FINAL REPORT

Lake Greenwood Sanitary Survey

Report prepared by
Pinnacle Consulting Group
A Division of North Wind, Inc.

Submitted to
Saluda-Reedy Watershed Consortium

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Project Objectives and Methods

The Pinnacle Consulting Group (Pinnacle) – A Division of North Wind, Inc. was tasked by the Saluda-Reedy Watershed Consortium (SRWC) to conduct a survey of sanitary wastewater facilities surrounding Lake Greenwood. This is a phased project begun in 2004, which will continue into 2005 and 2006 depending on the availability of funding.

Lake Greenwood is a moderately intensively developed lake with several thousand dwellings and numerous commercial establishments along its shoreline. The vast majority of these homes and facilities are dependent upon onsite wastewater systems (OSWS) for treatment and disposal of domestic wastewater. Lake Greenwood was impounded in 1941 and a considerable portion of the development around the lake is not "recent". It follows that many of the older houses and establishments are dependent on older OSWS's, which are not compliant with current technical requirements or performance standards. In most cases little is known about these older systems. In these cases, outdated or poorly sited and poorly maintained systems pose a high risk of impacting surface water and ground water quality. Specifically, in lakeshore development settings, these systems are potential sources of nutrient and bacterial contamination.

Current onsite wastewater technologies are absolutely sound, cost-effective, and protective of the environment, but only provided they are properly sited, sized, designed, constructed, managed and maintained. In fact, OSWS's that honor these criteria, and are effectively managed often are the most cost effective, environmentally friendly and sustainable technologies for onsite waste treatment and disposal.

This project will begin the process of assessing these systems and building a body of information that will support improved onsite wastewater facilities, and improved management of these systems, resulting in improved protection of water quality and the environment. The objective of this project is to capture data related to structures proximal to Lake Greenwood, and wastewater systems serving these facilities (both on-site systems and National Pollutant Discharge Elimination system 'NPDES' systems). Phase 1 of this work has been primarily a Geographic Information System (GIS) task, which attempts to capture the best-available planning data from county records. Likewise, best-available health department data will be captured with regard to individual septic systems. Where data are inconsistent due to differing levels of technology in Greenwood and Laurens County, we will identify data deficiencies and recommend system specifications and informational upgrades.

The product of this phase of work will be a data warehouse that will support ongoing phases of sanitary survey, system assessment, and development of a lakeshore management plan.

This project will be performed by Pinnacle staff, utilizing the planning and health resources of Greenwood and Laurens Counties, and the South Carolina Department of Health and Environmental Control (SCDHEC) Upper Savannah Office. Specifically, this project will progress along the following tasks:

1. Identify project data quality objectives (DQOs) and anticipate data quality issues for various data sources

(accuracy, precision, completeness, consistency).

2. Design the repository / data warehouse based on project requirements and anticipated issues, and adjust as needed throughout project. All data will be formatted in a standardized manner to include geo- and temporal referencing. Geo-referencing will be consistent with specifications set forth by the project GIS needs group.
3. Capture critical spatial resource data relevant to potential septic system performance, to include soils, ground water, topography, and the presence of other site-limiting conditions.
4. Design the GIS layers appropriate to the data fields.
5. Gather all readily available general resource data (e.g. agency data, GIS data, best available airphoto imagery, other SCDHEC, South Carolina Department of Natural Resources 'SCDNR', etc.).
6. Develop data layers to highlight critical information fields.
7. Conduct screening reviews to identify high-risk areas where system failures are most likely.
8. Identify areas for prioritization in subsequent field sanitation surveys.
9. Conduct preliminary reconnaissance surveys (vehicular or motorboat "windshield" reviews) to discern general field conditions in representative priority focus areas.
10. Document data gaps.
11. Develop summary report of data compilation and methodology through Phase 1. Recommend ongoing activities for Phase 2 (2005/2006).
12. Begin development of landowner / system owner education campaign and materials for deployment during Phase 2. Coordinate w/ SCDHEC and Clemson Cooperative Extension to minimize education program redundancies.

Project Funding

This project is funded jointly by SRWC with funding for technical tasks coming from VKRF, and anticipated funding for educational components to come from Fuji Corporation funds. In the future we anticipate significant supplemental funding to be provided by Greenwood County. The Greenwood County portion of this project's funding was delayed until SRWC fiscal year 2005/2006. The completion of the majority of this project's work will be contingent upon the availability of this supplemental funding. Current work completed has centered around tasks one thru six as listed above. This is explained further in depth in the next section.

Project Progress to Date

To date work on this project has focused around gathering GIS and other data essential to the seamless continuation of this project into the 2005/2006 fiscal year. As mentioned previously, this work has centered around tasks one thru six as listed previously.

Task 1: Identify DQOs and DQ Issues

The first task necessary to the completion of this project was to identify project data quality objectives and anticipate data quality issues for various data sources. Data quality

issues, particularly for GIS data, include spatial accuracy, completeness and consistency.

Data quality issues came significantly into play due to the interface of Lake Greenwood with three counties: Greenwood, Newberry and Laurens. Due to the significant external funding from Greenwood County much of this project will focus around Greenwood County's frontage on Lake Greenwood with minor work occurring in Laurens and Newberry Counties. Even so, data quality issues need to be generally discussed here that are foreseen between these three counties.

Greenwood County has excellent GIS data. On the other hand GIS data for Laurens and Newberry Counties is minimal at a county scale. For the most part, the only GIS data available for Newberry and Laurens Counties is data either generated at a state scale or data digitized from United States Geological Society (USGS) 1:24,000 quadrangle maps.

Due to these data quality inconsistencies, care is being taken during the merging of any data layers that do not have an identical scale or accuracy, or otherwise have compatible specifications. One solution around this problem would be to use data across the entire study area that has been generated at a common scale. This approach is not appropriate since almost all data from Greenwood County would have to be ignored due to its finer scale and resolution. Alternatively, and our first choice for this task, is to work with the best available data, i.e. that from Greenwood County.

Task 2: Design Data Warehouse

This task involves the design of a data warehouse to store information gathered and created throughout the life of this project. Instead of creating from scratch a new database for this project, a database has been structured around an existing GIS database received from Greenwood County.

Greenwood County supplied Pinnacle with a GIS point shapefile of address locations within approximately 1,000 feet of Lake Greenwood in Greenwood County. This shapefile included a point for every address as derived from an outside, independent telephone record file. This file as received from Greenwood County included a point with associated address and other attribute information at almost every property parcel. Pinnacle is processing this data to reconcile addresses with buildings present in a 2003 aerial imagery layer also provided by Greenwood County. This database will continue to be refined during 2005/2006 as additional data becomes available. The original GIS database received from Greenwood County included a total of 2,364 address points covering areas within 1000 feet of the lake. This was narrowed to a total of 1,428 points (mostly single family residential structures) as seen in the 2003 imagery from Greenwood County. It is noteworthy that this population of structures represents only the Greenwood County portion of the lakeshore and surrounding area. This analysis was done by comparing the address points as received by Greenwood County to 2003 aerial imagery. Address points that corresponded to an undeveloped parcel were removed since there was a very small likelihood of a private on-site septic system present. Address points that did correspond to a residence or other structure that were likely to posess a private on-sit septic system were retained.

Task 3: Capture Spatial Data

Task three requires the capture of critical spatial resource data relevant to potential septic system performance. This includes

soils, topography, hydrology, wetlands and other site-limiting conditions. As part of this task and also in conjunction with the GIS support task supported by SRWC funding several data layers were downloaded and merged into this project's file. These include:

1. NWI wetlands as provided by SCDNR at USGS 1:24,000 quadrangle resolution.
2. Hydrology in the form of streams and water bodies as provided by Greenwood County and as defined by the National Hydrography Dataset and provided by the USGS.
3. Topography provided by Greenwood County and the USGS. Digital Elevation Models can also be downloaded from the USGS to generate slopes, aspects and three dimensional models around the lake shoreline.
4. Soils as defined by the National Resource Conservation Service (NRCS) and provided as a resource layer by SCDNR.
5. Critical lake shoreline habitat as provided by Greenwood County and generated by an outside consultant.

Other needed spatial resource data layers can be downloaded on an as needed and available basis.

Task 4: Design GIS Layers

This task addresses the design of GIS data layers appropriate to needed data fields. The Greenwood County address database is being reconciled to buildings that likely are served by OSWS's. The development of this task will continue in fiscal year 2005/2006 with the delivery of funds from Greenwood County.

Task 5: Gather Resource Data

This task is similar to task three except data gathered under the guidance of this task is not critical resource data but can be best described as general reference data necessary to the project. Data downloaded and assimilated into this project's file under this task includes:

1. Zoning information as provided by Greenwood County.
2. NPDES points provided by SCDHEC.
3. Marinas as displayed on several Lake Greenwood fishing maps and entered into GIS by Pinnacle.
4. Roads provided by Greenwood County and the United States Census.
5. County boundaries provided by the US Census.
6. Municipalities as provided by the US Census.
7. HUC (Hydrologic Unit Code) 11 and 14 digit watersheds as provided by the USGS.
8. Various environmental files such as underground storage tanks, groundwater contaminant sources, and potential contaminant sources as provided by SCDHEC and partially generated by Pinnacle.
9. Subdivisions as provided by Greenwood County.
10. 2003 true-color aerial imagery as provided by Greenwood County.
11. 1999 infrared imagery as generated by the National Aerial Photography Program and provided by SCDNR.
12. Water and sewer lines generated by the South Carolina Department of Commerce and provided by the University of South Carolina.

As in task three, other needed spatial reference data layers can be downloaded on an as needed and available basis.

Task 6: Highlight Critical Info

This task is designed to develop data layers to highlight critical information fields. This tasks builds on data generated in tasks two, three and four. Work has begun on this task by clipping data from tasks two, three and four down to a working buffer area of the lake. This process allows the project to become more focused and also allows for smaller data layers which provide much improved calculation and interpretation time in a GIS.

Additional Analysis

GIS data collected and created from the above six tasks has been analyzed to produce some preliminary statistics regarding the extent and magnitude of private OSWSs along the Greenwood County side of Lake Greenwood.

Two private waste water treatment package plants were located in Greenwood County along Lake Greenwood. These are the Driftwood Associates and Pier 96 Waste Water Treatment Facilities (WWTF). Both of these facilities have NPDES permits and discharge to receiving streams which drain into Lake Greenwood.

According to the system managers, Driftwood provides service for 32 houses with 35 vacant lots existing in their service area that could potentially come online. The service level suggests current service to about 81 persons and a wastewater flow at roughly 6000 gallons per day (GPD). Potential service capacity can add another 89 people or about 6700 GPD to this facility.

The WWTF at Pier 96 currently serves 80 houses with an unknown potential for expansion. Using the same methodology as with Driftwood, this equates to 202 people and a design flow of roughly 15,000 GPD.

Based on information provided by the Driftwood WWTF, the households currently served by their WWTF will be transferred to Greenwood Metro in mid-September 2005 pending completion of an expansion of Greenwood Metro's sewer lines.

Analysis of structures in Greenwood County within a 1,000 foot buffer of Lake Greenwood revealed 1,428 total structures of which the vast majority are single-family dwellings. Again using the US Census figure of 2.53 persons per dwelling this equates to 3,613 people, or an overall population density of 1.9 persons per acre. Population densities within this area are as high as 1.04 to 1.96 persons per acre in developed areas without centralized waste water service to 1.66 to 3.69 persons per acre in areas where centralized waste water services are provided.

Synthesis and Effect

Great progress has been seen on this project already even without the significant supplemental funding from Greenwood County. As soon as this funding is received, this project will continue until completion.

From the preliminary work we have confirmed the general nature of wastewater facilities serving the several thousand homes that are in close proximity to Lake Greenwood. These conditions will help us continue to focus on the questions appropriate to improving the management and operability of those facilities, and to mitigating their impacts to Lake Greenwood.

The final product of this project will be a database and set of supporting GIS and other data that will assist in the ongoing phases of sanitary survey, system assessment, and development of a lakeshore management plan.

Contact Information

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