026565	Greenville	United Util/N Greenville Coll	0.20	0.05	60.88	16.45
SC0026611	Greenville	United Util/Trollingwood SD	0.10	0.01	30.44	4.12
SC0028673	Greenville	United Util/Valleybrook SD	0.10	0.02	29.22	6.70
SC0028941	Greenville	United Util/Canterbury SD	0.08	0.05	24.35	14.08
SC0029742	Greenville	Asbury Hills Camp & Retreat	0.05	0.00	13.70	0.89
SC0026379	Greenville	Look Up Forest Homes Assoc	0.03	0.00	9.13	0.95
SC0042684	Greenville	Links Water Treatment LLC	0.02	0.00	7.31	0.95
SC0030465	Greenville	Lakeview Steakhouse	0.02	0.20	4.81	61.00

Table A.1 - Detailed Flow And Sludge Production Information For WWTPs

NPDES Permit No.	County	Facility Name	Design Capacity (mgd)	Average Daily Flow (mgd)	Sludge Production Based on Design Capacity (dry tons)	Sludge Production Based on Current Flow (dry tons)
SC0028533	Greenville	Altamont Mobile Home Village	0.01	0.00	4.11	1.49
SC0026662	Greenville	Buck-A-Roo Ranch, Inc.	0.01	0.01	3.07	1.52
			81.79	40.15	24896.60	12221.38
SC0021709	Greenwood	Greenwood/Wilson Creek WWTF	12.00	8.31	3652.92	2530.76
SC0020214	Greenwood	Ware Shoals/Dairy Street WWTP	8.00	1.74	2435.28	530.92
SC0022870	Greenwood	Greenwood/West Alexander WWTF	2.20	1.40	669.70	426.17
SC0036048	Greenwood	Ninety Six WWTP	0.50	0.32	152.21	98.27
SC0034444	Greenwood	United Util/Highland Forest SD	0.08	0.02	22.83	5.02
SC0042706	Greenwood	Ninety Six CPW (Pier 96) WWTP	0.06	0.01	18.26	2.38
SC0032191	Greenwood	Northfall Acres SD	0.04	0.01	11.08	3.36
SC0040380	Greenwood	Driftwood Prop. Owners Assoc	0.02	0.01	6.09	1.83
			22.89	11.82	6968.37	3598.71
SC0042382	Hampton	Town of Brunson WWTP	0.11	0.09	33.49	27.00
SC0021318	Hampton	Town of Hampton WWTP	2.00	0.84	608.82	254.78
SC0025950	Hampton	Town of Yemassee WWTP	0.50	0.10	152.21	29.76
			2.61	1.02	794.51	311.55
SC0039039	Horry	GSW&SA/Myrtle Beach Water Reclamation Facility	17.00	10.32	5174.97	3140.69
SC0037753	Horry	GSW&SA/Schwartz WWTP	12.63	7.36	3845.92	2241.91
SC0041696	Horry	GSW&SA/George R. Vereen WWTP	7.00	1.96	2130.87	596.37
SC0022152	Horry	N Myrtle Beach/Ocean Drive WWTP	4.50	2.07	1369.85	629.58
SC0021733	Horry	GSW&SA/Conway WWTP	4.00	2.47	1217.64	751.34
SC0022161	Horry	N Myrtle Beach/Crescent Beach WWTP	2.90	1.24	882.79	376.89
SC0025348	Horry	GSW&SA/Loris WWTF	0.70	0.46	213.09	140.31
SC0040886	Horry	GSW&SA/J L Bucksport WWTF	0.20	0.05	60.88	14.69
SC0040878	Horry	GSW&SA/Longs WWTP	0.20	0.06	60.88	19.31
			49.13	25.99	14956.88	7911.08
SC0047279	Jasper	BJW&SA/Cherry Point-Okatie Water Reclamation Facility	1.10	4.10	334.85	1247.24
SC0034584	Jasper	BJW&SA/Hardeeville Church Road	1.01	0.45	307.45	135.50
SC0035394	Jasper	Coosawatchie Land Company, LLC	0.01	0.00	3.04	0.31
SC0034550	Jasper	Stuckey's Pecan Shoppe #3	0.01	0.00	1.52	0.76

Table A.1 - Detailed Flow And Sludge Production Information For WWTPs

NPDES Permit No.	County	Facility Name	Design Capacity (mgd)	Average Daily Flow (mgd)	Sludge Production Based on Design Capacity (dry tons)	Sludge Production Based on Current Flow (dry tons)
			2.13	4.55	646.87	1383.81
SC0043451	Kershaw	Palmetto Util Inc Reg WWTP	6.00	0.00	1826.46	0.00
SC0021032	Kershaw	City of Camden WWTF	3.00	1.48	913.23	450.73
SC0039870	Kershaw	Kershaw Co/Lugoff WWTF	0.72	0.28	219.18	85.82
SC0033651	Kershaw	Nosoca Pines Ranch	0.03	0.00	7.61	1.42
			9.75	1.77	2966.48	537.97
SC0046892	Lancaster	Lancaster/Catawba River WWTF	7.50	2.53	2283.08	770.99
SC0047864	Lancaster	Lancaster Co/Indianland WWTP	2.00	0.14	608.82	41.55
SC0025798	Lancaster	Kershaw/Hanging Rock Creek WWTP	0.80	0.44	243.53	132.72
SC0030112	Lancaster	CWS/Lamplighter Village SD	0.63	0.22	191.78	66.32
SC0040118	Lancaster	Heath Springs WWTF	0.15	0.03	45.66	9.96
SC0030210	Lancaster	Buford High School	0.04	0.01	10.65	2.54
SC0027383	Lancaster	McAteer Mobile Home Park	0.01	0.00	1.70	0.82
SC0041807	Lancaster	Saratoga Properties LLC	ND	ND	ND	ND
			11.12	3.37	3385.22	1024.90
SC0020702	Laurens	Laurens Comm of PW/Laurens Sewage Treatment Plant	4.50	2.25	1369.85	684.92
SC0040002	Laurens	WCRSA/Durbin Creek WWTP	3.30	1.26	1004.55	382.81
SC0037974	Laurens	Laurens Co W&S/Clinton-Joanna WWTP	2.75	1.51	837.13	459.51
			10.55	5.02	3211.53	1527.25
SC0035378	Lee	Bishopville WWTF	2.50	1.47	761.03	445.98
SC0042676	Lee	Lyncburg WWTF	0.11	0.08	32.57	23.43
			2.61	1.54	793.60	469.40
SC0024147	Lexington	Cayce WWTF	9.50	5.33	2891.90	1622.01
SC0024465	Lexington	Batesburg-Leesville WWTF	2.50	0.51	761.03	155.62
SC0029483	Lexington	Alpine Utilities/Stoop Creek	2.00	1.57	608.82	477.59
SC0026735	Lexington	Lexington/Conventry Woods SD	1.95	1.02	593.60	309.48
SC0036137	Lexington	CWS/Friarsgate SD	1.20	0.72	365.29	219.01
SC0040631	Lexington	Town of Chapin WWTP	1.20	0.40	365.29	122.94
SC0035564	Lexington	CWS/I-20 Regional	0.80	0.49	243.53	150.05
SC0032743	Lexington	Bush River Utilities	0.40	0.31	121.76	93.19

Table A.1 - Detailed Flow And Sludge Production Information For WWTPs

NPDES Permit No.	County	Facility Name	Design Capacity (mgd)	Average Daily Flow (mgd)	Sludge Production Based on Design Capacity (dry tons)	Sludge Production Based on Current Flow (dry tons)
SC0027162	Lexington	CWS/Watergate Development	0.29	0.20	89.50	59.76
SC0029475	Lexington	Woodland Hills West SD	0.29	0.12	87.67	35.75
SC0031402	Lexington	Piney Grove Util/Lloydwood SD	0.15	0.10	46.88	29.86
SC0030651	Lexington	CWS/Glenn Village II SD	0.13	0.03	39.09	7.77
SC0030988	Lexington	Bellemeade SD	0.08	0.16	24.35	49.30
SC0033685	Lexington	Rolling Meadows MHP	0.07	0.09	21.77	27.20
SC0031321	Lexington	TCH Properties LLC/ Silver Lake	0.04	0.02	11.57	5.99
SC0030473	Lexington	Shandon Terrace/Parkwood MHP	0.04	0.01	10.65	4.24
SC0031178	Lexington	Brookforest Mobile Home Estate	0.03	0.01	8.22	2.43
			20.67	11.08	6290.91	3372.19
SC0046230	Marion	Marion/S Main St WWTF	6.00	1.83	1826.46	557.62
SC0029408	Marion	Mullins/ White Oak Creek WWTF	2.75	1.36	837.13	415.40
SC0041327	Marion	Nichols WWTF	0.14	0.03	41.10	10.41
			8.89	3.23	2704.68	983.43
SC0025178	Marlboro	Bennettsville WWTF	3.90	2.11	1187.20	643.59
SC0041963	Marlboro	McColl WWTF	0.40	0.22	121.76	66.36
SC0040606	Marlboro	Clio WWTF	0.30	0.16	91.32	47.90
			4.60	2.49	1400.29	757.85
SC0030783	McCormick	McCormick/Rocky Creek WWTF	3.35	0.59	1019.77	180.63
SC0021466	McCormick	SC DPRT/Hamilton Branch	0.01	0.00	2.74	1.37
			3.36	0.60	1022.51	182.00
SC0024490	Newberry	Newberry/Bush River WWTF	3.50	2.29	1065.44	696.52
SC0022390	Newberry	Town of Whitmire WWTP	1.00	0.46	304.41	138.65
SC0048313	Newberry	NCW&SA/Cannons Creek WWTP	0.95	0.29	289.19	89.19
SC0048020	Newberry	NCW&SA/Broad River WWTF Phase 1A	0.05	0.01	15.22	4.55
SC0024571	Newberry	Forest Hills SD/Elbo Inc	0.02	0.01	6.09	3.04
SC0032042	Newberry	MII-DERA Garden Apts	0.01	0.00	4.38	1.06
			5.53	3.06	1684.73	933.01
SC0033553	Oconee	Oconee Co/Coneross Creek WWTF	7.80	2.95	2374.40	896.63
SC0022322	Oconee	Keowee Key Utility Systems, Inc	0.90	0.16	273.97	49.96

Table A.1 - Detailed Flow And Sludge Production Information For WWTPs

NPDES Permit No.	County	Facility Name	Design Capacity (mgd)	Average Daily Flow (mgd)	Sludge Production Based on Design Capacity (dry tons)	Sludge Production Based on Current Flow (dry tons)
SC0022357	Oconee	Total Environ/Foxwood Hills SD	0.30	0.04	91.32	12.11
SC0024872	Oconee	SC DPRT/Oconee State Park	0.06	0.01	18.26	2.85
SC0022063	Oconee	Naco/Carolina Landing Campgr	0.04	0.00	12.18	0.76
SC0038644	Oconee	West-Oak HS/Oconee Co. School District	0.03	0.00	9.74	1.37
SC0026727	Oconee	Tamassee DAR School	0.03	0.01	9.44	2.71
SC0026638	Oconee	SC Dept Trans/Welcome Center-F Play	0.02	0.01	4.57	2.18
SC0048259	Oconee	Chickasaw Pointe SD	0.00	0.06	0.00	18.49
			9.18	3.24	2793.87	987.06
SC0024481	Orangeburg	Orangeburg WWTF	9.00	4.05	2739.69	1234.24
SC0040037	Orangeburg	Town of Bowman WWTF	0.24	0.10	71.84	29.83
SC0047821	Orangeburg	Town of North WWTP	0.20	0.10	60.88	31.82
SC0047333	Orangeburg	Town of Branchville WWTP	0.15	0.08	45.66	22.88
SC0023272	Orangeburg	Springfield/Plant #1	0.12	0.06	36.53	18.26
SC0045993	Orangeburg	Town of Norway WWTP	0.11	0.02	33.49	7.04
SC0029645	Orangeburg	CWS/Roosevelt Garden Apts	0.07	0.05	20.58	14.17
SC0023281	Orangeburg	Springfield/Plant #2	0.06	0.04	18.26	12.28
SC0029751	Orangeburg	Southside Assoc	0.03	0.02	9.13	6.78
SC0040185	Orangeburg	Edisto High School	0.02	0.01	5.17	2.67
SC0032671	Orangeburg	Connie Maxwell Children's Home (Brookland Plantation Boys'	0.01	0.00	2.74	1.37
			10.00	4.54	3043.98	1381.36
SC0020010	Pickens	Clemson/Cochran Road WWTP	1.15	0.64	350.07	194.57
SC0042994	Pickens	Pickens Co/Eighteen Mile Creek WWTP	1.00	0.25	304.41	76.42
SC0047856	Pickens	Pickens Co/Middle Reg WWTF	1.00	0.30	304.41	90.96
SC0047716	Pickens	Pickens/12 Mile River & Wolf Creek WWTP	0.95	0.34	289.19	104.47
SC0023043	Pickens	Easley/Georges Creek Lagoon	0.82	0.40	249.62	121.49
SC0023035	Pickens	Easley/Golden Creek Lagoon	0.58	0.15	176.56	44.81
SC0026191	Pickens	Pickens Co-Liberty/Roper WWTP	0.50	0.14	152.21	42.58
SC0026166	Pickens	Pickens Co-Liberty/Cramer WWTP	0.16	0.06	47.79	19.54
SC0024996	Pickens	Pickens Co PSC/Central-North	0.15	0.06	45.66	18.72
SC0029548	Pickens	Heatherwood SD/Madera Utils	0.07	0.03	21.92	9.73

Table A.1 - Detailed Flow And Sludge Production Information For WWTPs

NPDES Permit No.	County	Facility Name	Design Capacity (mgd)	Average Daily Flow (mgd)	Sludge Production Based on Design Capacity (dry tons)	Sludge Production Based on Current Flow (dry tons)
SC0047899	Pickens	Pickens County Stockade WWTP	0.06	0.01	18.26	2.60
SC0024856	Pickens	SC DPRT/Table Rock State Park	0.04	0.00	10.65	1.23
SC0023141	Pickens	Isaqueena Mobile Home Park	0.02	0.01	7.31	3.65
SC0022012	Pickens	Cateechee Village, Inc. WWTF	0.02	0.01	6.09	3.70
SC0038652	Pickens	Pickens Co/Daniel High School	0.02	0.01	6.09	1.54
SC0028762	Pickens	R C Edwards Jr High School	0.02	0.01	5.48	2.28
SC0026557	Pickens	McCall R A Camp	0.01	0.00	3.65	0.68
SC0027049	Pickens	Massingill Trailer Court	0.00	0.00	0.73	0.37
			6.57	2.43	2000.10	739.33
SC0020940	Richland	Columbia/Metro WWTP	60.00	33.26	18264.60	10123.57
SC0038865	Richland	East Rich Co PSD/Gills Creek WWTP	13.00	8.78	3957.33	2671.99
SC0046621	Richland	Richland Co./ Broad River WWTF	2.50	1.42	761.03	433.28
SC0047911	Richland	Richland Co/Eastover Reg WWTP	0.25	0.08	76.10	24.31
SC0039055	Richland	Raintree Acres SD/Midlands UTL	0.14	0.05	42.62	15.36
SC0031399	Richland	Piney Grove UT/Franklin Park	0.04	0.02	12.18	4.62
SC0031500	Richland	Rich Dist 1/ Hopkins Jr. High	0.03	0.00	9.13	1.28
SC0032018	Richland	Cedar Creek MHP	0.02	0.00	4.81	1.48
SC0031496	Richland	Rich Dist 1/Hopkins Elem	0.01	0.00	3.65	0.64
SC0031526	Richland	Rich Dist 1/ Gadsden Elem	0.01	0.01	3.04	1.52
			76.00	43.62	23134.69	13278.05
SC0022381	Saluda	Town of Saluda WWTP	0.47	0.37	141.55	111.47
			0.47	0.37	141.55	111.47
SC0020435	Spartanburg	SSSD/Fairforest WWTP	10.00	7.64	3044.10	2325.69
SC0020427	Spartanburg	SSSD/Lawson WWTP	9.00	0.87	2739.69	264.41
SC0021300	Spartanburg	City of Lyman WWTP	6.00	1.60	1826.46	486.57
SC0046345	Spartanburg	Greer/Maple Creek WWTP	4.50	2.09	1369.85	636.49
SC0048143	Spartanburg	SSSD/Lower Tyger River WWTP	2.50	1.25	761.03	380.51
SC0045624	Spartanburg	SSSD/Cowpens-Pacolet River WWTP	1.50	0.21	456.62	65.03
SC0021601	Spartanburg	City of Inman WWTP	1.00	0.41	304.41	125.75
SC0026875	Spartanburg	SSSD/Page Creek WWTP	1.00	0.38	304.41	116.23

Table A.1 - Detailed Flow And Sludge Production Information For WWTPs

NPDES Permit No.	County	Facility Name	Design Capacity (mgd)	Average Daily Flow (mgd)	Sludge Production Based on Design Capacity (dry tons)	Sludge Production Based on Current Flow (dry tons)
SC0047732	Spartanburg	SSSD/S Tyger River Reg WWTP	1.00	0.05	304.41	16.19
SC0045802	Spartanburg	Woodruff/Enoree River WWTP	0.70	0.32	213.09	97.73
SC0025763	Spartanburg	Chesnee WWTF	0.50	0.17	152.21	50.37
SC0036773	Spartanburg	SC Dept Corr/Tyger River Corre	0.35	0.18	106.54	53.47
SC0044717	Spartanburg	SSSD/Pacolet Mills WWTP	0.30	0.11	91.32	33.21
SC0042668	Spartanburg	SSSD/Clifton WWTP	0.29	0.15	88.28	46.77
SC0024414	Spartanburg	City of Inman/Lawson Fork Creek WWTP	0.18	0.06	53.27	18.83
SC0039560	Spartanburg	SSSD/Carolina Country Club WWTP	0.10	0.06	30.44	19.65
SC0035734	Spartanburg	Riverdale Mills W&S Dist WWTP	0.09	0.03	27.40	7.64
SC0000957	Spartanburg	SSSD/Buckeye Forest WWTP	0.09	0.04	26.18	13.09
SC0030554	Spartanburg	SSSD/Idlewood SD	0.08	0.03	24.35	9.69
SC0047759	Spartanburg	SSSD/Community of Fingerville WWTP	0.02	0.00	6.09	1.36
SC0030571	Spartanburg	Wellford Estates Trailer Park (Midway Park Inc.)	0.02	0.01	4.57	2.16
SC0030279	Spartanburg	Spartanburg Wtr Sys WWTP/Simms	0.01	0.00	3.65	0.21
SC0024449	Spartanburg	Spartanburg Boys Home, Inc	0.00	0.00	1.07	0.78
SC0031577	Spartanburg	Tall Tales Fish Camp	0.00	0.00	0.85	0.20
			39.22	15.68	11940.27	4772.01
SC0027707	Sumter	Sumter/Pocataligo River WWTP	15.00	9.25	4566.15	2816.21
SC0045349	Sumter	SC Dept Corr/Wateree River	0.25	0.16	76.10	48.65
SC0030678	Sumter	CWS/Oakland Plantation SD	0.16	0.07	48.71	21.85
SC0046868	Sumter	Town of Pinewood WWTP	0.13	0.07	40.79	21.42
SC0030724	Sumter	CWS/Pocalla Village-Belk SD	0.10	0.04	31.66	11.53
SC0038962	Sumter	Sumter County/Rest Area I-95	0.04	0.02	12.18	5.07
SC0023647	Sumter	Sumter/Twin Lakes SD	0.04	0.02	10.65	7.25
SC0032212	Sumter	Carolina Mobile Court WWTF	0.03	0.01	9.13	2.60
SC0031844	Sumter	Briarcliff MHP	0.03	0.02	7.91	6.09
SC0033235	Sumter	South Forge Apts	0.02	0.01	5.54	3.28
SC0031925	Sumter	Burgess Glenn MHP 1	0.02	0.00	5.48	0.38
SC0032239	Sumter	Burgess Glenn MHP 2	0.02	0.00	5.48	0.94
SC0031895	Sumter	Scenic Lake Park	0.01	0.01	3.04	2.07

Table A.1 - Detailed Flow And Sludge Production Information For WWTPs

NPDES Permit No.	County	Facility Name	Design Capacity (mgd)	Average Daily Flow (mgd)	Sludge Production Based on Design Capacity (dry tons)	Sludge Production Based on Current Flow (dry tons)
SC0031704	Sumter	High Hills Rural/Harwood MHP	0.01	0.00	2.19	0.53
			15.85	9.68	4825.02	2947.88
SC0047244	Union	Union/Tosch's Creek WWTP	6.00	3.00	1826.46	913.23
SC0047236	Union	Union/Meng Creek WWTP	1.00	0.27	304.41	80.89
SC0021202	Union	Union/Beltline WWTP	0.35	0.10	106.54	29.86
SC0024988	Union	Town of Jonesville WWTP	0.25	0.06	76.10	19.77
SC0003051	Union	Lockhart Treatment Facility	0.17	0.08	51.45	25.72
SC0035041	Union	United Util/Fairwoods SD	0.07	0.03	19.79	9.68
			7.83	3.55	2384.75	1079.16
SC0035971	Williamsburg	Town of Kingstree WWTP	3.50	2.00	1065.44	607.71
SC0048097	Williamsburg	Williamsburg Co/Santee River WWTF	0.60	0.14	182.65	42.61
SC0039934	Williamsburg	Town of Hemingway WWTP	0.45	0.38	136.98	115.44
			4.55	2.52	1385.07	765.76
SC0020443	York	Rock Hill/ Manchester Creek WWTP	20.00	8.96	6088.20	2727.53
SC0020371	York	Fort Mill WWTF	2.00	0.83	608.82	251.96
SC0038156	York	York Fishing Creek WWTP	2.00	1.38	608.82	420.09
SC0026743	York	Tega Cay WWTP #2	0.32	0.20	97.41	60.71
SC0026751	York	Tega Cay #3 & #4 WWTF	0.29	0.05	88.28	16.57
SC0041203	York	Pinetuck Util/Pinetuck SD	0.15	0.08	45.66	22.83
SC0027146	York	Util Services of SC/Foxwood SD	0.12	0.05	36.53	14.42
SC0037605	York	Lake Wylie MHP	0.09	0.05	27.40	13.94
SC0031208	York	Twin Lakes Mobile Estates	0.06	0.05	19.03	14.27
SC0041670	York	Adnah Hills MHP Blue Ribbon Water	0.04	0.02	12.18	6.46
SC0035661	York	Piedmont WTR Co/Woodforest SD	0.04	0.02	11.87	6.01
SC0024759	York	Pinelakes Campgr	0.04	0.02	11.42	5.71
SC0032417	York	Cedar Valley Mobile Home Park	0.03	0.02	9.13	5.78
SC0028622	York	Quail Meadow Park	0.03	0.01	7.61	1.84
SC0043095	York	Mack Estates	0.02	0.01	6.09	3.04
SC0038113	York	Util Services of SC/Carowood SD	0.02	0.01	6.09	1.81
SC0039217	York	Util Services of SC/Country Oaks	0.02	0.01	6.09	3.51

Table A.1 - Detailed Flow And Sludge Production Information For WWTPs

NPDES Permit No.	County	Facility Name	Design Capacity (mgd)	Average Daily Flow (mgd)	Sludge Production Based on Design Capacity (dry tons)	Sludge Production Based on Current Flow (dry tons)
SC0027111	York	McAfee Mobile Home Park	0.02	0.00	5.48	0.47
SC0032662	York	Beaver Creek MHP	0.01	0.00	4.38	0.35
SC0027189	York	Util Services of SC/Shandon SD	0.01	0.01	4.26	1.99
SC0027341	York	Jack Nelson Enterprises, Inc	0.01	0.00	3.65	0.60
			25.32	11.76	7708.39	3579.89
		TOTAL ALL WWTPS	**697.78**	**341.76**	**212411.39**	**104036.41**

Notes:

1. ND = No Data

2. NPDES dischargers taken from DHEC FOIA request and/or USEPA Envirofacts Warehouse. Only NPDES dischargers classified as sewerage systems; operators of residential mobile home sites; land subidividers and developers; sporting and recreational camps; operators of dwellings other than apartment buildings; elementary and secondary schools; civil, social and fraternal organizations; residential care; child day care services; eating places; operators of apartment buildings; and colleges, universities, and professional services are included in this list.

3. Domestic WWTPs are italicized. All other dischargers are likely package WWTPs with biosolids that are already collected by a municipality or could be collected by a municipality.

4. Plants with average daily flow data that could not be determined were assigned an average daily flow of 1/2 the design capacity unless specialized knowledge existed concerning the discharge such as the plant is not open yet.