APPENDIX G
GAINESVILLE REGIONAL UTILITIES' OPERATIONS AND MAINTENANCE PROGRAMS

I. Gainesville Regional Utilities (GRU) Wastewater Treatment and Collection Systems Overview

GRU Wastewater Treatment

The City of Gainesville's wastewater treatment facilities consist of the Kanapaha Water Reclamation Facility (KWRF) and the Main Street Water Reclamation Facility (MSWRF), which are permitted by the Florida Department of Environmental Protection at combined capacity of 22.4 MGD per day. KWRF provides advanced wastewater treatment to incoming wastewater that meets Primary and Secondary Federal Drinking Water Standards. MSWRF also provides advanced treatment, and meets Class III surface water standards. MSWRF was upgraded to advanced treatment in 1990 at a cost of $16 million. KWRF was expanded by 5 MGD to 15 MGD in 2003 at a cost of $13.92 million. KWRF and MSWRF have an Operations and Maintenance Budget of $1.96 million for fiscal year 2007. Figure __ is shows aerial photographs of the KWRF and MSWRF.

Figure__Aerial Photographs of the GRU Kanapaha Water Reclamation Facility and Main Street Water Reclamation Facility

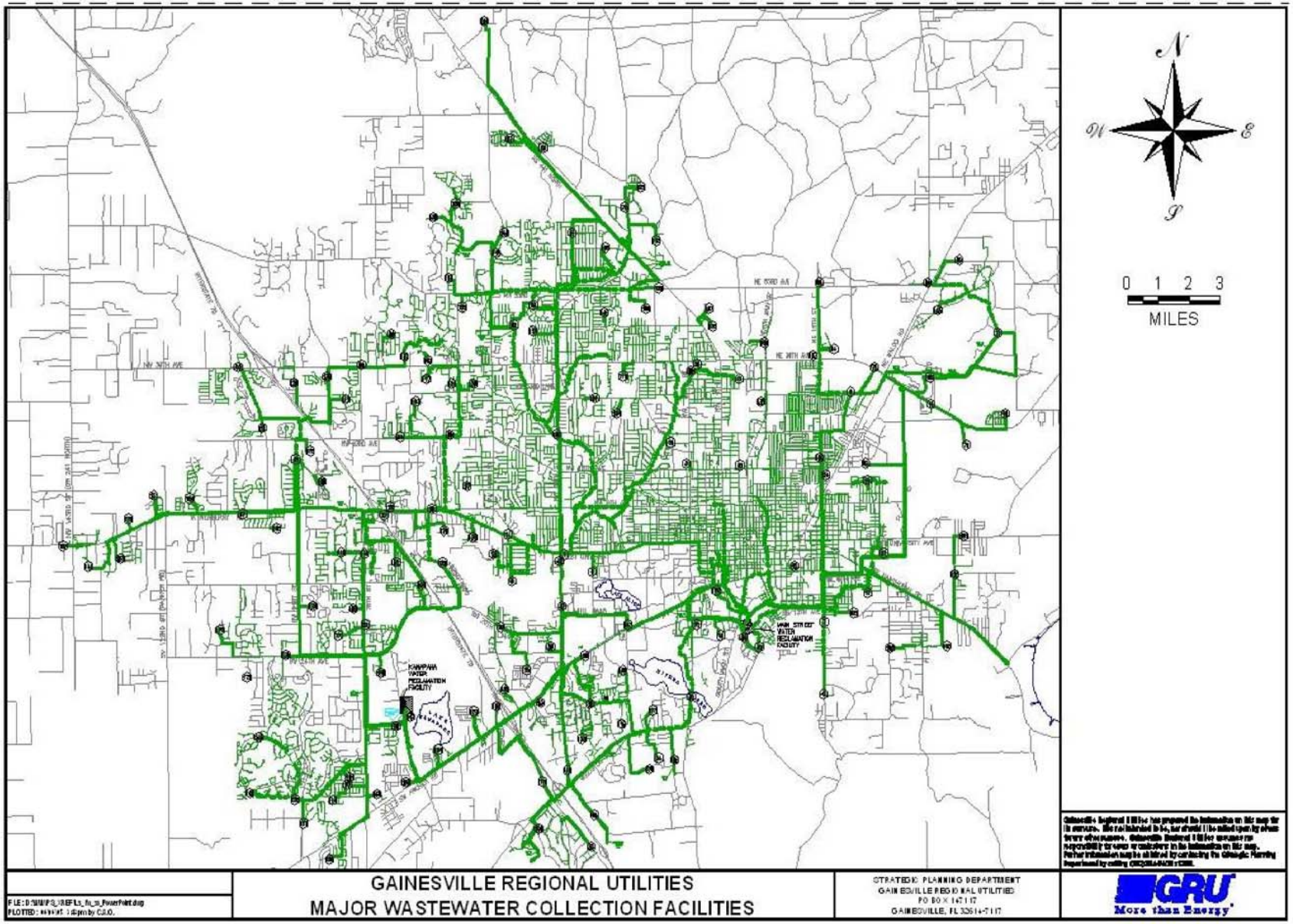
KWRF **MSWRF**

GRU Wastewater Collection System

The City of Gainesville's wastewater collection system piping consists of 127 miles of force main where wastewater is conveyed under pressure by pumping stations, and 578 miles of gravity main where the wastewater flows by gravity; for a total of 705 miles of piping. The wastewater collection system also includes 160 Lift Stations (pumping stations) with 13,888 manholes, and covers a service area of 115 square miles. GRU's Water / Wastewater Systems has 171 budgeted full time positions and the wastewater collection and treatment system serves over 160,000 people. GRU wastewater

collection system operations and maintenance costs are budgeted at $1.58 million for fiscal year 2007. Figure _ is a map of GRU major wastewater collection facilities serving Gainesville and areas of Alachua County.

Figure_. Gainesville Regional Utilities Major Wastewater Collection Facilities


N
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0 1 2 3
MILES
KANAPAHA WATER RECLAMATION FACILITY
MAIN STREET WATER RECLAMATION FACILITY
GAINESVILLE REGIONAL UTILITIES
MAJOR WASTEWATER COLLECTION FACILITIES
STRATEGIC PLANNING DEPARTMENT
GAINESVILLE REGIONAL UTILITIES
P.O. BOX 147117
GAINESVILLE, FL 32614-7117
GRU
More than Energy

In 2006, GRU systems conveyed and treated over 5.5 billion gallons of wastewater (99.999% efficiency based on volume), and maintained a spill rate of less than 25-percent of the national average in 2004, 2005 and 2006 (See Figure__ and Figure__). The national average of 7.1 spills / 100 miles of collection system is based on a national survey of comparable utilities conducted by the Water Environment Research Foundation[1]. GRU's average spill rate from 2001 through 2006 was 2.3 spills / 100 miles.

Figure . GRU Wastewater System Performance - Total Number of GRU Spills, 2001 through 2006, Compared to Projected National Average per 100 miles Wastewater Collection System Spills

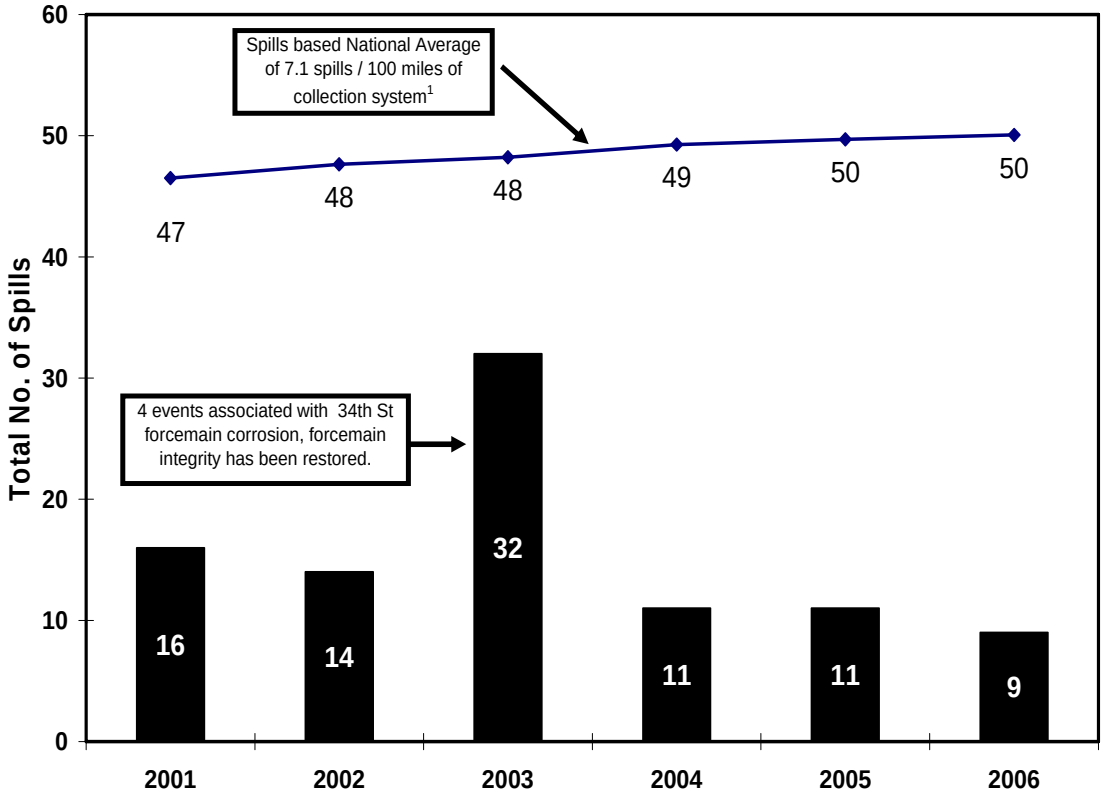
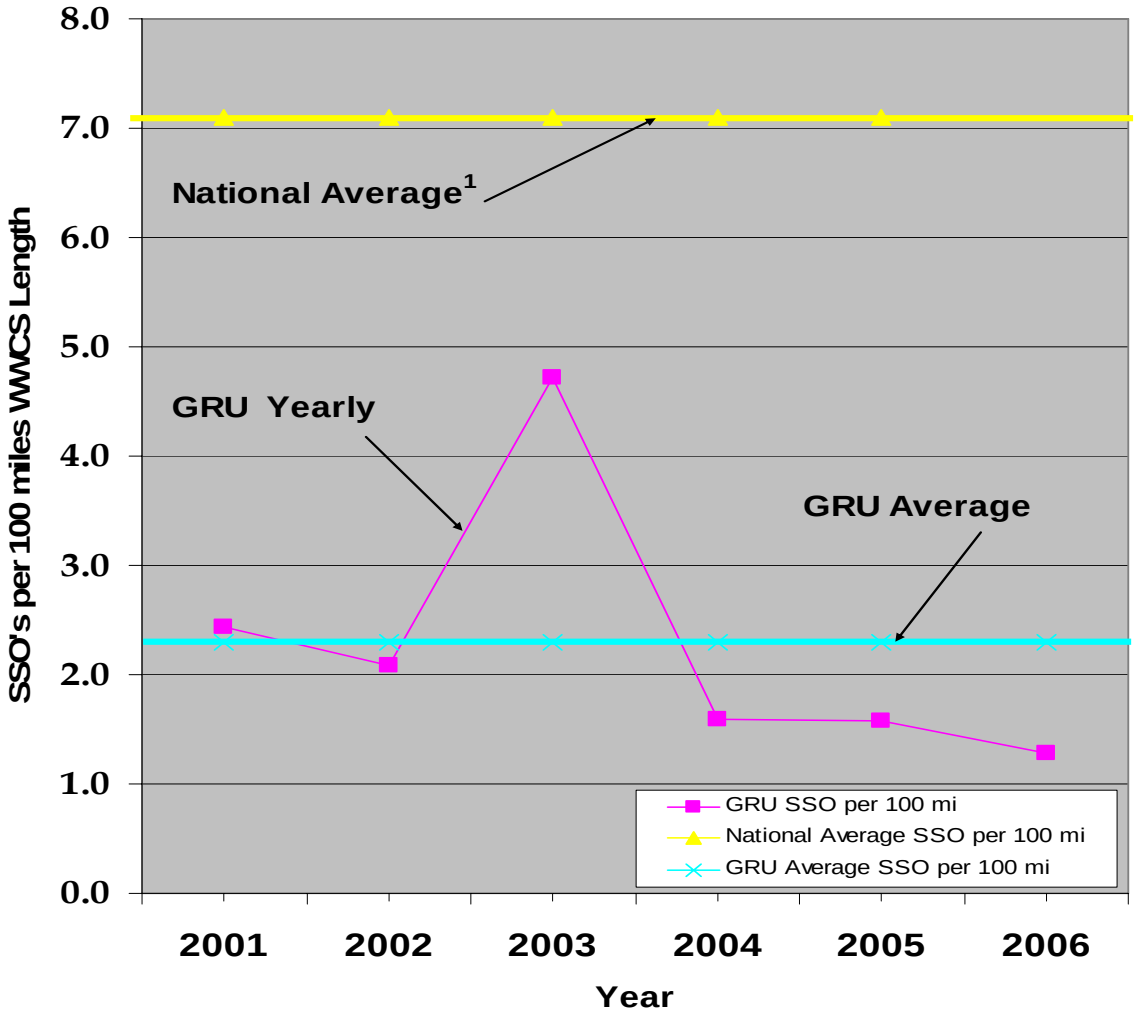


Figure . GRU Wastewater System Performance Compared to National Averages – SSO's per 100 miles of Collection System Length, 2001 through 2006



II. GRU Wastewater Collection System Integrity Programs and Projects

GRU's integrity programs and projects continuously protect the public and the urban creeks from wastewater release from the publicly owned and operated wastewater collection system. These programs and projects include:

- Closed-Circuit TV Inspection / Repair and Cleaning
- Infiltration & Inflow (I & I) Testing
- Sliplining of Gravity Mains Adjacent to Urban Creeks
- Force Main Integrity Testing
- GIS Asset Management System – Mapping and Targeted Maintenance
- Plan Review and New Development Inspection – Redundancy, Oversizing and New Standard Practices to Improve Reliability
- Annual Water/Wastewater Engineering Operation and Maintenance Services
- Wastewater Spill Prevention Programs

The following is a more detailed description of each of these efforts.

Closed-Circuit TV Inspection / Repair, and Cleaning

GRU has an ongoing closed-circuit TV inspection / repair and cleaning program, and recently added a new closed-circuit TV unit (truck and crew) in fiscal year 2006. Crews clean gravity mains with high pressure water jets prior to closed-circuit TV inspection. As the crews inspect the lines, they log any deficiencies that may inhibit the pipe's performance. A closed-circuit TV / sealing (grout) unit (truck and crew) follows the inspection to make repairs to damaged pipelines as needed. If necessary, additional crews are dispatched to repair the pipe by sliplining techniques or by utilizing some other appropriate repair method to restore the pipeline to optimum condition. GRU has the ability to make joint repairs and slip lining repairs for the pipe diameters up to 12-inches immediately. This ability eliminates the time and expense of procuring outside contractors to perform this work. Figure__ shows the components of the closed-circuit TV unit.

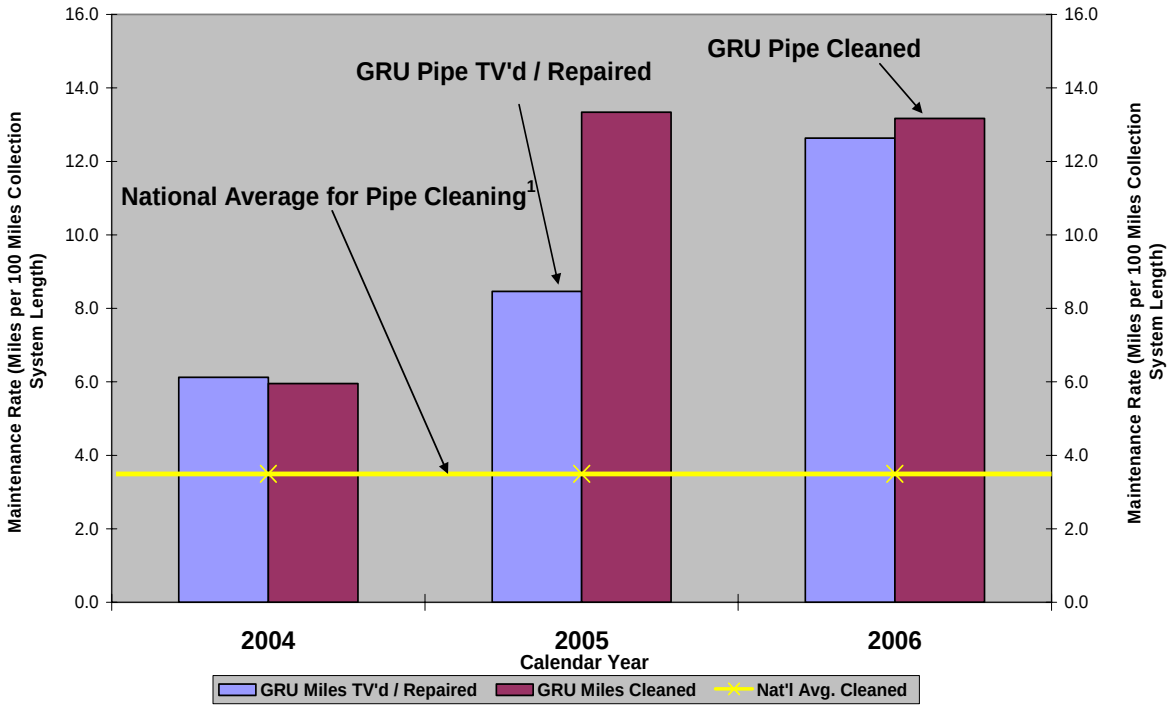
Figure . Closed-Circuit TV Unit Components

Closed-Circuit TV Inspection Crew & Equipment

Closed-Circuit TV Inspection Camera

Figure____ is a bar graph of GRU Wastewater Systems TV/Repair and cleaning, with a comparison of pipe cleaning to the national average.

Figure . GRU Wastewater Collection System Maintenance Rate Compared to the National Average



Infiltration & Inflow (I & I) Testing

GRU's Inflow and Infiltration (I & I) program goal is to eliminate all non-wastewater flows from entering the wastewater collection system. Infiltration is water that flows into the wastewater collection system via cracks and joints that are not completely sealed in the pipe system. Inflow is water that flows directly into the wastewater collection system through for example, manholes lids, broken cleanouts, or direct illicit connections. Both infiltration and inflow can have significant impacts on wastewater collection system capacity. Eliminating I&I is a key component of wastewater collection system preventative maintenance.

As part of the I&I elimination program, GRU's crews utilize techniques including smoke testing, closed-circuit TV inspection, and dye testing to find potential locations where I&I can occur. Figure___ shows the areas that have been tested since January 2001. In August 2003, GRU commenced with Phase 3, where the focus was on the urban creek areas. If collection system defects are found, crews immediately repair each defect in the collection system area before moving on the next designated test area. Figure___ show pictures of smoke testing being used to find sources of I&I. GRU has tested over 71% of its wastewater collection system since January 2001, with the urban creek areas covered in Phase 3 of the project during 2003, 2004 and 2005. GRU has spent $2.8 million since 2001 on I&I, and has budgeted $1.36 million to continue this effort for the 2007 to 2012 budget period.

Figure GRU Sewer System Inflow and Infiltration (I&I) Elimination Program
(Colored and shaded areas represent the designated wastewater collection system tested areas in the TMDL listed Hogtown, Sweetwater and Tumblin' Creek basins – as shown in the graph, all of GRU wastewater collection system in these urban creeks areas have been tested)

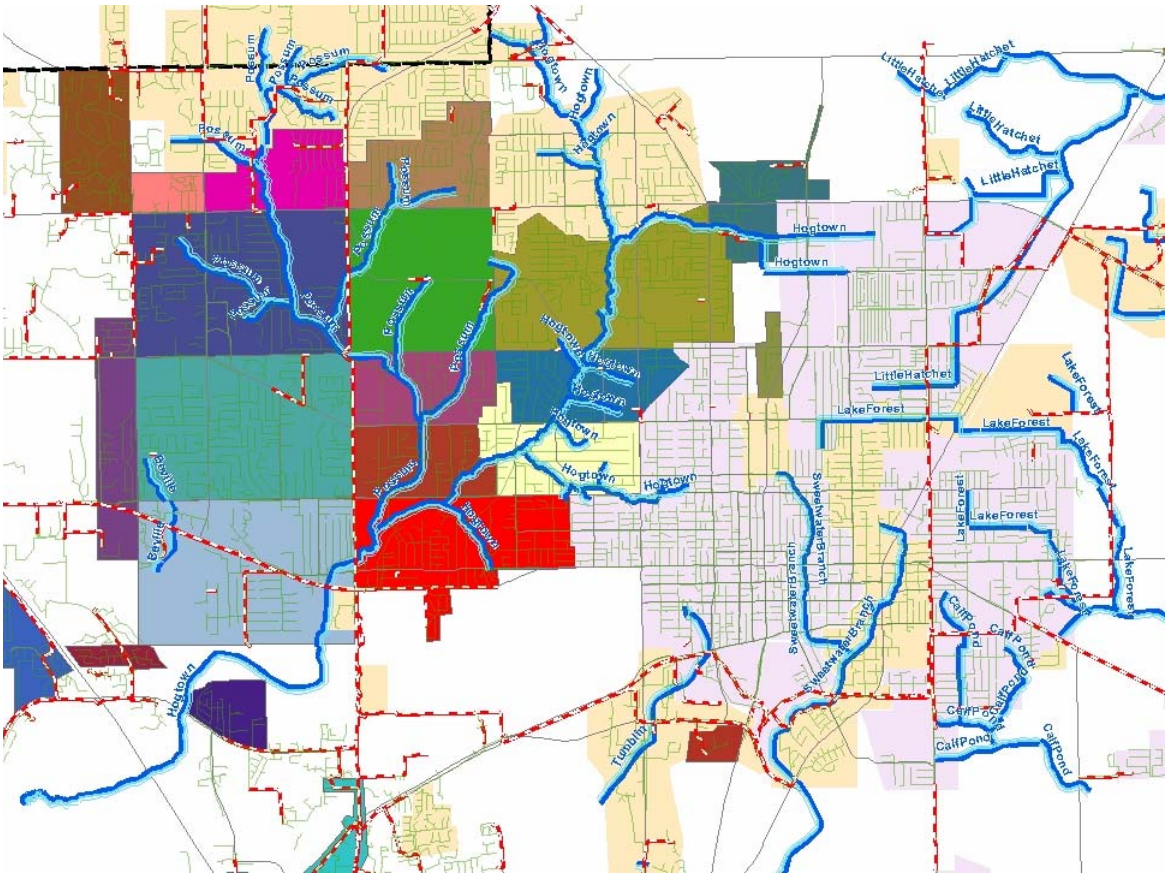


Figure___ Pictures of Smoke Testing Used to Find I&I

Broken Cleanout

Broken Service Lateral

Illegal Connections to GRU Wastewater Collection System: Apartment Rain Gutter

Illegal Connections to GRU Wastewater Collection System: Stormwater Retention Pond

Sliplining of Gravity Mains Adjacent to Urban Creeks

GRU utilizes sliplining technology to rehabilitate the wastewater gravity mains throughout its collection system. Sliplining pipelines protect the urban creeks by minimizing the possibility of wastewater leakage by essentially replacing old pipe with new pipe. Sliplining of gravity sewer interceptor tributary small diameter lines adjacent to creeks is ongoing. GRU sliplining projects have totaled $4.7 million as of 2006 and the projected budget for continuing these efforts is $681,000 over the 2007-2012 budget period.

The Insituform® process is the most widely used trenchless method (sliplining) for restoring structural integrity of gravity mains that can not be restored cost effectively

through digging an open trench. It has been proven in pipes with a wide range of shapes and in diameters of up to nine feet (2.75 m). In the Insituform® process, a resin-impregnated Insituform® tube is installed into an existing pipe. This process results in a seamless, jointless "pipe-within-a-pipe" with a smooth, continuous inner surface which usually increases flow capacity. Typically installations are completed in a single day, using robotic methods to restore active connections from within the line. Since the collection system provides 24-hour per day service, crews construct “pump arounds” to allow isolation of GRU wastewater collection system lines for cleaning and sliplining. Pump around pipelines are typically assembled using High Density Polyethylene (HDPE) where sections are fusion welded to form a continuous pipe. Pumps are setup, attached to common manifold, and then operated to pump wastewater “around” the work area section to a manhole down gradient where wastewater continues gravity flow. After a pump around is established, the pipe is typically cleaned with a jet truck cleaning crew. Then, a Closed-Circuit Television (CCTV) crew records and documents the wastewater collection system gravity line**.** If tuberculation (corrosion) is found, the pipe is then cleared of the corrosion with a hydraulic chain cutter tool. To verify the pipe is properly prepared, the pipe is pressure cleaned and CCTV’d before the sliplining work is performed. Once the pipe is prepared, a polyethylene resin impregnated tube is placed inside the pipe and heated water cures the resin creating a new pipe within the old pipe, with the installation of the tube typically taking a few hours. The cured pipe is then cut at manholes and laterals are cut open completing the work to install a new cast-in-place pipe. Figure_ show pictures of the installation sequence of for a Hogtown Creek sliplining project described above. The sliplining process typically restores the hydraulic and structural integrity of the older pipe to that of a new pipe. While sliplining is an expensive technology, it is less invasive as compared to open trench construction along the urban creek corridors.

Figure__. Pictures Showing the Installation Sequence of a Hogtown Creek Sliplining Project

Pump Around (Hogtown Creek Basin)

Sliplining Pipe Installation

Sliplined Pipe in Manhole

Finished Pipe in Manhole

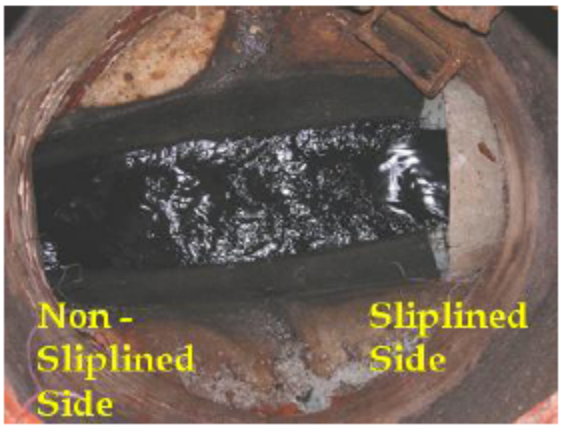
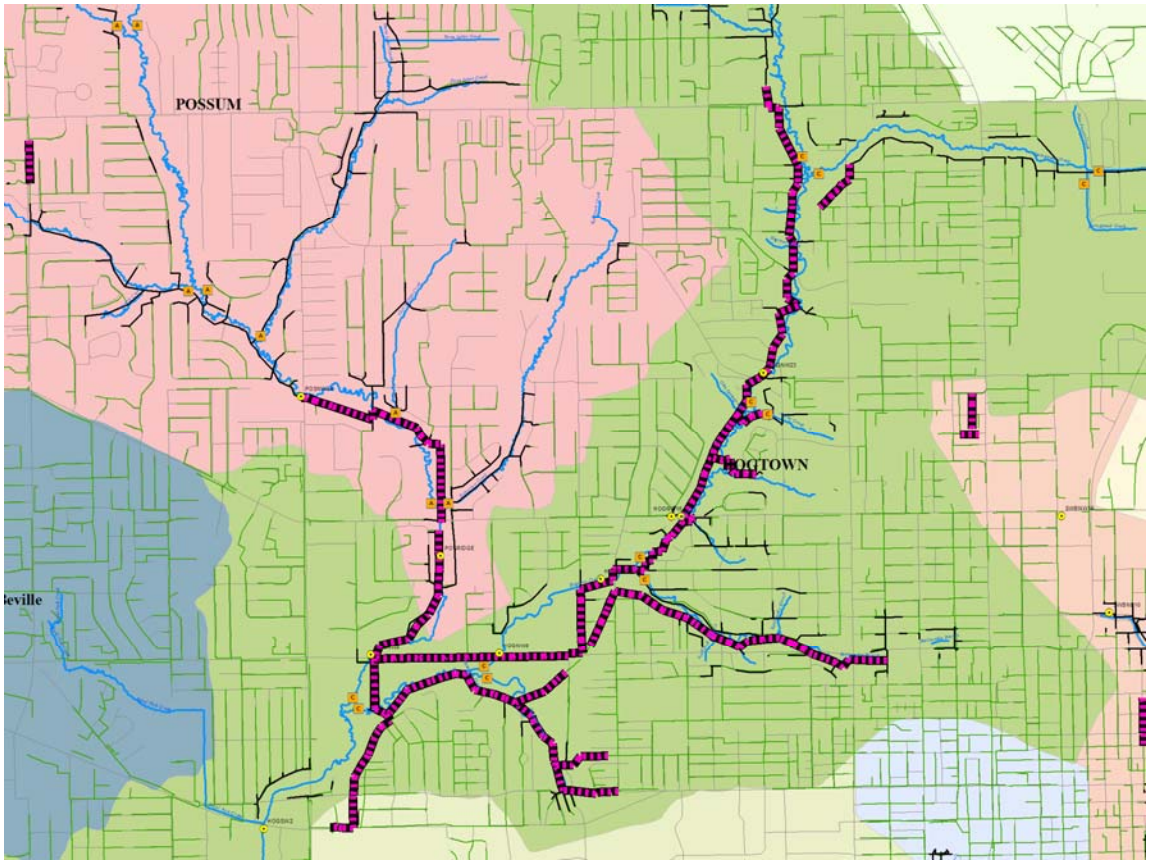


Figure __ Shows GRU sliplined major gravity mains adjacent to Hogtown Creek and its tributaries since 1994.

Figure . GRU Sliplined Major Gravity Mains Adjacent to Hogtown Creek and Tributaries



Force Main Integrity Testing

GRU staff have identified more than twenty-five miles of major force mains that were constructed with ductile iron or cast iron, and are 16-inches in diameter and larger, for inspection and wall thickness testing. A comprehensive program was developed and initiated to test the wall thickness of the ten major force mains at forty-eight locations, perform pressure monitoring at six strategic locations within the force main system, and inspect fifty-two air release valves.

Nearly 1,700 pipe wall thickness test measurements have been collected to assess the overall condition of GRU's major force mains. The following conclusions can be made from this effort:

- GRU's major force mains appear to be in relatively good condition based on the pipe wall thickness and system operating pressure data collected
- No significant loss of pipe wall material was noted for the 10 major force main systems.

- Major force mains operate at relatively low pressures and pressure surges do not appear to be detrimental to the system in considering the bursting strength of measured pipe wall thicknesses.
- Air release valves that are not operating to specifications are to be replaced as part of a multi-year rehabilitation program.

Figure __ shows pictures of engineers and crews performing pipe wall thickness testing after accessing the pipeline.

Figure___ Pictures of GRU Engineers and Crews Performing Pipe Wall Thickness Testing

GRU has initiated a program to test 2nd tier force main systems, which have piping diameters of 14-inches or smaller. As of January 2007, 6 of the 15 miles of force mains has been identified and tested. In addition, GRU has adopted a Standard Operating Procedure (SOP) that requires pipe wall thickness testing prior to all taps (connections) to existing force mains, to ensure quality taps to the force main and to minimize risk of failure resulting in released wastewater.

GIS Asset Management System – Mapping and Targeted Maintenance

GIS facilities mapping involves efforts associated with incorporating developer and GRU installed wastewater and reclaimed water systems into a GIS database format, including a creek crossing pipeline assessment project that logged the GRU wastewater system creek crossings and are being used for assessment of the infrastructure for targeted maintenance. The GIS based software system also stores mapping information and facility specific information such as age, material, maintenance history, and adjacent utilities. It also incorporates new developments into this mapping system and reduces construction accidents due to increased accuracy in the location of underground utilities.

Plan Review and New Development Inspection – Redundancy, Oversizing and New Standard Practices to Improve Reliability

All new construction requires a plan review process for compliance with all GRU design and construction standards. GRU's requirements exceed industry standards in such areas as improved manhole connection methods, pipe materials and utility crossings (casings), and wastewater collection system oversizing and redundancy. All of these

requirements improve the reliability of the GRU's wastewater collection system. Inspections during and after completion of construction projects are performed to assure compliance with construction standards. In addition, before any new gravity wastewater infrastructure is accepted by GRU for ownership and maintenance, it is inspected with closed-circuit TV cameras, flushed, smoked tested, and repaired as necessary. For force main systems, it is standard practice to pressure test all new systems before they are put into service.

Annual Water/Wastewater Engineering Department Operation and Maintenance Services for Initiating and Administrating the Capital Budget

GRU's executes a five-year scheduling system for initiating and administrating wastewater capital projects, at an annual operation and maintenance cost of about $650,000. GRU has budgeted $70 million in capital improvements to the wastewater collection and treatment system over the 2007-2011 budget cycle. Projects are timed and prioritized to ensure that facilities are available in a timely manner to meet demands as needed. Some specific capital projects are in this section. General descriptions of the major areas of capital improvements include the following:

WASTEWATER TREATMENT FACILITIES – Projects associated with the expansion, improvement, renewal and replacement at the Kanapaha and Main Street Water Reclamation Facilities. Projects in the capital budget category include: reclaimed water systems; pumping and facility effluent discharge; disinfection; process and efficiency studies and projects; digestion and biosolids management; emergency generation; capacity analysis and future planning; tertiary filter rehabilitation; electrical control systems replacement; process monitoring equipment; transfer pump station evaluation; grit drying facilities; and operator interface software system wide upgrades.

LIFT STATIONS - Work in this capital budget category are associated with improvements, renewal and replacement required to maintain the existing lift stations in a reliable and efficient operating condition including control cabinet replacement; wetwell and piping rehabilitation, replacement and oversizing; valve and flow diversion upgrades; pump and motor drive system replacements; retrofits of control communication hardware; emergency portable and permanent generators for power outages to help prevent and/or minimize wastewater releases; communication system frequency conversion; maintenance facility expansion; storage and pumping capacity increases; motor soft start replacements; and float ball replacements.

WASTEWATER COLLECTION SYSTEM - This budget category includes wastewater collection system gravity and force main extensions, oversizing, rehabilitation, replacement and removal to accommodate present and future customers and developments; modification of force main system to establish redundancy and rerouting options; deepening of gravity mains; manhole rehabilitation or replacement; purchasing of software to analyze gravity sewer and force main systems; gravity system capacity analysis study; installing and replacing wastewater service laterals and cleanouts to new and existing customers, which are not associated with new developments.

GRU is working with an independent consultant to evaluate its wastewater collection system integrity programs. The goal of this effort is to increase the reliability of the wastewater collection system by assessing GRU's wastewater collection system procedures and compare them against standard industry practices. Recommendations

will be provided for modifying GRU existing procedures, or if necessary, provide suggestions for new procedures to achieve the goal of increased reliability.

Specific Examples of a Major Capital Projects, Equipment Utilized and Work Performed

The following is are recent capital improvement projects and provides an example of work performed on GRU's wastewater collection and treatment system.

Figure ___ shows pictures of the force main replacement on NW 34th Street and provides an example of a major capital project, and the equipment methods utilized to complete a project of this scale. Approximately $4.2 Million was spent to replace 10,730 feet of force main piping.

Figure___ Pictures of the Force Main Replacement on NW 34th Street

HDPE Butt Welder Creates Contiguous Force Main Pipe Onsite

Pipe Assembly and Installation Near 34th Street

Trench Boxes Installed and Jack and Bore Method Utilized to Install Pipe Casing under Utility Conflicts such as Roads, Gas Lines and the Stormwater Sewer System

Directional Boring Method Utilized to Install Piping Casing under Utility Conflicts such as NW 34th Street

Tie In of New Pipe to Existing Pipe Utilizing Trench Box, Tapping Tool, Valve Assemblies and Excavation

Final Steps in Pipeline Installation

Lift Station 10 Renovation

This capital project replaced the existing pumps, controls and mechanical equipment. The antiquated station was converted from a Yeomans wetwell/drywell station, to a more efficient Flygt submersible station with upgraded controls, variable frequency drives and mechanical appurtenances. The existing aboveground structure was also demolished. The total cost of the project was 1.4 million. Figure ___ provides pictures of the project work.

Figure ___ Pictures of LS 10 Renovation

Lift Station Before Renovation

Lift Station during Renovation with Demolition and External Pumping

Renovated Receiving Manhole, Wetwell, Drywell and Completed Lift Station

Wastewater Spill Prevention Programs

To further reduce releases from the wastewater collection system to the environment, GRU has implemented an aggressive pretreatment program focused on commercial grease control. The program includes two inspectors that conduct inspections on all food service establishments. In addition, GRU has implemented a campaign focused on residential grease control. As part of the public outreach campaign, staff distributed 5,000 grease trappers; presented at local schools; distributed press releases where local media assisted in getting information out to the public; and provided spill prevention information in the GRU customer bulletin.

Wastewater Collection System Performance Monitoring (BST)

GRU funded a Bacterial Source Tracking (BST) $325,000 study which examines the DNA of fecal coliforms to determine whether their source was from animal or human origin. The results of the study will be used by local stake holders in developing practical indicators for future monitoring and implement appropriate strategies to reduce bacteria in Gainesville's urban creeks. This project and the techniques utilized are explained in depth in Section 5.4.3.

References

"Effective Practices for Sanitary Sewer and Collection System Operations and Maintenance", Water Environment Research Federation. June 2003