Sam M. McCall, CPA, CGFM, CIA, CGAP
City Auditor

September 13, 2007

AUDIT OF THE CITY'S GAS INFRASTRUCTURE

The City has appropriate processes and procedures to ensure a safe and reliable gas infrastructure; but enhancements are needed.

HIGHLIGHTS

Highlights of City Auditor Report #0727, a report to the City Commission and City management

WHY THIS AUDIT WAS DONE

The City operates a gas system that serves approximately 28,000 residential and commercial customers. The system receives natural gas through four gate stations and distributes natural gas through 780 miles of gas mains, 18 regulating stations, and 6,900 valves. Although the City gas system has been in effect since 1956, the majority of the system infrastructure was installed within the last 20 years.

This audit addressed the processes, procedures, and systems used by the Gas Utility to (1) account for and manage infrastructure components including mains, service lines, meters, valves, regulating stations, etc.; (2) install, construct, and maintain the infrastructure in accordance with controlling federal and state regulations; (3) protect and educate the public in regard to gas infrastructure risks; and (4) plan and fund infrastructure expansion and replacement.

WHAT WE RECOMMEND

A project management plan should be developed to assist the Gas Utility in refining the Gas Utility GIS as part of the ongoing "Automation Implementation" capital project. An additional isolation valve should be installed at a regulating station in accordance with PSC regulations. Critical infrastructure valves should be better identified and designated in the Gas Utility's infrastructure records. Actions should be taken to ensure that federally required inspections and tests are completed at required frequencies and are adequately and efficiently documented. All gas leaks should be repaired within the time periods prescribed by PSC regulations. Better records should be maintained in regard to tracking gas leaks, dispatching emergency notifications, and responding to those notifications.

To view the full report, go to:
http://www.talgov.com/auditing/index.cfm
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Audit conducted by T. Bert Fletcher, CPA

WHAT WE FOUND

Significant improvements and enhancements have been and continue to be made in regard to accounting for and tracking the City's gas infrastructure. Overall, the Gas Utility has adequate and proper processes and procedures to ensure a safe and reliable infrastructure. Installations of new infrastructure meet federal and state requirements. Infrastructure expansions and replacements are planned and funded. An appropriate and effective public protection program has been established. As noted below, we also identified areas where improvements and enhancements are needed.

Gas Utility GIS A project management plan should be developed to assist the Gas Utility in refining its geographic information system (GIS) as part of the on-going "Automation Implementation" capital project.

Materials Pipe stored at the City's MSC should be better protected from environmental elements.

Regulating Station Valves The Gas Utility should install an additional isolation valve at one of the 18 regulating stations; regulating station valves found not to be reflected in Gas Utility records should be integrated into the GIS.

Cathodic Protection The system that protects underground metallic mains and service lines from corrosion should be tested at the required frequencies and intervals and records of those tests better documented.

Atmospheric Corrosion Non-Gas Utility staff inspecting for corrosion may need enhanced training to ensure appropriate identification of corrosion. More efficient tracking and monitoring of corrosion is needed.

Gas Leaks Grade 2 and 3 gas leaks, although not representing immediate threats to public safety, should be timely repaired; improvements are needed in documenting and monitoring the status of leaks and related repairs.

Valves The Gas Utility should designate critical infrastructure valves in the GIS.

Pressure Monitoring Station 21 (satellite City utility facility) staff should be trained in their expected roles in monitoring system pressures after the system upgrade is completed; system alarms should be reestablished at Station 21.

Emergency Notifications and Responses The Gas Utility should better document responses to emergencies; Station 21 staff should better document notifications dispatched to the Gas Utility.

Gas Infrastructure

AUDIT REPORT #0727

September 13, 2007

CITY OF TALLAHASSEE
OFFICE OF THE CITY AUDITOR

Copies of this audit report #0727 (project #0612) may be obtained from the City Auditor's web site (http://talgov.com/auditing/index.cfm), by telephone (850 / 891-8397), by FAX (850 / 891-0912), by mail or in person (City Auditor, 300 S. Adams Street, Mail Box A-22, Tallahassee, FL 32301-1731), or by e-mail (auditors@talgov.com).

Audit conducted by:
T. Bert Fletcher, CPA, Senior Audit Manager
Sam M. McCall, CPA, CGFM, CIA, CGAP, City Auditor

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Gas Infrastructure

Sam M. McCall, CPA, CGFM, CIA, CGAP
City Auditor

Report #0727 ***September 13, 2007***

Executive Summary

This audit focused on various processes, procedures, and systems relating to the City's gas infrastructure, including accounting for, managing, installing, and maintaining that infrastructure.

This audit addressed the City's gas infrastructure. The audit focused on processes, procedures, and systems used by the Gas Utility to (1) account for and manage infrastructure components including gas mains, services lines, meters, valves, regulating stations, etc.; (2) install, construct, and maintain the infrastructure in accordance with controlling federal and state regulations; (3) protect and educate the public in regard to gas infrastructure risks; and (4) plan and fund infrastructure expansion and replacement. The processes, procedures, and systems in effect during the time of our audit fieldwork in winter and spring 2007 were reviewed. Records of activity in recent years, primarily calendar year 2006, were also reviewed. Capital projects established for expansion and replacement of the City's gas infrastructure were also considered in this audit.

The Gas Utility maintains 780 miles of gas mains and approximately 28,000 service lines.

The City's gas infrastructure is comprised of:

- Four gate stations at which gas is received from private transmission companies;
- 780 miles of gas mains;
- Approximately 28,000 service lines;
- 18 regulating stations; and
- Approximately 6,900 valves.

The Gas Utility expends $1.6 million annually in maintaining the City's gas infrastructure; over$14 million was spent over the last five years for gas infrastructure expansion and replacement.

Although in existence since 1956, the majority of the City's gas infrastructure was established within the last 20 years. The vast majority of expansion and replacement is performed by a private contractor. The primary regulating authorities are the United States Department of Transportation, Office of Pipeline Safety (OPS) and the State of Florida, Public Service Commission (PSC).

Over the last five years, the Gas Utility has expended an average of $1,587,660 annually to operate and maintain the City's gas infrastructure (excluding cost of natural gas). Also, over the last five years a total of $14,449,332 was expended through ten capital projects for infrastructure expansion and replacement.

Overall, processes, procedures, and systems are adequate to ensure the maintenance of a safe and appropriate gas infrastructure and to fund expansion and replacement.

Our audit showed that significant improvements and enhancements have been and continue to be made in regard to accounting for the City's gas infrastructure. We found that, overall, the Gas Utility has adequate and appropriate processes and procedures to ensure that a safe and reliable gas infrastructure is operated and maintained. Those processes and procedures ensure that installation of new infrastructure in connection with expansion and replacement projects meets applicable federal and state regulations. Our review showed that gas infrastructure expansion and replacement projects are adequately planned and funded. In addition, we found that an appropriate and effective public protection program has been established.

We also identified issues that indicate the need for additional improvements and enhancements in the management of the City's gas infrastructure. Accordingly, recommendations were made within this report to:

However, various issues were identified that indicate the need for additional improvements and enhancements.

- Establish a project management plan to assist in enhancing the Gas Utility's geographic information system (GIS).
- Protect the inventory of gas pipe, valves, and fittings maintained at the City's Municipal Supply Center (MSC) from direct sunlight, and update related MSC purchasing specifications and reorder points and quantities.
- Install an additional valve near one regulating station in accordance with PSC regulations.
- Incorporate within the Gas Utility GIS those regulating station valves found on audit not to be reflected in that system.

Recommendations were made to address identified issues.

- Ensure that applicable parts of the Gas Utility's cathodic protection system are tested at the required frequencies, and those tests are consistently documented.
- Establish accurate and complete records of the test stations created for the cathodic protection system.
- Ensure applicable non-Gas Utility staff is adequately trained to properly identify atmospheric corrosion on exposed portions of the Gas Utility's service lines.
- Ensure that efforts are continued to establish a single, efficient method for tracking instances of atmospheric corrosion.
- Establish documented operating procedures for identifying and addressing atmospheric corrosion on service lines.
- Repair all identified grade 2 and 3 gas leaks (which do not represent immediate threats to public safety) within the time periods prescribed by PSC regulations.
- Efficiently document, track, and monitor reported gas leaks and related repairs.
- Establish complete and accurate records that designate critical valves within the gas infrastructure.
- Adequately document inspections of valves and regulating stations, and efficiently store the related inspection records.
- Train Station 21 (a Water Utility satellite office) staff as to their expected roles and responsibilities in using the SCADA system to monitor gas flows and pressures, and complete the upgrade to the SCADA application used by Station 21 staff.
- Use the SCADA system to monitor the City's gas infrastructure located in Gadsden County (City of Midway), as planned.
- Adequately and consistently document dispatches of emergency calls and the related responses to those calls.
- Report accurate and clear performance measures that are adequately supported by appropriate records.

We would like to thank the Gas Utility, Water Utility, ISS, MSC, and UBCS staffs in their assistance during this audit.

Gas Infrastructure

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Report #0727 ***September 13, 2007***

Objectives

The purpose of this audit was to determine if the City maintains and installs a safe and appropriate gas infrastructure, properly accounts for that infrastructure, and adequately plans and funds infrastructure expansion and replacement.

The objectives of this audit were to determine (1) whether adequate and complete records are maintained that enable the Gas Utility to effectively and efficiently track, monitor, and manage the City's gas infrastructure; (2) whether the Gas Utility has a process in place to ensure that additions to the City's gas infrastructure (expansion and replacement) meet minimum installation standards as specified by controlling federal and state regulations; (3) whether the Gas Utility has a process in place to ensure that the City's gas infrastructure is safely and appropriately maintained in accordance with controlling federal and state regulations; (4) whether an adequate public protection program is maintained in regard to the City's gas infrastructure; and (5) whether the Gas Utility has an adequate process for planning and funding gas infrastructure expansion and replacement.

Scope

This audit focused on the current COT gas infrastructure and related processes.

The scope of this audit included a review of the Gas Utility's processes established to install (construct), maintain, protect, and account for the City's gas infrastructure. That infrastructure is comprised of mains, service lines, meters, valves, regulating stations, etc. The Gas Utility's public protection program was also reviewed. The audit focused on the programs and processes that were in effect during the time of our audit fieldwork in winter and spring 2007. For certain processes, records of activity in recent years were also reviewed. Capital projects established for the expansion and replacement of the City's gas infrastructure were also considered in this audit.

(NOTE: Technical areas which audit staff was not qualified to address were excluded from the scope of this audit. For technical areas that were addressed in this audit, audit staff relied, at least in part, on understandings and explanations provided by

knowledgeable individuals, primarily Gas Utility engineering and maintenance staffs, in the completion of audit procedures.)

Methodology

We conducted various audit procedures to address the stated audit objectives. Those audit procedures included making audit observations, conducting interviews of knowledgeable personnel, and inspecting and analyzing applicable records and reports. Specific audit methodologies and procedures included the following:

We identified and reviewed processes, made observations at selected locations, interviewed knowledgeable staff, and analyzed recorded activity.

- We identified and reviewed the federal and state regulations that pertain to and govern the City's gas infrastructure.
- We reviewed annual inspection reports issued by the Florida Public Service Commission (PSC) and discussed issues with PSC staff as appropriate.
- We identified the records and software applications used to document and account for the various gas infrastructure components (mains, service lines, meter settings, valves, regulating stations, etc.). We conducted various tests and analyses of those records, as well as interviews of applicable Gas Utility and Information System Services (ISS) staffs, to determine the accuracy and completeness of those records.
- We reviewed applicable contract language and visited and observed current installations of new gas mains and service lines to determine if materials used and processes followed met federal specifications and requirements.
- We determined if required inspections and tests were performed and documented by the Gas Utility for installations of gas mains and service lines by the City's contractor.
- We observed and inspected the inventory of gas infrastructure components (e.g., pipe, valves, and fittings) maintained at the City's Municipal Supply Center (MSC) to determine whether

(1) those components were marked as meeting federally required manufacturing specifications, (2) processes were adequate to ensure appropriate quantities were maintained on hand, and (3) inventory was adequately stored and protected.

- We interviewed knowledgeable Gas Utility staff, inspected applicable records, and made site visits to sampled locations to determine if valves were strategically and appropriately placed within the existing infrastructure.

- We determined if required periodic testing was performed of the City's "cathodic protection system" (the process of using electrical current to protect metallic gas mains from external corrosion), and whether appropriate corrective measures were taken when those tests indicated inadequate protection.

- We determined if inspections to check for atmospheric corrosion were performed at required intervals, and whether timely corrective actions were taken for instances where significant corrosion was noted.

Numerous processes, items, and records were reviewed, observed, and analyzed.

- We determined if leak surveys were conducted at required intervals, and whether timely corrective actions were taken for applicable leaks identified by those surveys or through other means.

- We determined if required inspections of regulating stations and critical valves, and for system odorant, were performed.

- We reviewed the methods used to monitor the pressures of gas flowing through the City's gas mains, and to prevent over-pressurization of those mains.

- We reviewed the process used by the City to identify and mark the locations of buried gas mains and service lines in areas where the City receives notifications of planned excavations.

- We reviewed the process for responding to emergencies (e.g., gas leaks and damaged gas lines).

- We reviewed the Gas Utility's public awareness program for educating the public as to potential hazards and the appropriate steps that should be taken when planning excavation activities or in the event of unintended releases (leaks) of gas.

- We evaluated the adequacy of the process used by the Gas Utility to budget for gas infrastructure expansion and replacement.

- We reviewed the accuracy of performance measures reported by the Gas Utility that pertain to the City's gas infrastructure.

To complete the audit procedures, audit staff relied, in part, on the explanations and assistance provided by knowledgeable Gas Utility staff.

The auditor performing the described audit procedures was not a trained or educated engineer. As a result, reliance was placed on assistance and explanations provided by knowledgeable individuals (primarily Gas Utility engineering and maintenance staffs) in the completion of some of those procedures. Accordingly, the basis for our audit conclusions relating to technical areas included in the scope of this audit is knowledge and understandings obtained through interviews and discussions with knowledgeable Gas Utility staff, in conjunction with reviews of applicable technical materials and observations of items or processes.

This audit was conducted in accordance with Generally Accepted Government Auditing Standards and Standards for the Professional Practice of Internal Auditing.

Background

The City of Tallahassee Gas Utility was established in 1956, approximately 50 years ago. Our analyses performed in winter 2007 showed the City's gas infrastructure was comprised of the following:

- Four gate stations at which the City receives natural gas from privately owned and operated transmission pipelines (NOTE: A significant portion of the infrastructure at those gate stations is owned and maintained by the gas transmission companies and not the City.);

The current infrastructure consists of four gate stations, 780 miles of gas mains, 28,000 service points, 6,900 valves, and 18 regulating stations.

- 780 miles of gas mains (includes high, medium, and low pressure mains);
- 18 regulating stations at which the pressures of gas flowing through the City's distribution mains are reduced to lower levels to ensure the efficient and effective flow of gas and to allow for the eventual distribution to customers' premises at safe and usable pressure levels;
- 27,925 active service points representing connections from gas mains to residential or commercial premises (service points are also known as service lines and meter settings);
- Approximately 6,900 gas valves (excluding valves on individual service lines); and
- Other miscellaneous components such as test stations and anodes (parts of the City's cathodic protection system), odorizing equipment, etc.

Although in existence since 1956, Gas Utility management indicated that the majority of the current gas infrastructure was installed within the last twenty years. Specifically, Gas Utility management estimated that in the late 1980's there were about 6,000 service points and 200 miles of gas mains, compared to almost 28,000 service points and 780 miles of gas mains today.

The City's Gas Utility was established 50 years ago; however, the majority of the current infrastructure was installed in the last 20 years.

The City's gas pipelines (mains and service lines) are made of either coated steel or polyethylene plastic. Gas Utility staff indicated that, to their knowledge, no other materials (e.g., ductile iron or cast iron) have been used in the installation of City mains and service lines. The steel and polyethylene pipe used for gas pipelines must be manufactured in accordance with specifications provided in governing federal regulations. Gas Utility records showed that of the City's 780 miles of gas mains, 324 miles are coated steel and 456 miles are polyethylene plastic. While polyethylene plastic is generally used for medium and low pressure

lines, coated steel is used for all high pressure lines (i.e., pressure of 100 pounds or more).

A private contractor performs the vast majority of infrastructure installation and replacement.

The vast majority of infrastructure expansion and replacement is performed by an independent contractor. The current contractor is "R.A.W. Construction LLC." Occasionally, City staff installs or replaces gas mains or other infrastructure for minor jobs or projects.

We determined that the primary authority that controls and regulates the City's gas infrastructure is the United States Department of Transportation, Office of Pipeline Safety (USDOT OPS). In addition, the State of Florida, Public Service Commission (PSC) establishes additional regulations. The PSC periodically monitors the City's compliance with governing USDOT OPS regulations, as well as the governing PSC regulations.

As shown in the following table, costs incurred to maintain and operate the City's Gas Utility (exclusive of fuel costs) totaled $7,938,299 over the last five complete fiscal years (FYs), for an annual average of $1,587,660.

In the last five years, the Gas Utility expended $7.9 million to maintain and operate the City's Gas Utility.

Table 1 – Maintenance and Operating Costs

Fiscal Year	Amount
2002	$1,472,260
2003	$1,519,151
2004	$1,607,226
2005	$1,694,218
2006	$1,645,444
TOTAL	$7,938,299

Those costs were comprised primarily of personnel expenses (salaries and benefits), operating expenses (e.g., contractual services and supplies), vehicle operational expenses, and utility expenses incurred by the Gas Transmission and Distribution (or

Maintenance) Division. Personnel costs were the largest, representing 73% of total maintenance costs.

Over the last five years the City expended almost $14.5 million for infrastructure expansion and replacement.

In regard to infrastructure expansion and replacement, a total of $14,449,332 was expended through 10 capital projects over the last five complete fiscal years (FY 2002 through FY 2006). Those expenditures are classified in the following table.

Table 2 – Expansion and Replacement

Expenditure	Description
$5,905,739	System expansion – includes extending gas mains into new areas, neighborhoods, and subdivisions
$4,397,078	New service connections – includes installing new service lines and meter settings at customer premises
$2,271,603	Relocations and adjustments of existing mains and valves in connection with road widening projects; also, includes minor adjustments and replacements
$1,220,306	New and replacement meters
$568,431	Expansion, addition, or improvements to existing high pressure components to make the system better or more efficient
$86,175	Other – primarily includes repairing damage to mains and service lines (cut or broken lines) resulting from excavation activities by third parties
$14,449,332	TOTAL

Overall Summary

Overall, adequate records, processes and procedures are in place to account for and ensure a safe and reliable infrastructure; however, issues were identified.

The results of audit procedures showed that significant improvements and enhancements have been and continue to be made in regard to accounting for the City's gas infrastructure. Also, we found that, overall, the Gas Utility has adequate and appropriate processes and procedures to ensure that a safe and reliable gas infrastructure is maintained. We noted those processes and procedures ensure that installation of new infrastructure in connection with expansion and replacement projects meets applicable federal and state regulations. Those gas infrastructure

expansion and replacements projects are planned and funded. In addition, we found that an appropriate and effective public protection program has been established. We also identified issues that are indicative of the need for additional improvements and enhancements to the management of the City's gas infrastructure. Those issues, and related processes and procedures, are addressed in the following sections of this report.

Accounting for the City's Gas Infrastructure

Overview In regard to accounting for and tracking the various components of the City's gas infrastructure, the Gas Utility recently migrated from a paper map system (produced by AutoCAD software) to a geographic information system (GIS). The GIS is a computer system that captures and stores geographically referenced data and associated attributes that can be displayed graphically (e.g., as a map). That geographically referenced data and related attributes can be edited, updated, analyzed, and managed through available software applications.

The Gas Utility recently migrated from a paper map software application to a GIS database.

The migration of the basic gas infrastructure data, including the graphical (or pictorial) display of gas mains, valves, meter settings, regulating stations, gate stations, etc., has been substantially completed. In addition, much of the critical attribute data for those components has been entered into the GIS database. Completion of those steps has enhanced the ability of the Gas Utility to account for, track, monitor, and otherwise manage the City's gas infrastructure relative to the former paper map system. For example, the GIS can be updated almost immediately to reflect changes (e.g., main extensions and new meter settings), opposed to not reflecting changes until the next date at which paper maps are updated and printed. Also, component and related attribute data can be more efficiently accumulated, summarized, and analyzed through the GIS. Additionally, with the implementation of mobile computer units in Gas Utility vehicles, staff is able to access the GIS and quickly locate infrastructure components, which can be critical in emergency circumstances. Further automation and efficiencies have been and are being achieved through integration

of the gas infrastructure GIS with other systems, including the City's PeopleSoft Customer Information System (CIS), Leon County GIS, and unique software applications used in construction project management. The successful efforts made to date by the Gas Utility in establishing the GIS and installing related software applications have been funded through a recurring capital project, currently titled "Automation Implementation."

The GIS allows the Gas Utility to more efficiently and effectively track, monitor, and manage the City's gas infrastructure.

Now that the migration of basic gas infrastructure data to the GIS has been completed, the Gas Utility intends to make refinements that will further enhance staff's capability to manage and monitor that infrastructure. Those refinements are to be made in connection with the ongoing "Automation Implementation" capital project. Examples of planned refinements include:

- Identifying and adding to the GIS gas valves and mains that were not reflected in the manual records formerly used to account for the infrastructure. While the vast majority of valves and mains were reflected in the former manual records and are now properly reflected in the GIS, one of the stated purposes of the "Automation Implementation" capital project is for completing surveys to verify the location and accessibility of existing valves and facilities (e.g., mains) for proper integration into the GIS. As noted in a subsequent section of this report (see page 27), our audit fieldwork substantiated this condition as we identified three regulating station valves that were not reflected in the GIS or existing manual records.

- Designating and depicting key, isolation, and other critical valves in the GIS. The Gas Utility staff currently relies on other records, including manual lists used in conjunction with "old" paper maps, to identify those critical valves. (Also, see pages 42 and 43 of this report.) The Gas Utility indicated during the audit that staff was currently in the process of designating all key and isolation valves in the GIS database. Such designations will enhance the ability to track, manage, and maintain those valves.

- Recording additional attribute data in the GIS for infrastructure components. One advantage of the GIS is that various attributes can be recorded and displayed for each infrastructure component. Attributes that can be reflected include, for example, material type, material manufacturer, date of installation, operating pressures, construction inspection data, and various maintenance data such as leak survey dates and frequencies. Many attributes are already available in the Gas Utility GIS template for the various infrastructure components. For example, we found that pipe diameter, material type, and operating pressures (among other attributes) were recorded for most gas mains. Similar key attributes were reflected for valves and other components. However, the Gas Utility plans to add other attributes to assist in managing and maintaining the infrastructure components. One example is construction inspection data (inspection dates, test pressures, test durations, etc.) for service lines, which currently must be obtained from staff inspection reports stored in the City's electronic data imaging system (EDMS).

Additional refinements are planned to enhance the Gas Utility GIS.

- Referencing and/or linking applicable construction, inspection, and engineering documents to gas mains reflected in the GIS. For each gas main added to the City's gas infrastructure, federal regulations require the retention of applicable construction test records (i.e., pressure tests). The retention of those records, along with applicable inspection and engineering records, serve as source documents for critical attribute data. In prior years, those paper records have been manually maintained in files at the Gas Utility. However, with the recent migration to the GIS and the initiation of the "Automation Implementation" capital project, the Gas Utility is converting to storage of those documents in the City's Electronic Data Management System (EDMS). Gas Utility staff indicated that using the EDMS for storage is an intermediate step, as plans are eventually to use available software to record that data directly into the GIS or other computer database, thereby eliminating the need for

preparing and retaining paper records (regardless of whether they are stored manually or electronically). Notwithstanding these plans, the traditional reference between those construction, inspection, and engineering records and the correlating recording/depiction of the mains in the GIS (or former paper map system) was "address." However, that address information reflected on the paper records (and currently being indexed into the EDMS) is often not sufficient to identify the applicable main segment as recorded in the GIS. As a result, it is difficult and sometimes impossible to identify applicable construction, inspection, and engineering records for main segments currently depicted in the GIS. Because of this circumstance, the Gas Utility plans to develop a means to index those records with a unique identifying number that will also be recorded in the GIS for the applicable main. Completion of that step will allow Gas Utility staff to effectively and efficiently demonstrate that required inspections and tests were performed for gas mains that have been added to the City's infrastructure.

The additional enhancements to the GIS will be made in connection with the ongoing "Automation Implementation" capital project.

- Adding other (non-primary) infrastructure components to the GIS. The Gas Utility, for the most part, has recorded the primary infrastructure components (mains, service lines, meter settings, valves, regulating stations, and gate stations) in the GIS. The Gas Utility also plans to add other (non-primary) components, such as test stations used for testing the cathodic protection system.

- Adding gas meter settings that were not successfully integrated into the GIS through the automated interface with the City's PeopleSoft CIS and Leon County GIS. Those periodic interfaces result in the majority of gas meter settings (reflected as service points in the PeopleSoft CIS) being successfully integrated into the Gas Utility GIS. For example, we found that, as of February 14, 2007, there were 27,925 gas service points in PeopleSoft CIS, of which 27,076 (or 97%) were reflected in the Gas Utility GIS. Discussions with Gas Utility and ISS staffs

indicated that the remaining 849 service points likely represent instances where either (1) addresses in the PeopleSoft CIS had not yet been added to the Leon County GIS (e.g., addresses represent new developments which have not been platted, and therefore are not yet created in the Leon County GIS) or (2) inaccurate recordings of address data in the PeopleSoft CIS that cannot be matched to the addresses recorded (i.e., accurately) in the Leon County GIS. Each of those 849 service points will have to be researched and/or additional interfaces will have to be made before they can be properly recorded in the Gas Utility GIS.

In summary, the Gas Utility has made significant strides in using available technology to improve staff's capability to account for, monitor, and manage the City's gas infrastructure. Additional refinements are planned as part of the ongoing "Automation Implementation" capital project to further enhance those capabilities.

Issue – Project Management Plan As noted above, the Gas Utility plans to make refinements to enhance the GIS. Several planned refinements are described above. Some of those refinements will represent ongoing processes that will not be totally completed at any point in time. While those refinements are planned as part of the ongoing "Automation Implementation" capital project, no formal, documented "project management plan" has been developed to assist in their implementation. Such a plan should help staff in ensuring that appropriate tasks and actions are identified, prioritized, and timely completed; and necessary resources identified and allocated.

Establishing a "project management plan" should assist the Gas Utility in the efficient completion of planned refinements.

Recommendation To facilitate efforts in refining the Gas Utility GIS, we recommend that the Gas Utility, with the assistance of ISS, establish a documented "project management plan" for the GIS that:

- Identifies tasks and actions remaining to be completed (including, but not limited to, those noted above);

- Prioritizes those tasks and actions;
- Establishes completion goals (dates);
- Identifies and allocates resources needed to complete the tasks/actions; and
- Tracks and reports on progress in completing tasks and actions.

That plan should be dynamic, in that it should be modified and adjusted as additional issues (technological, logistical, resource, or otherwise) are identified.

(NOTE: Gas Utility management indicated that the timely and successful completion of the noted actions, and the overall "Automation Implementation" capital project, requires the commitment of City management to allow the Gas Utility to retain the information technology (IT) position currently reporting directly to the utility. The Office of the City Auditor agrees that an IT position, knowledgeable of the Gas Utility business operations and needs and available to the Gas Utility on a full-time basis, will help ensure the noted actions and project are timely and successfully completed.)

Infrastructure Installation and Materials

Federal regulations prescribe manufacturing and installation standards for natural gas infrastructures.

Overview To ensure an adequate and safe gas infrastructure, the USDOT Office of Pipeline Safety (in Title 49, Part 192, Subpart B, Code of Federal Regulations) requires that gas distribution pipelines (mains, service lines, and related valves and fittings) be manufactured in accordance with listed specifications. Those USDOT Office of Pipeline Safety (OPS) regulations also require that each valve, fitting, and length of pipe be marked (1) in a manner that shows it was manufactured in accordance with a prescribed specification or, alternatively, (2) to indicate size, material, manufacturer, pressure rating, and as appropriate, type, grade, and model. Other USDOT OPS regulations govern the

installation of new gas mains and service lines for the purpose of ensuring an adequate and safe infrastructure. Specifically:

- New segments of pipelines must be tested for leaks and to ensure minimum strength requirements are met. Such tests must be conducted before the new pipeline segment is placed into service. Those tests must be performed at pressures and for durations designated for the applicable materials and intended operating pressures. Those test records must be retained for a minimum of five years and, in some cases, for the useful life of the applicable pipeline segment. (Title 49, Part 192, Subpart J, Code of Federal Regulations)

Federal regulations for installing gas infrastructure address leak tests, welding and fusion, pipeline depths, valve placements, etc.

- Welding segments of metallic (steel) pipe and joining (fusing) segments of plastic pipe must be performed in accordance with prescribed standards by qualified individuals. (Title 49, Part 192, Subparts E and F, Code of Federal Regulations)
- For protection from external pressure and loads, buried gas mains and service lines must be installed at prescribed depths (i.e., ground cover must not be less than certain minimum amounts). (Title 49, Sections 192.327 and 192.361, Code of Federal Regulations)
- Valves must be installed on each service line to allow the flow of gas to be cut off as needed at a customer's premises. Those cut-off valves must be installed in readily accessible locations on the upstream side of the regulator, or upstream of the meter if no regulator is used. (Regulators are devices that reduce the pressure of gas flowing through the service line into the customer premises to an appropriate level.) (Title 49, Sections 192.363 and 192.365, Code of Federal Regulations)
- For single residence customers, the Gas Utility must provide the customer the option to have an "excess flow valve" placed on a newly installed service line. As an alternative, the Gas Utility can elect to place those valves on each new service line without consulting the customer. An excess flow valve is designed to shut off the flow of natural gas automatically if the service line breaks (e.g., breaks resulting from accidents caused by

excavation activities). (Title 49, Section 192.383, Code of Federal Regulations)

(NOTE: There are other USDOT OPS regulations relating to infrastructure installation that were excluded from the scope of this audit due their highly technical nature. Those regulations addressed, for example, various pipe and infrastructure design requirements.)

While most installations are done by the City's contractor, the Gas Utility maintains a small working supply of gas infrastructure materials for minor jobs and projects.

The Gas Utility has contracted with a private entity to install the vast majority of new and replacement gas mains and service lines, and to repair damaged mains and service lines. That contractor acquires materials for those jobs directly from applicable manufacturers/vendors; the City does not acquire and provide materials to the contractor. Occasionally, Gas Utility Maintenance Division staff will install new pipe, fittings, or valves in connection with a minor repair or replacement job or a minor main extension. For those occasions, and also for emergency circumstances (e.g., break in a gas line at a time when contractor staff are not available), the Gas Utility maintains a small working supply of materials at the City's Municipal Supply Center (MSC).

Our audit tests, analyses, observations, inspections, and inquiries showed that, overall, the Gas Utility has adequate processes and procedures to ensure that proper materials are available and used, and that gas mains and service lines are installed in accordance with the noted regulations. Specifically:

- The contract with the third party installing mains and service lines on behalf of the Gas Utility contains terms and provisions that, among other things, (1) require the contractor to comply with all applicable local, state, and federal laws, rules, and regulations, including those established by the USDOT OPS; (2) provide required material specifications that are in accordance manufacturing specifications prescribed by USDOT OPS; (3) provide main and service line installation and testing specifications; (4) allow Gas Utility staff to inspect and approve all work; and (5) establish welding and joining (fusion) requirements for contractor staff.

We found that the Gas Utility has adequate processes and procedures to ensure that proper materials are used and installation standards are met.

- Gas Utility staff conducts periodic on-site inspections of each installation performed by the contractor. Those inspections address, among other areas, whether (1) materials were appropriate, (2) welds and fusions were adequate and performed only by certified (qualified) personnel, (3) required pressure (leak and strength) tests were performed and passed, (4) depth of buried pipe was appropriate, and (5) installation activities were appropriate. Our test of recent main and service line installations showed that those inspection activities are performed and documented.

  (NOTE: As noted in the issue described in the previous section of this report ["Accounting for the City's Gas Infrastructure"], inspection and related engineering and construction records for gas main installations have not been adequately referenced to gas main installations recorded and depicted in the Gas Utility GIS. Accordingly, the Gas Utility was not able to successfully identify [and retrieve when applicable] the applicable inspection records for our initial sample of gas mains selected from the GIS. Accordingly, we adjusted our audit approach to select a sample from main installations completed in fiscal year 2006, for which related inspection reports were identified and available. Accordingly, our audit conclusions noted above in regard to documented inspections of gas main installations is based solely on fiscal year 2006 activity.)

- For ongoing installations selected for site visits and audit observation, we determined that:

  - Materials (pipe, fittings, and valves) used by the contractor were appropriate for the job and were marked as manufactured in accordance with federally required specifications.

  - Contractor staff performing welds and joins had been properly certified by the Gas Utility as qualified to perform that work.

  - Mains and service lines were buried at appropriate depths.
  - On-site Gas Utility staff inspected the materials and contractor's installation activities.

- Pipe on hand at the MSC that was acquired by the City in recent years was marked as manufactured in accordance with federally required specifications.
- For sampled service lines, cut-off valves were installed in appropriate locations on those service lines.
- The Gas Utility elected to install excess flow valves on all new service lines. Our review of records for recent service line installations, as well as observations of ongoing service line installations, showed that excess flow valves were installed (or being installed) for each sampled installation.

The processes and procedures employed by the Gas Utility appear sufficient to ensure that new gas mains and service lines added to the City's gas infrastructure are safe and appropriate (i.e., in relation to those areas included in the scope of this audit).

We also identified issues for which additional actions are needed. Those issues, which pertain to the relatively small quantities of pipe and related materials acquired and stored by the MSC on behalf of the Gas Utility, are addressed below.

The inventory of materials stored by the City at the MSC should be better protected from direct sunlight.

Issue – Protecting Stored Pipe and Fittings From Environmental Elements As noted previously, the Gas Utility maintains a small working supply of materials (pipe and fittings) at the City's MSC. We noted that the quantities on hand were reasonable in regard to current expected usage levels. In addition, the materials were adequately secured within the fenced MSC yard. Furthermore, based on our observations made jointly with Gas Utility maintenance staff, materials appeared to be in acceptable to good condition. However, we noted that the rolls and lengths of plastic (polyethylene) pipe were not adequately protected from the elements. Specifically, that pipe was stored in the open yard and thus exposed to ultraviolet degradation from the

sun. In addition, four large wooden crates containing various plastic fittings for large plastic pipe were stored outside against the side of the MSC warehouse. Those fittings were also exposed to direct sunlight. As polyethylene materials are expected to have useful lives that may reach or exceed 100 years, it is important that those materials be retained in the best possible condition prior to being installed in the ground. Gas Utility staff agreed with this assessment.

Recommendation MSC and Gas Utility staffs should determine a cost efficient method for storing polyethylene pipe and related fittings in a manner that properly protects the materials from direct sunlight and other applicable environmental elements. Once that method is determined, actions should be taken by MSC to store those materials accordingly.

Purchasing specifications should be updated for the three applicable pipe types and sizes.

Issue – Purchase Specifications We determined that the MSC maintained purchasing specifications for 7 different sizes of polyethylene pipe and 6 different sizes of steel pipe (a total of 13 specifications for gas mains and service lines). We found for 10 of the 13 that accurate and complete federally required manufacturing and testing requirements were included in the available purchasing specifications on file at the MSC. However, for the remaining three pipe materials and sizes, we noted that the purchasing specifications on file at MSC were not complete. We acknowledge that there are compensating controls to ensure that only proper pipe and materials are used in gas main and service line installations (e.g., on-site inspections during installation). Additionally, our observations showed that pipe on hand were marked as meeting applicable federal manufacturing requirements. Notwithstanding, the lack of complete purchasing specifications reduces assurance that proper pipe will be acquired and installed for minor jobs completed by in-house staff.

Recommendation The Gas Utility should provide updated and complete purchasing specifications to the MSC for the applicable pipe. MSC should use that information to update the applicable purchasing specifications.

Reorder points and quantities were updated for current circumstances based on our audit analysis.

Issue - Reorder Points and Quantities We determined that reorder points and quantities and maximum suggested inventory levels for polyethylene and steel pipe (used for gas mains and service lines) as recorded in the City's PeopleSoft Financials System were based on circumstances in place when City Gas Utility staff performed more installations compared to current circumstances. Accordingly, those reorder points and quantities and suggested inventory levels were generally overstated. For example, for ¾ inch polyethylene pipe, the PeopleSoft Financials System reorder quantity was 2,000 feet, reorder point was 1,000 feet, and suggested maximum inventory level was 3,000 feet. Based on our discussions with Gas Utility maintenance staff, more appropriate levels for that pipe under current circumstances are 500 feet (reorder quantity), 500 feet (reorder point), and 1,000 feet (maximum suggested inventory level). Unless the system is manually overridden, the reorder levels and quantities reflected in the PeopleSoft Financials System will determine when and how much pipe is ordered. We noted that current MSC and Gas Utility staff has manually overridden those PeopleSoft Financials reorder points and quantities in recent acquisitions to preclude ordering unneeded quantities of pipe, which could be susceptible to damage from environmental elements while in storage. However, overstated reorder points and quantities in the PeopleSoft Financials System increases the risk that excessive quantities will be ordered and maintained at the MSC.

Recommendation The Gas Utility should determine appropriate reorder points and quantities and suggested maximum inventory levels. MSC should revise the levels recorded in the PeopleSoft Financials System based on those determinations. (NOTE: The Gas Utility and MSC completed those recommended actions subsequent to our initial audit fieldwork.)

Valve Placement

A safe and adequate infrastructure requires the strategic placement of valves in critical locations.

Overview Valves are placed on various gas infrastructure components (mains, service lines, regulating stations, etc.) to allow the gas supply to be turned off (cut off) at strategic points within the infrastructure. The reasons for turning off the supply of gas include, for example:

- Turning off the gas supply due to an emergency, such as a gas leak resulting from a broken main or a gas leak that results in a fire at a damaged regulating station;

- Turning off the gas supply flowing through specific mains while excavation activities are conducted or repair or maintenance work is being done on those mains; and

- Turning off gas at a customer premises because the customer no longer wants service or fails to pay a utility bill.

In the previous section of this report, we noted that critical valve placement on service lines was found to be appropriate and in accordance with controlling federal regulations (i.e., cut off valves and excess flow valves were found to be properly placed on service lines). In regard to placement of other infrastructure valves, applicable federal regulations provide:

- For high pressure mains, valves are spaced so as to reduce the time to shut down a section of main in an emergency. The valve spacing should be determined by the operating pressure, size of the mains, and local physical conditions. (Title 49, Section 192.181, Code of Federal Regulations)

- For regulating stations, valves must be installed on the inlet piping (upstream side) at a distance from the station sufficient to permit operation of the valve in an emergency that might preclude access to the station. (Title 49, Section 192.181, Code of Federal Regulations) Similar to that federal regulation, Public Service Commission (PSC) regulations require valves to

be installed upstream of each regulator station for use in an emergency to stop the flow of gas. Those PSC regulations provide those valves are to be installed at a safe distance from the station, but no more the 500 feet from the regulating station. (Section 25-12.022, Florida Administrative Code)

We found that the Gas Utility has generally installed valves in accordance with those regulations. Specifically, we found that:

Overall, valves were installed at proper locations.

- Valves were placed in locations that will allow the gas supply to be stopped in areas where critical populations congregate (e.g., schools, shopping centers, colleges, hospitals).

- Valves were placed at key street intersections to allow "sectionalizing" the shut down of gas flow based on City blocks.

- Valves were placed in locations that allowed the gas supply to be stopped at each regulating station.

- Valves were located to stop or adjust the flow of gas coming into the City's system at each gate station.

- Valves were strategically placed at other locations to allow the gas supply to be stopped at other critical areas (e.g., valves to stop the flow of gas through a main under a railroad crossing).

Overall, the Gas Utility's procedures ensure the proper and strategic placement of valves within the City's gas infrastructure. However, as noted below, certain issues relating to regulating station valves were identified.

A valve for one City regulating station was not placed at the distance prescribed by controlling PSC regulations.

Issue – Regulating Station Valve Placement We selected a sample of 11 of the City's 18 regulating stations to determine if valves were strategically located as required by applicable federal and PSC regulations. We found that valves were installed on mains upstream from each of those 11 stations. Because of the design and flow of gas through applicable mains, some of these regulating stations required two valves to stop the flow of gas. Also, because of the design of the gas infrastructure, we found in one instance that the same two valves were needed to stop the flow of gas at either of two regulating stations located in the same proximity. Accordingly (with the assistance of Gas Utility staff), we determined there were 13 valves strategically placed to stop the upstream flow of gas into the 11 sampled regulating stations.

As noted above, PSC regulations provide those isolation valves are to be installed at a safe distance, but not more 500 feet from the regulating station. (Section 25-12.022, Florida Administrative Code) Isolation valves within 500 feet of the station may enhance public safety, because further distances will result in additional volumes of gas that will flow into a station before the gas flow stops; and those additional volumes of gas could become critical to public safety in the event of an emergency (e.g., explosion and fire). However, that requirement to have an isolation valve within 500 feet of a station is only applicable for regulating stations installed/constructed after the promulgation of that PSC regulation in 1974. PSC staff indicated that isolation valves on the upstream side of regulating stations installed/constructed prior to the promulgation of the regulation in 1974 do not have to be located within 500 feet of the stations. Our understanding is that PSC does not consider the safety issues, related to not having a valve within 500 feet, significant enough to warrant installing additional valves at those stations. Instead, PSC requires that additional valves within 500 feet be installed at those stations whenever significant revisions or modifications are made to the stations.

For 10 of the 11 regulating stations selected for review, we found that the isolation valves were either located within 500 feet of the applicable stations or the stations were installed/constructed prior to 1974. For the remaining regulating station, which was constructed in 1996, we found that the isolation valve was located approximately 1,250 feet from the station. After discussion of this issue, the Gas Utility indicated that it would install an additional valve within 500 feet of that regulating station.

Recommendation For the applicable regulating station constructed subsequent to 1974, the Gas Utility should install an additional valve on the upstream side of the applicable main at a distance that is no more than 500 feet from the station.

Three critical regulating station shut-off valves were not reflected in the GIS or other Gas Utility records.

Issue – Regulating Station Valve Records In regard to the 13 valves pertaining to the sampled 11 regulating stations addressed in the previous issue, we found that only 10 were reflected in the Gas Utility GIS. The remaining three valves were not depicted or otherwise reflected in the GIS. In addition, we found that those three valves also were not reflected in other records maintained by the Gas Utility, including the former paper maps and manually prepared lists of critical valves. In response to our inquiry on this matter, the Gas Utility staff demonstrated that current staff was knowledgeable of the existence and location of those three valves. Notwithstanding that knowledge of current staff, the lack of accurate accountability for those valves increases the risk that the gas flowing into the applicable regulating stations will not be stopped in a timely manner in the event of an emergency (i.e., if there is an unexpected turnover or absence of current staff, records are not available to allow the quick locations of those valves). Identifying and adding to the GIS gas valves not currently reflected in that system are part of the Gas Utility's ongoing "Automation Implementation" capital project. (See page 13 of this report.)

Recommendation The Gas Utility should integrate those three valves into the GIS. Both the location and related valve attributes should be depicted and reflected in that system.

Cathodic Protection

Overview Cathodic protection is a technique to control corrosion of a metal surface by making that surface the cathode of an electrochemical cell. It is commonly used to protect steel pipelines, water/fuel storage tanks, pier piles, offshore oil platforms, and onshore oil well casings. Federal regulations specifically require that buried (underground) metallic gas mains and service lines be protected against external corrosion through a cathodic protection system. (Title 49, Subpart I, Code of Federal Regulations)

The Gas Utility uses a cathodic protection system to protect the City's steel gas lines from external corrosion.

As required by those federal regulations, the Gas Utility uses a cathodic protection system to protect the City's buried metallic gas mains and service lines from external corrosion. Currently, the Gas Utility uses two different methods in providing that cathodic protection. The first method involves the use of "sacrificial anodes," for which the applicable electrical current is generated without any external power source. Under that method, anodes are buried at spaced intervals along the protected metallic pipelines. The anodes are connected to the applicable pipe by a wire and the current is generated through a chemical reaction. The second method involves "rectifiers," for which an external power source is used to generate the applicable current. In a rectifier, anodes are installed in "beds" and are energized by an external power source (e.g., City electricity). The generated current is sufficient to protect mains and service lines within a certain geographical area. The Gas Utility uses four rectifiers. Each method (sacrificial anodal and rectifier) is used to cathodically protect different segments of the City's metallic mains and service lines.

The cathodic protection system must be tested at federally prescribed frequencies.

In addition to sacrificial anodes and rectifiers, the Gas Utility uses an "interference bond" to preclude a metallic pipeline owned by a transmission company, which crosses one of the City's high pressure mains (at North Meridian Road), from reducing the

cathodic protection on that City gas main (i.e., that other metallic pipeline naturally "draws" or "bleeds" the cathodic protection current away from the City's high pressure main unless adequate "interference" is employed).

Controlling federal requirements specify the criteria that a cathodic protection system must meet. For example, the cathodic protection system must operate at a minimum specified voltage. Those regulations also require that the cathodic protection system be tested at least once annually, but at intervals not exceeding 15 months, to determine that it is operating properly and in accordance with the specified criteria. Similarly, each cathodic protection rectifier and interference bond (whose failure would jeopardize infrastructure protection) must be inspected six times each calendar year, at intervals not exceeding 2½ months, to ensure they are operating properly. Prompt remedial action is required to correct any deficiencies indicated by this testing.

We found that Gas Utility staff spent considerable time and effort maintaining and performing the required testing of the cathodic protection system, as well as identifying, locating, and correcting identified deficiencies (e.g., inadequate current voltage). We noted in calendar year 2006 that testing was performed for each of the major areas designated as protected by sacrificial anodes and for each of the four rectifiers, as well as for the one interference bond. In addition, we found that once identified and located, deficiencies were properly and timely prepared. However, issues relating to testing frequencies and records were identified, as explained below.

Issue – Testing Frequencies Testing was not documented as being performed at the required frequencies for both the sacrificial anodal and rectifier systems and for the critical interference bond.

- Sacrificial anodes – As noted above, federal regulations require annual testing for a sacrificial anodal system. To accomplish that testing, the Gas Utility established strategic

test sites (or test stations) within that system. There were approximately 130 test stations based on available calendar year 2006 records. Applicable Gas Utility staff indicated that to meet the test requirements, each of those stations should be tested at least once each calendar year. Our analysis of those records showed that testing was performed in calendar year 2006 at 49 (representing 38%) of those 130 test stations. Records did not substantiate any testing at the remaining 81 test stations. (We did note that cathodic protection tests were performed at an additional 119 non-established test stations. Testing performed at those 119 sites was attributable by staff to efforts in locating the specific deficiencies (shorts) identified through the testing performed at the initial 49 test stations. That additional testing did not ensure that geographical areas and system components represented by the other 81 test stations was adequately tested.)

Our audit showed that the Gas Utility tested the required components of the cathodic protection system and corrected identified deficiencies. However, testing was not documented as performed at the required frequencies.

- Rectifiers – As previously noted, rectifiers must be tested six times annually, at intervals not greater than 2½ months between tests. We found that each of the four rectifiers was tested several times. However, records did not demonstrate that testing was always at the required frequencies and intervals. Specifically our review and analysis of records relative to calendar year 2006 showed:

    - One rectifier was tested in each of the first eight months, but not tested in any of the last four months.

    - A second rectifier (protecting high pressure mains) was tested in only three months, resulting in one five-month period and one three-month period in which testing was not done.

    - A third rectifier was tested in five different months, but there was one four-month period and one three-month period in which no tests were performed.

- The fourth rectifier was tested in eight different months, but there was one three-month period in which no tests were performed.

In addition to testing the rectifiers six times annually, the Gas Utility processes provide for annual testing of established test stations within the specific geographical areas served by the rectifiers. Annual testing of those sites (stations) provides the Gas Utility with valuable knowledge as to the effectiveness and efficiency of the rectifier throughout the respective areas. For three of the four rectifiers, we found that each designated test station was documented as tested at least once in calendar year 2006. However, available records did not demonstrate that the cathodic protection system was tested in that year at 11 of the 27 test sites established for the fourth rectifier (high pressure main rectifier).

- Interference Bond – Testing frequencies for critical interference bonds are the same as those established for rectifiers (six times each calendar year, at intervals that do not exceed 2½ months between tests). Contrary to those requirements, we found that available records show that the one critical interference bond was tested only once in calendar year 2006.

In response to our inquiry on this matter, Gas Utility staff indicated other job responsibilities detracted from timely preparation and updating of cathodic protection test records. They also indicated that testing may have been performed at additional test stations or at additional dates, but records of those tests were not prepared and/or retained. Furthermore, they acknowledged that staff efforts in researching and correcting deficiencies might have precluded completion of all required testing.

Recommendation For assurance that the cathodic protection system is properly protecting metallic mains and service lines from

corrosion, the Gas Utility should ensure that system is tested at the required frequencies. All testing (dates, results, and corrective actions when applicable) should be timely, accurately, and clearly documented. Gas Utility Maintenance Division management should periodically obtain and review those test records to ensure that applicable staff is performing and documenting the required testing. (NOTE: In response to this issue, Gas Utility staff demonstrated to audit staff on March 20, 2007, records being prepared and used for calendar year 2007 to accurately track and reflect testing performed to date. Furthermore, the Gas Utility indicated its intent to eventually use the recently developed GIS to track cathodic protection system testing.)

Records of test stations were found to be incomplete.

Issue – Completeness of Test Station Records Complete and accurate lists of test stations are necessary to allow the Gas Utility a method for tracking and monitoring the performance and results of required testing of the cathodic protection system. We found that the Gas Utility maintained records that identify the test sites (stations) for the rectifier and sacrificial anodal systems. Those records were generally categorized by geographical area served by the related systems. However, our review of applicable records and discussions with applicable Gas Utility staff showed those records were not complete as:

- Fifteen established test stations were identified that were not included in those records.

- No test stations were shown for four different isolated segments of metallic mains, which were cathodically protected. (Gas Utility staff acknowledged that the cathodic protection on two of those four main segments was not tested in calendar year 2006. That lack of testing may be attributable, at least in part, to the incomplete records.)

Recommendation The Gas Utility should take actions to ensure that complete records are maintained that show test stations

established for all components (rectifiers, interconnected main segments, isolated main segments, etc.) and areas. Those records should be timely updated to reflect changes. (NOTE: In response to this issue, Gas Utility staff demonstrated to audit staff on March 20, 2007, the records being prepared and used for calendar year 2007 to accurately reflect all test stations.)

Atmospheric Corrosion - Service Lines

Overview Federal regulations require that portions of gas service lines (i.e., line running from a gas main to the meter setting at a customer's premises) that are exposed to the atmosphere must be periodically inspected for evidence of atmospheric corrosion (e.g., rust). Those inspections are to be performed at least once every three calendar years, at intervals that do not exceed 39 months between inspections. In the event that atmospheric corrosion is found by these inspections, the Gas Utility must take appropriate remedial actions. Specifically, the affected pipe or fittings must be cleaned and coated with material suitable to prevent further corrosion, or replaced. Corrective actions are not required if the identified atmospheric corrosion is not significant (e.g., light surface rust) or will not affect the safe operation of that line before the next scheduled inspection. (Title 49, Sections 192.479 and 192.481, Code of Federal Regulations)

Service lines must be checked for atmospheric corrosion at least once every three years.

We reviewed the processes and methods used by the Gas Utility to monitor exposed portions (i.e., not buried) of service lines for atmospheric corrosion and to address that corrosion when identified. As explained below, we found that the Gas Utility has recently enhanced its approach and methods to monitor and identify atmospheric corrosion on the approximately 28,000 existing service lines.

City meter readers assist in checking gas service lines for atmospheric corrosion.

Prior to calendar year 2006, the Gas Utility indicated that service lines were inspected by Gas Utility Maintenance Division staff for atmospheric corrosion at the same time that required leak surveys were conducted on those lines. However, as those leak surveys were conducted on a five-year cycle, that approach did not result in all service lines being inspected on the required three-year cycle. Accordingly, in calendar year 2006, the Gas Utility requested and

received assistance of the City's meter readers in inspecting service lines for corrosion. Knowledgeable Gas Utility staff provided training to those meter readers to assist them in identifying corrosion for which corrective actions were needed. As the meter readers visit each premises at which service lines exist on a monthly basis (i.e., to read utility meters for billing purposes), this approach was intended to ensure that each of the Gas Utility's 28,000 service lines was inspected during the current three-year period (calendar years 2006 through 2008). During calendar year 2006, Gas Utility Maintenance Division staff also continued to check for atmospheric corrosion during their leak surveys. As explained below, this innovative approach has resulted in successes, but additional enhancements are needed.

Issue – Consistent and Proper Identification of Atmospheric Corrosion As noted above, the Gas Utility relied on two separate staffs to identify atmospheric corrosion on City service lines during their work processes. Those staffs included (1) Gas Utility Maintenance Division staff performing required leak surveys and other maintenance activities and (2) Utility Accounting Division meter readers. We acknowledge that this process should have ensured that all service lines were inspected during calendar year 2006. In addition, we noted that both staffs identified instances of atmospheric corrosion. However, as noted in the following paragraph, the inspection results show that additional training may be appropriate to assist meter readers in identifying instances of atmospheric corrosion.

Additional training will be appropriate for City meter readers if they continue to check service lines for atmospheric corrosion.

During their leak surveys and other maintenance duties, Gas Utility staff identified 1,071 instances of atmospheric corrosion in calendar year 2006, compared to 290 instances identified by City meter readers in that year. While some of the instances identified by Gas Utility staff were also identified by meter readers and vice versa, we noted that 606 of the instances identified by the Gas Utility were identified after the meter readers identified their 290 instances. As meter readers inspected all City service lines (and reported the 290 instances) during the summer of 2006, this implies (1) judgment and subjectivity are involved in determining the significance of the

atmospheric corrosion and (2) meter readers did not possess the training and experience to identify all instances that should be addressed. If the Gas Utility continues to rely on meter readers or other staffs outside the Gas Utility Maintenance Division to inspect service lines for atmospheric corrosion, additional training and/or appropriate supervision should be provided to help ensure atmospheric corrosion is properly identified and reported.

Recommendation In the event that staff outside the Gas Utility Maintenance Division continues to be assigned responsibility for identifying and reporting instances of atmospheric corrosion on City service lines, the Gas Utility should provide additional and/or appropriate training on identifying that corrosion. To help ensure that applicable corrosion is identified and reported, the Gas Utility should also consider implementing a quality control process to selectively follow up on efforts by the non-Gas Utility staff conducting those inspections.

Issue – Records for Tracking Identified Corrosion Prior to calendar year 2006, summary records were not prepared or maintained that identified and tracked instances of identified atmospheric corrosion. The only records prepared and maintained were the individual atmospheric corrosion reports (paper records). During calendar year 2006, the Gas Utility made significant improvements in maintaining records for and tracking instances of identified atmospheric corrosion. Specifically, all instances were either documented in (1) the PeopleSoft CIS through the creation and dispatch of system field activities and orders or (2) a separate excel document maintained by the Gas Utility maintenance staff. (The PeopleSoft CIS field activities/orders were generally created and dispatched for those instances identified by meter readers while the separate excel document was maintained for instances identified by Gas Utility staff.) The use of the PeopleSoft CIS and excel tracking document greatly enhanced the ability of management and staff to track and monitor the status of identified instances of atmospheric corrosion.

Efforts should be continued to use the PeopleSoft CIS to document and track all instances of atmospheric corrosion.

The Gas Utility acknowledged that maintaining two separate sets and types of records (PeopleSoft CIS and excel documents) is not as efficient as a single set of records and indicated they planned to start using the PeopleSoft CIS to document and track all instances of atmospheric corrosion. The Gas Utility indicated that planned action would be completed as part of the ongoing "Automation Implementation" capital project.

Recommendation We recommend that the Gas Utility continue with its plans to use the PeopleSoft CIS to document and track all instances of atmospheric corrosion. A single tracking system with the analytical and managerial capabilities provided by the PeopleSoft CIS should further enhance the Gas Utility's ability to efficiently and effectively monitor and address atmospheric corrosion.

Issue – Documenting Processes and Methods for Identifying and Addressing Atmospheric Corrosion While the Gas Utility has made significant enhancements in monitoring and tracking atmospheric corrosion, we noted that there are no documented operational procedures specifying the manner and methods for inspecting, addressing, repairing, and tracking that corrosion. Such documented procedures will help ensure that inspections and related repairs are done properly and consistently, especially in circumstances where there is unexpected turnover of key staff that oversee or conduct those inspections and repairs.

The Gas Utility should determine and document the processes that will be used to conduct future atmospheric corrosion inspections.

In our discussions on this matter, the Gas Utility indicated that a determination has not been made as to whether the current processes for identifying atmospheric corrosion on service lines will be continued. Specifically, because of potential future changes in the meter reader function (i.e., technology may be implemented to allow for off-site reading of meters), it may no longer be feasible to use City meter readers to conduct inspections. Management stated that using Gas Utility staff to conduct inspections at all

service lines in each three-year period might require some changes in staff assignments and possibly additional resources.

Recommendation Upon management's determination of the processes and methods that will be employed to conduct future atmospheric corrosion inspections, we recommend that the Gas Utility establish documented operating procedures that address, at a minimum:

- Definitions of atmospheric corrosion and examples of instances that should be addressed and repaired;
- Staffs conducting the inspections (e.g., Gas Utility Maintenance Division staff and/or Utility Accounting Division meter readers);
- Frequency of inspections (e.g., all inspected in a single year of the applicable three-year period or a portion inspected each year);
- Methods and timing of inspections (e.g., during leaks surveys, meter readings, other site visits);
- Time standards for addressing and repairing or otherwise disposing of reported instances of atmospheric corrosion; and
- Methods for recording and tracking identified corrosion and related dispositions (e.g., repair actions).

Gas Leaks

Overview Federal regulations require that the gas infrastructure be surveyed for leaks in business districts annually, and in non-business districts at least once every five years. More frequent testing (or "patrolling") for leaks is required for gas mains in places where physical movement or external loading is anticipated. (Title 49, Sections 192.721 and 192.723, Code of Federal Regulations) For leaks that are identified by those surveys or by any other methods, PSC regulations provide that the leaks be classified into

one of the following three categories (Section 25-12.040, Florida Administrative Code):

Federal and PSC regulations require the Gas Utility to perform periodic leak surveys; identified leaks must be "graded" and repaired.

- Grade 1 leak – represents an existing or probable hazard and requires immediate and prompt action to rectify.
- Grade 2 leak - not considered a threat at the time of detection, but justifies timely repair based on potential future hazard; must be repaired within 90 days from date of detection (unless subsequently determined to be a Grade 3 leak).
- Grade 3 leak – not considered a threat and not expected to become a threat; if above ground the leak must be repaired within 90 days from date of detection unless subsequently determined not to be a leak; if underground the leak must be reevaluated at least once every six months until cleared.

The Gas Utility conducted the required leak surveys and classified and repaired identified leaks.

We found that the Gas Utility conducted the required leak surveys and patrols in accordance with those regulations. Detected leaks were documented and classified in accordance with PSC regulations. Overall, we also found that identified leaks were repaired. However, we noted that improvements are needed in regard to the timely repair of Grade 2 and Grade 3 leaks and in monitoring and tracking the status of detected leaks.

Issue – Timely Repair of Leaks Gas Utility records document that 538 leaks were detected in calendar year 2006. Those 538 instances were comprised of 120 Grade 1 leaks, 142 Grade 2 leaks, and 276 Grade 3 leaks. Those leaks were detected by periodic leak surveys and other methods (e.g., investigating customer complaints or responding to emergency calls relating to damaged mains or service lines). We found that records and processes ensured that the most significant leaks (Grade 1 leaks) were always timely addressed and repaired. However, as explained below, our review showed that Grade 2 and Grade 3 leaks were not always timely repaired.

Grade 2 and 3 leaks were not always timely repaired.

Of the 142 Grade 2 leaks documented as detected in 2006, 83 were tracked on an excel document (i.e., leaks that were not immediately repaired were tracked on an excel document – see following issue

for further explanation). For the 83 Grade 2 leaks identified in calendar year 2006 and tracked by the Gas Utility:

- Ten were reported as repaired more than 90 days after the date of detection. The repair period for those 10 leaks ranged from 91 to 200 days. As noted above, PSC regulations required Grade 2 leaks to be repaired within 90 days.
- Fifteen were reflected by the records as not repaired as of the date of our audit fieldwork on March 9, 2007, and more than 90 days had elapsed since the dates of detection. As of March 9, 2007, the records show those 15 leaks had been identified for periods ranging from 116 to 414 days. Our site visits to seven of those 15 locations confirmed that repairs had not been done for four of the leaks. However, the site visits showed that the leaks at the other three locations had been repaired, but the repairs were not documented. As a result, the Gas Utility has not documented if those three repairs were done timely.

We also identified (and confirmed by site visit) an additional Grade 2 leak identified in 2006 that had not been repaired as of March 9, 2007, although 328 days had elapsed since the date the leak was detected. Although not as significant, similar instances were noted in regard to Grade 3 leaks.

In regard to these circumstances, we found that management relied on staff assigned the tasks of repairing leaks to notify them (management) in the event that leaks were not being timely repaired. As that assigned staff was not efficiently tracking the status of identified leaks (see the following issue), the untimely repair of certain leaks was not communicated to management.

Recommendation Management should monitor the status of reported leaks to ensure that applicable staff repairs those leaks in a timely manner. To facilitate that process, reports reflecting identified leaks and the repair status of those leaks should be periodically generated and provided to management.

Identified leaks were not efficiently and effectively tracked and monitored.

Issue – Tracking and Monitoring the Status of Identified Leaks

We found that the Gas Utility documented detection and repair of individual leaks using standard forms ("leak report form"). The top portion of that form was used to document the detection of a leak, and the bottom portion was subsequently completed to document the repair was done. In instances when the leak is repaired immediately, the top and bottom portions of the form are completed simultaneously. Leaks that are repaired immediately generally include (1) Grade 1 leaks (most severe) which require immediate attention and repair to ensure public safety and (2) leaks that can be repaired relatively easily upon detection (e.g., by adding appropriate sealants at the time of detection). Leaks that were not immediately repaired were tracked by the supervisor on an excel document. For those leaks, the supervisor used the individual leak report forms to record on the excel document the location of the leak, date of detection, and grade. When the repair was done and the bottom portion of the form completed, the supervisor used that form to also record on the excel document the repair date and staff repairing the leak. Of the 538 leaks documented as detected in calendar year 2006, we noted that 285 were recorded on that excel document.

If properly maintained, those leak report forms and the excel tracking document would provide the supervisor an effective and efficient method for tracking the statuses of identified leaks, including ensuring that all leaks were repaired in a timely manner. However, we determined that improvements are needed in the tracking of leaks and their dispositions. Specifically:

- Individual leak report forms were not efficiently organized and filed. As a result, many forms were not available for our review. We selected 130 of the 285 leaks reflected on the excel tracking document. Out of those 130 instances, 73 leak report forms (56%) were not located and provided for our review. Individual leak report forms contain critical information that is not recorded on the excel tracking document, such as description and specific location of the leak on the applicable infrastructure (e.g., meter or service line).

- Some un-repaired leaks were not tracked on the excel document. We identified 27 leak report forms for leaks identified in calendar year 2006, and for which no repairs were documented as of the date of our audit fieldwork in March 2007, that were not recorded and tracked on the excel document.

- The individual leak report forms and excel tracking document were not always timely updated to reflect the repair of reported leaks. We made site visits to 13 locations for which leaks were reported as not repaired. For five of those 13 locations, we found that the applicable leaks had been repaired, but the applicable records (excel tracking document and/or individual leak report forms) had not been updated to reflect those repairs.

As of the time of our audit fieldwork in March 2007, the Gas Utility indicated that it was beginning the process of converting to the PeopleSoft CIS as the method for documenting and tracking detected leaks. That system, if properly used, should provide the Gas Utility an efficient process for monitoring those leaks.

Recommendation Actions should be taken to ensure that records prepared and maintained for leak detections and the related repairs are properly and efficiently retained/filed, completed, and updated. Management should use those records to ensure that appropriate and timely actions are taken to repair identified leaks (see previous issue).

In regard to converting to the PeopleSoft CIS for documenting and tracking identified leaks, specific actions that should be taken include:

- All leaks should be recorded in that system (i.e., as a system field activity with the related field order dispatched to the appropriate staff assigned responsibility for repairing the leak).

- Repairs of leaks should be timely and accurately recorded in that system (i.e., as completed system field activities and orders).

- Monitoring reports showing detected leaks and the related repair status should be periodically generated and provided to appropriate supervisory/managerial staff responsible for tracking leaks and ensuring timely repairs.

Other Required Inspections

Overview In addition to required inspections and tests for cathodic protection, atmospheric corrosion, and leaks, controlling federal and PSC regulations require periodic inspections of other components of the City's gas infrastructure. Those other components pertain to gas valves, regulating stations, and system odorant.

Federal and PSC regulations require periodic inspections of critical valves, regulating stations, and system odorant.

Valves Federal regulations provide that each valve, the use of which may be necessary for the safe operation of a gas distribution system, must be checked and serviced at least once each calendar year. (Title 49, Section 192.747, Code of Federal Regulations) Examples of critical valves include (1) valves that shut off gas flowing into schools, shopping malls, medical facilities, or other areas where significant populations congregate and (2) valves on high pressure mains. As noted in the background section of this report, the City's gas infrastructure includes approximately 6,900 gas valves (excluding valves on service lines). Our discussions with Gas Utility Maintenance Division staff, as well as review of applicable records, showed that the Gas Utility does have a process for inspecting critical infrastructure valves on an annual basis. However, as described below, improvements are needed to ensure those critical valves are identified and inspected.

Issue – Identifying and Designating Critical Valves At the time of our audit fieldwork and as explained in the following paragraphs, the Gas Utility did not have comprehensive and accurate records reflecting the "critical" valves within the City's gas infrastructure.

Accurate and complete records designating critical valves within the City's gas infrastructure were not available.

In our initial audit efforts to identify critical valves, we examined the designations for the 6,918 valves reflected in the Gas Utility GIS at the time of our fieldwork. We noted that 261 of those valves were designated as either "key," "isolation," or otherwise "critical."

However, in our discussions, Gas Utility staff asserted those designations in the GIS at the time of our fieldwork were not considered accurate and complete. Our initial testing confirmed that assertion, as 43 out of a sample of 53 of those 261 valves were not included on a separate list (excel document) of "critical" valves maintained by the Gas Utility Maintenance Division. The Gas Utility indicated that the accurate designation of individual valves within the GIS would be completed when applicable tasks were done ("hydraulic modeling") that would assist in the proper and accurate identification of the critical valves. (This issue is also reflected as a planned refinement to the Gas Utility GIS on page 13 of this report.)

For purposes of identifying and ensuring annual inspections of critical valves, we found that the Gas Utility Maintenance Division relied on (1) a separate list of 205 critical valves maintained on an excel document (that was several years old) and (2) "old" map printouts from the former AutoCAD software (which has been replaced by the Gas Utility GIS). Gas Utility staff acknowledged that the listing of 205 critical valves was not comprehensive and that the old AutoCAD maps were likely outdated. However, Gas Utility Maintenance Division staff asserted that using those available records, in conjunction with staff knowledge, ensured that critical valves were inspected as required.

We acknowledge that the described circumstances may result in the performance of required valve inspections. However, the lack of complete and comprehensive records designating the "critical" valves within the City's gas infrastructure not only increases the risk that the annual inspections will not be performed, but the risk those valves will not be timely identified and located in an emergency. Under the described circumstances, that risk will increase significantly in the event of an unexpected turnover or absence of current staff.

Recommendation The Gas Utility should proceed as soon as practicable and reasonably possible with its plans to accurately designate critical valves within the GIS.

Instances were noted where valve inspection records were not retained.

Issue – Documenting Annual Valve Inspections For seven of 29 sampled valves confirmed by the Gas Utility as critical in nature, records were not available to document that the required annual inspections were performed in either the 2005 calendar year (six instances) or 2006 calendar year (one instance). For those instances, the Gas Utility responded that the inspections were likely done, but the inspection records misplaced or misfiled.

Recommendation To ensure that appropriate records are maintained to demonstrate that required annual inspections are done, we recommend that the Gas Utility consider imaging the inspection documents into the City's Electronic Data Management System (EDMS). The imaged documents should be indexed in a manner that allows efficient identification and retrieval of the inspection documents for a specific valve or valves. The Gas Utility indicated that imaging these documents was currently part of their overall plan to convert to a more efficient, paperless environment (i.e., part of the "Automation Implementation" capital project).

Regulating Stations Federal regulations provide that each regulating station and its equipment must be inspected and tested at least once each calendar year, at intervals not exceeding 15 months between inspections. (Title 49, Section 192.739, Code of Federal Regulations) Those inspections and tests should determine if the stations and equipment are:

- In good mechanical condition;
- Adequate from the standpoint of capacity and reliability;
- Set to properly control or relieve at the correct pressure; and
- Properly installed and protected from dirt, liquids, or other conditions that might prevent proper operation.

Our audit showed that required annual inspections were done annually and at the required intervals. Those inspections were generally adequately documented through the completion of standard inspection forms. In addition, we found that inspection records documented that appropriate corrective actions (e.g., repairing leaks, installing new gauges, scraping rust and painting to counteract corrosion, greasing valves, cutting back shrubbery and weeds) was taken. However, instances were noted where documentation of inspection efforts could be improved.

Issue – Documenting Annual Station Inspections We reviewed inspection records for a sample of seven of the Gas Utility's 18 regulating stations. We found the standard forms used to document those inspections were generally available and adequately completed for calendar years 2004 through 2006. However:

Instances were noted where forms documenting inspections of regulating stations were not properly completed.

- Five of the seven inspection forms completed for 2006 did not address whether the stations had been inspected for atmospheric corrosion.
- Four of 19 applicable inspection forms (pertaining to all three years) did not document that the stations and equipment were inspected for leaks.
- None of the inspection forms documented that the location of the related isolation valve was determined and/or verified.
- For one station, an inspection form was not available for calendar year 2005.

For those instances, we acknowledge that the required areas were likely inspected, as our site visits to many of those stations reflected they were recently painted and free of corrosion and, with assistance of Gas Utility staff, we located and observed the related isolation valves. Notwithstanding our observations, records should be adequately completed to clearly demonstrate that required inspections are performed.

Recommendation The Gas Utility should ensure that all parts of the standard inspection forms are adequately completed to demonstrate that all areas are properly inspected/tested. As also noted in the recommendation for the previous issue, the Gas Utility should consider imaging the inspection documents into the City's EDMS.

System Odorant Federal and PSC regulations require that a natural odorant be placed in natural gas pipelines. That odorant must be in sufficient concentrations that will allow reasonable detection by a person with a normal sense of smell in the event of a leak. Those regulations require periodic tests at sampled locations to ensure that the odorant is present in adequate concentrations. PSC regulations specifically require those tests be performed at least 12 times each calendar year, at intervals not exceeding 45 days between tests. (Title 49, Section 192.625, Code of Federal Regulations and Section 25-12.055, Florida Administrative Code)

The Gas Utility places odorant into the City's gas infrastructure at strategic locations. To ensure the odorant remains at the appropriate concentrations, the Gas Utility established 13 sample points at which periodic tests are performed. Adequate records are maintained to document the testing at those sample points. For calendar years 2004, 2005, and 2006, our review showed that, except for minor delays that were documented and reasonable, the Gas Utility conducted testing for sufficient concentrations of odorant at the required frequencies and intervals.

Pressure Monitoring

The Gas Utility monitors and controls gas flows and pressures in the City's gas infrastructure.

Overview Federal regulations provide that the Gas Utility must use pressure relieving or limiting devices to protect against accidental over pressurization of the system. (Title 49, Section 192.195, Code of Federal Regulations) During our fieldwork, knowledgeable Gas Utility staff explained and demonstrated the equipment at the City's gate stations and regulating stations that protect against over pressurization. In addition to that equipment, the Gas Utility uses a software application, the Supervisory Control and Data Acquisition (SCADA) system, to monitor gas pressures at strategic locations.

Furthermore, Gas Utility staff observes pressure gauges measuring the flow of gas during their regular and periodic site visits to the City's gate stations and regulating stations. Based on the explanations and audit observations, it appears that the Gas Utility properly monitors and controls pressure within the City's gas infrastructure. Gas Utility staff indicated, that to their knowledge, there have been no instances where dangerous over pressurization of the City's gas infrastructure occurred.

However, our discussions and observations disclosed further enhancements to the pressure monitoring process are planned and/or needed, as explained below.

Issue – Updating SCADA As noted, the Gas Utility uses a SCADA system to monitor gas pressures and flows at strategic locations (e.g., gate stations and regulating stations). Staff monitoring that system is able to detect not only instances of over pressurization, but also instances of under pressurization (e.g., gas flowing from a gate station is unexpectedly interrupted.) Monitoring gas pressures and flows at each gate station also allows staff to ensure that appropriate quantities of gas are received from applicable vendors.

Various staff in the Gas Utility Maintenance and Engineering Divisions is provided access to and use SCADA to monitor gas flows and pressures. We also noted that SCADA is available to staff working at a Water Utility satellite facility, known as "Station 21." Among other responsibilities, Station 21 staff receives and dispatches emergency calls regarding utility outages or incidents after normal working hours. Accordingly, that staff is available to monitor gas flows on behalf of the Gas Utility during those times.

Upon completion of the SCADA system upgrade, system alarms should be reestablished and Station 21 staff retrained.

Our discussions with Station 21 staff disclosed that they were not sure of their assigned role and responsibilities in regard to using SCADA for monitoring the flows of natural gas through the City's gas infrastructure, other than to respond to inquiries received from the Gas Utility on current operating pressures and to call Gas Utility staff in the event they notice a severe decrease in the pressures.

Furthermore, Station 21 staff indicated that system alarms (visual and audible) indicating potential under or over pressurizations of gas flows were no longer working in the SCADA application installed at their facility. Discussions with applicable Station 21 and Gas Utility staffs disclosed this circumstance occurred because the SCADA application installed at Station 21 has not been upgraded to allow the reestablishment of meaningful system alarms. (The Gas Utility indicated that plans are in place to complete that upgrade.)

As a result of these discussions, the Gas Utility indicated upon completion of the appropriate upgrade in the Station 21 SCADA application, that (1) appropriate training would be provided to Station 21 staff in regard to their monitoring roles and responsibilities and (2) the visual and audible alarms would be reestablished at Station 21.

Recommendation Upon completion of the SCADA system upgrade, we recommend that the Gas Utility provide the appropriate training to Station 21 staff and reestablish the alarms as indicated.

Issue – Expanding SCADA Coverage One of the more recent expansions of the City's gas infrastructure was into the City of Midway, located in Gadsden County. That expanded system is currently not interconnected with the remaining City gas infrastructure located in Leon County. Because of its relatively small size, the gas flows and pressures in that expanded infrastructure have not been tracked through the Gas Utility's SCADA system. The Gas Utility relies on periodic site visits by staff to monitor those gas pressures and flows. Additionally, a pressure relief valve located at the City's gate station in the City of Midway protects that infrastructure from dangerous over pressurization. Also, Gas Utility staff indicated that the applicable gas transmission company (Florida Gas and Transmission, or FGT) monitors the gas flows and pressures at the Midway gate station, and that the City can contact FGT at any time to determine those flows and pressures. Notwithstanding those other processes and

The Gas Utility plans to start using the SCADA system to monitor gas pressures for the City's infrastructure located in the City of Midway.

controls, implementing a SCADA application to monitor the gas pressures and flows for that infrastructure would be more efficient, as pressures/flows could be monitoring continuously without having to rely on site visits or calls to FGT. In response to our inquiries on this matter, the Gas Utility responded that plans are to include the City of Midway segment in the infrastructure that is monitored through the SCADA system. The Gas Utility indicated that this will done in connection with the current upgrade to the SCADA system.

Recommendation We recommend that the Gas Utility incorporate the City of Midway gas infrastructure into the infrastructure monitored through the SCADA system, as planned.

Public Protection

Overview Federal regulations require that the Gas Utility establish processes and related procedures to (Title 49, Sections 192.614, 192.615, and 192.616, Code of Federal Regulations):

- Prevent damage to buried pipelines from excavation activities.
- Provide continuing public education as to possible hazards and steps that should be taken in the event of a gas pipeline emergency.
- Minimize the hazards resulting from a gas pipeline emergency.

The City has an adequate and effective process for educating the public of the requirement to notify officials before commencing excavation activities and for responding to those notifications.

Excavation Activities Our review disclosed that the Gas Utility, in conjunction with the Utility Business and Customer Services (UBCS) Department, has established appropriate and adequate processes for (1) educating the public of the requirements to notify appropriate officials before commencing any excavation activities and (2) responding to those notifications by sending staff that mark the locations of City gas pipelines (as well as other City utilities) at the proposed excavation sites. Those responses and markings help ensure that the City's gas mains and service lines are not broken or damaged by excavation activities.

Public Education We found that the Gas Utility maintains a documented public awareness program that informs the public of:

- Required steps and notifications prior to excavation activities;
- Possible hazards associated with unintended natural gas releases;
- Physical indications that a natural gas release may have occurred;
- Appropriate steps to take in the event of a release; and
- How to report events such as unintended releases.

The Gas Utility uses the following mediums to make these communications:

- City of Tallahassee Internet website;
- Paid advertising (e.g., television, radio, newspaper);
- Direct mailings to known contractors/entities that perform excavating activities;
- Distribution of printed materials to the public; and
- Signs and notifications placed at strategic places (e.g., on meters and at regulating stations).

The Gas Utility established an appropriate and documented public awareness program.

Emergency Response Program The Gas Utility has appropriate documented emergency response procedures that specify actions to take in the event of natural gas leaks or fires occurring as the result of such leaks. Those procedures provide for notifying fire, police, and other public officials. The procedures also include a checklist for staff to follow in the event of a major emergency.

The City has an established and effective emergency response program.

In addition, the City has staff on duty and on call each day of the year (24 hours a day) to receive and dispatch gas emergency calls and to respond to those calls. Specifically, public notifications

(telephone calls) are automatically routed through the City's interactive voice response system to "Station 21," a Water Utility satellite facility, which among other things, receives and dispatches emergency calls regarding utility outages or incidents. Calls received at Station 21 that relate to natural gas emergencies (suspected or known leaks, broken or damaged mains or service lines, etc.), are dispatched to the Gas Utility. Designated Gas Utility staff is on-call to respond to those dispatches during and after normal working hours.

Our review showed that this process was adequate. We also found that available records showed the Gas Utility timely and appropriately responded to emergency calls. However, issues relating to the adequacy of records were noted, as addressed below.

The Gas Utility needs to better document its emergency responses.

Issue – Documenting Responses to Emergency Calls To assess the adequacy of the dispatch and response processes, we selected for testing a sample of 41 emergency calls/notifications received at Station 21. Those 41 instances represented a cross section of the types of calls received and the records used to document those calls and related dispatches. Our review showed that records often demonstrated that those calls were timely dispatched to applicable Gas Utility staff and that the Gas Utility staff timely responded. The responses included verifying the leak or emergency, making the situation safe (e.g., evacuating citizens and turning off the gas in the area), and making appropriate repairs to the City's gas infrastructure. However, we noted that adequate and consistent records were not always prepared, completed, and/or retained. Specifically, for the 41 sampled instances we noted:

- Fifteen instances where there was no record of the Gas Utility's response to notifications documented as dispatched to the Gas Utility. (In one of those 15 instances there was a documented response, but it was dated 19 days prior to the date of the recorded call.)

- Two instances where the Gas Utility's records did not adequately document the specific disposition to the emergency calls (e.g., no leak found or leak found) and/or the actions taken in response to the disposition (e.g., no action needed or leak repaired).

In summary, for 17 of the 41 instances (or 41% of the items tested), records were not available and/or were inadequate to demonstrate that appropriate responses and actions were initiated/completed by Gas Utility staff. The Gas Utility responded that it is very likely the situation was properly and timely addressed but proper records were not created and/or completed to document those actions.

Recommendation To adequately demonstrate that proper and timely actions are taken to protect the public and the integrity of the City's gas infrastructure, we recommend that the Gas Utility ensure that proper and consistent records are prepared showing actions taken in response to calls/notifications received.

Issue – Documenting Calls Received and Related Dispatches

Station 21 staff needs to consistently document the dispatch of gas emergency calls to the Gas Utility.

During the period covered by our review, emergency calls received at Station 21 were recorded in a "Customer Incident Database" (CID). That internal tracking system was also used to track other calls relating to gas services, such as reconnect services or pilot lighting requests. Calls of an emergency nature were recorded in the CID after Station 21 staff notified the applicable Gas Utility staff of the emergency circumstances. Notification to the Gas Utility was made by (1) phone call and (2) the creation and dispatch of a PeopleSoft CIS system field activity/order. The disposition of the emergency situation was documented in the PeopleSoft CIS, but not in the CID.

We reviewed gas emergency calls recorded in both the CID and the PeopleSoft CIS in January and February 2007. During those two months there were 106 gas emergency calls recorded in the PeopleSoft CIS and 133 gas emergency calls recorded in the CID.

Our analyses of those calls and related inquiries of Station 21 staff showed:

- Station 21 staff did not create and dispatch PeopleSoft CIS field activities/orders for 35 calls reflected in the CID.

- Station 21 staff did not record 16 emergency calls in the CID, although they did create and dispatch PeopleSoft CIS field activities/orders in those instances.

- In 6 instances, Station 21 staff created and dispatched PeopleSoft CIS field activities/orders using incorrect task descriptions (e.g., indicated the tasks as "needing to light customer's pilots" instead of "investigate gas leak").

- In 11 instances, no PeopleSoft CIS field activity/order was created and dispatched because the location of the emergency was not a premises or service point reflected in the PeopleSoft CIS. However, in other similar instances we noted that Station 21 staff created and dispatched PeopleSoft CIS field activities/orders using a generic location code.

Those inconsistencies by Station 21 staff in recording and dispatching gas emergency calls result not only in incomplete accountings of those calls, but also an increased risk that appropriate actions are not timely taken in an emergency. Not creating and dispatching a PeopleSoft CIS field activity/order, or using the incorrect task description, results in the Gas Utility having to rely solely on the phone call from Station 21.

We recognize that changes are currently planned and being initiated that should help resolve this issue. Specifically, a new system ("MOBILE Work Management System") is being implemented that will replaced the current CID. As the documentation of emergency call in that new system will be accomplished through an automated interface with the PeopleSoft

CIS, procedures will necessitate that PeopleSoft CIS field activities/orders be accurately and properly created and dispatched by Station 21 staff for each emergency call.

Recommendation To ensure accurate and complete accountability and to help ensure timely actions are taken in response to gas emergencies, we recommend that Station 21 staff create and dispatch accurate PeopleSoft CIS field activities/orders to the Gas Utility for each gas emergency notification received at Station 21.

Planning and Budgeting for Infrastructure

The Gas Utility adequately plans and budgets for infrastructure expansion and replacement.

As noted in the background section of this report, the City expended almost $14.5 million for gas infrastructure expansion and replacement in FYs 2002 through 2006. Those funds were expended through recurring and ongoing capital projects established for:

- System expansion into new areas;
- New service connections;
- Relocations and adjustments of existing infrastructure in connection with road widening projects;
- New and replacement meters; and
- Enhancing the system high-pressure components.

Amounts budgeted to be expended through those projects for FYs 2007 through 2011 total approximately $19.5 million.

Based on these capital projects and discussions with knowledgeable staffs, we determined the City's process for budgeting for future gas infrastructure expansion and replacements to be proper and reasonable. In reaching that conclusion, we posed the question as to the impact that age had in

determining when an infrastructure component should be replaced. Responses from the City of Tallahassee and other municipality gas utility staffs indicated that industry practices do not consider the age of a component as a primary factor when determining replacement needs. Specifically, discussions with City of Tallahassee Gas Utility staff, as well as staffs of the City of Pensacola, City of Gainesville, and City of Colorado Springs indicated that age is not a primary consideration as there is no "expected life" for gas infrastructure components (mains, service lines, valves, etc.). The useful life of a particular component depends on factors such as soil type and moisture content. Statements were made that mains, if adequately protected and maintained, could last indefinitely. Our review of available industry materials did not dispute those assertions.

Furthermore, the Gas Utility stated in the event that a main segment or other infrastructure component is found to be in poor condition based on a leak survey or other process, that a sub-project is established (within one of the recurring capital projects) to replace or repair that segment or other component. Gas Utility maintenance staff indicated that replacement of infrastructure components under those circumstances is rare.

Performance Measures

Overview In connection with this audit, we reviewed the accuracy and validity of six performance measures pertaining to the City's gas infrastructure, as reported by the Gas Utility for FY 2005 in the City's FY 2007 operating and capital budget.

Issue – Performance Measure Accuracy and Clarification As shown and explained in notes 1 through 3 in the following table, we found that improvements are needed in regard to ensuring accurate and clear reporting of gas infrastructure performance measures.

Gas Infrastructure Performance Measures		Reported for FY 2005 in the FY 2007 budget:	Accurate per Audit?
1.	Miles of gas mains maintained	734 miles	YES
2.	Number of gas mains added annually	23.4 miles	CND (1)
3.	Number of new service connections	1,078	YES
4.	Annual cost per foot of gas mains	$7.03	CND (1)
5.	Annual operational and maintenance cost per customer	$429	NO (2) (Should be $298)
6.	Emergency responses exceeding 30 minutes	18	YES (3)
Note (1): While the described process for determining and calculating these performance measures was logical, the Gas Utility responded that applicable records for FY 2005 had been partially erased and that it was not practicable to recreate those records.			
Note (2): This performance measure was overstated by 44% due to inadvertent clerical errors. Specifically, Gas Utility staff (a) extracted and used revenue figures instead of cost figures when determining costs and (b) incorrectly included fund transfers as part of operational and maintenance costs.			
Note (3): This performance measure only addresses responses to "cut lines due to accidents." Clarification should be added as to what this measure represents or, alternatively, the measure should be revised to also address responses to other emergencies, such as leaks called in by customers.			

Some reported performance measures were not supported or correctly calculated, while one measure could be misinterpreted.

In summary, while the measures are appropriate, we found that they were sometimes not adequately supported, incorrectly determined, or potentially misleading.

Recommendation The Gas Utility should take appropriate steps to ensure the accurate and clear reporting of performance measures. Actions that should be taken include retention of supporting documentation, using correct data and information when calculating measures, and using appropriate language and terms that clarify what the measures represent.

Conclusion

While processes and procedures relative to the City's gas infrastructure were generally adequate and appropriate, various issues were identified that indicate enhancements and improvements are needed.

Our audit showed that the Gas Utility generally has adequate and appropriate processes and procedures to ensure that a safe and reliable gas infrastructure is operated and maintained. Those processes and procedures ensure that installation of new infrastructure in connection with expansion and replacement projects meets applicable federal and PSC requirements. The City also maintains an adequate and appropriate public protection program. In addition, the Gas Utility has an adequate process for planning and funding infrastructure expansion and replacement.

Notwithstanding those adequate processes and procedures, we did identify, with the assistance of Gas Utility staff, issues that indicate that enhancements and improvements are needed. Accordingly, recommendations were made within this report to:

- Establish a project management plan to assist in implementing planned refinements to the Gas Utility GIS.

- Protect the inventory of gas pipe, valves, and fittings from direct sunlight, and update related purchasing specifications and reorder points and quantities.

- Install an additional valve near one regulating station in accordance with PSC regulations.

- Incorporate within the Gas Utility GIS those regulating station valves found not to be reflected in that system.

- Test the applicable parts of the Gas Utility's cathodic protection system at the required frequencies, and consistently document those tests.

- Maintain complete records of the test stations established for the cathodic protection system.

- Ensure staffs are adequately trained to properly identify atmospheric corrosion on exposed portions of the Gas Utility's service lines.

- Ensure that adequate and efficient records are maintained for tracking instances of atmospheric corrosion.

- Document the processes and methods used to identify atmospheric corrosion on service lines.

Recommendations were made to address identified issues.

- Repair all identified grade 2 and 3 gas leaks (which do not represent immediate threats to public safety) in a timely manner.

- Efficiently document, track, and monitor reported gas leaks and related repairs.

- Identify and designate critical valves within the City's gas infrastructure.

- Properly document inspections of valves and regulating stations, and efficiently store the related inspection records.

- Train Station 21 (Water Utility satellite office) staff as to their expected roles and responsibilities in using the SCADA system to monitor gas flows and pressures, and complete the upgrade to the SCADA application used by Station 21 staff.

- Continue with plans to use the SCADA to monitor the City's gas infrastructure located in Gadsden County (City of Midway).

- Properly and consistently document dispatches of emergency calls and the related responses to those calls.

- Report accurate and clear performance measures that are adequately supported by appropriate records.

We would like to thank the Gas Utility, Water Utility, ISS, MSC, and UBCS staffs in their assistance during this audit.

Appointed Official's Response

City Manager: I am very pleased with the results of this audit. The report reflects management's commitment to compliance with applicable regulations and to using advanced technology to improve efficiency and effectiveness. The most important factor is the obvious commitment of management to a safe environment for our customers and employees. I thank the audit staff for their thorough analysis.

Appendix A – Action Plan

Action Steps	Responsible Employee	Target Date
A. Objective: To enhance records used to account for and manage gas infrastructure		
Gas Utility and ISS		
1. With the assistance of ISS, a project management plan will be established for the GIS that (1) identifies tasks and actions remaining to be completed, (2) prioritizes those tasks and actions, (3) establishes completion goals (dates), and (4) identifies and allocates resources needed to complete those tasks/actions.	Akram Morghem Jim Van Riper	12-31-2008
B. Objective: To ensure proper materials are obtained and safeguarded		
Gas Utility		
1. In conjunction with MSC, a cost efficient method will be identified to protect stored polyethylene pipe and related fittings from direct sunlight.	Tim Potter	9-30-2008
2. Updated pipe specifications will be provided to the MSC for all pipe materials and sizes.	Stephen Mayfield	Complete* 9-06-2007
3. Appropriate reorder points and quantities will be determined for current circumstances and provided to the MSC.	Tim Potter	Complete* 9-06-2007
Municipal Supply Center		
4. In conjunction with Gas Utility staff, a cost beneficial method for protecting stored polyethylene pipe and fittings from direct sunlight will be determined. Upon that determination, the pipe and fittings will be stored accordingly.	John McPhaul	9-30-2008
5. The PeopleSoft Financials system will be updated upon receipt of updated pipe specifications from the Gas Utility.	John McPhaul	9-30-2008

Action Steps	Responsible Employee	Target Date
6. Upon receipt of recommended quantities from the Gas Utility, recorder points, quantities, and suggested maximum inventory levels will be adjusted in the PeopleSoft Financials system.	John McPhaul	9-30-2008
C. Objective:	**To ensure proper valve placement and records for regulating stations**	
Gas Utility		
1. For the one regulating station, constructed subsequent to 1974 and identified on audit, as not having an isolation valve located no more than 500 feet upstream from the station, an additional valve will be installed in accordance with PSC requirements.	Tim Potter	9-30-2008
2. The Gas Utility will ensure that isolation valves for other regulating stations (i.e., stations not selected for audit) are properly located in accordance with PSC regulations. Additional valves will be installed at those other stations if warranted.	Tim Potter	Complete* 9-06-2007
3. The three applicable regulating station isolation valves will be incorporated into the Gas Utility GIS.	Akram Morghem	Complete* 9-06-2007
D. Objective:	**To ensure proper cathodic protection for metallic mains and service lines**	
Gas Utility		
1. Testing of the sacrificial anodal system, rectifiers, and interference bond will be conducted at the required frequencies. All testing and related actions will be properly and adequately documented (i.e., test dates and results and repairs when applicable).	Akram Morghem Tim Potter	9-30-2008

2. Gas Utility Maintenance Division management will periodically obtain and review records of tests performed to ensure that applicable staff is performing and documenting the required testing.	Akram Morghem Tim Potter	9-30-2008
3. Complete and accurate records of each test station established for the cathodic protection system will be prepared and maintained. Those records will clearly identify for each test station the area and system component (interconnected main, isolated main, rectifier, etc.) covered.	Akram Morghem Tim Potter	9-30-2008
E. Objective:	**To properly and timely identify and address atmospheric corrosion**	
Gas Utility		
1. In the event that non-Gas Utility staff continues to be assigned responsibility for identifying and reporting instances of atmospheric corrosion, additional and appropriate training will be provided to that staff in regard to proper identification of such corrosion. As a quality control measure, knowledgeable Gas Utility staff will selectively follow up on efforts by the non-Gas Utility staff in their identification of corrosion.	Tim Potter	9-30-2008
2. The PeopleSoft CIS will be used to document and track all instances of identified atmospheric corrosion.	Akram Morghem Tim Potter (With assistance from ISS as needed)	9-30-2008
3. The process and methods employed to identify, report, and monitor atmospheric corrosion will be documented in formal written procedures. Those procedures will address, at a minimum: (1) definitions of atmospheric corrosion and examples of instances that should be addressed and repaired; (2) staff assigned responsibility for conducting the inspections and making needed repairs; (3) frequency of inspections; (4) methods and timing of inspection; (5) time standards for addressing and repairing or otherwise disposing of reported instances; and (6) methods for recording and tracking identified corrosion and related dispositions.	Akram Morghem Tim Potter	9-30-2008

F. Objective:	**To ensure gas leaks are timely and properly addressed**	
Gas Utility		
1. Applicable staff will be reminded that all gas leaks will be repaired in a timely manner. To facilitate that timely repair, Gas Utility Maintenance Division management will obtain and review periodic reports that reflect the status of all identified leaks.	Akram Morghem Tim Potter	9-30-2008
2. PeopleSoft CIS field activities and orders will be used to document, track, and record the repair of all identified leaks. Actions taken (e.g., repairs) will be timely recorded in that system.	Akram Morghem Tim Potter (With assistance from ISS as needed)	9-30-2008
G. Objective:	**To ensure other required inspections are performed**	
Gas Utility		
1. Upon completion of applicable hydraulic modeling, critical valves (including isolation, key, and other critical designations) will be accurately and clearly designated in the Gas Utility GIS.	Akram Morghem Tim Potter	1-31-2008
2. Valve and regulating station inspection records will be properly and adequately completed and imaged into the City's EDMS for storage. The imaged documents will be adequately indexed so as to allow efficient identification and retrieval of inspection documents for a specific valve(s) or regulating station(s).	Akram Morghem Tim Potter (With assistance from ISS and Treasurer-Clerk's Office as needed)	9-30-2008
H. Objective:	**To ensure adequate monitoring of system pressurization**	
Gas Utility		
1. Upon completion of the SCADA system upgrade, Gas Utility staff will (1) provide appropriate training to Station 21 staff as to their expected roles and assigned responsibilities and (2) reestablish meaningful system alarms at Station 21 that indicate potential system over or under pressurizations.	Akram Morghem Stephen Mayfield	10-31-2007

2. The City of Midway gas infrastructure will be incorporated into the system monitored through the SCADA system.	Akram Morghem Stephen Mayfield	9-30-2009
I. Objective:	**To ensure appropriate and timely emergency responses**	
Gas Utility		
1. Gas Utility staff responding to reported gas emergencies will be reminded of the requirement to properly and timely document their responses and actions taken in regard to the emergencies. Those responses/actions will be recorded in the PeopleSoft CIS through completed system field activities/orders and also recorded in the new MOBILE Work Management System through a system interface.	Tim Potter	Complete* 9-06-2007
Station 21 (Water Utility Facility)		
2. Station 21 staff will be reminded of the requirement to create and dispatch a PeopleSoft CIS field activity/order to the Gas Utility for each gas emergency notification received, regardless of whether a verbal dispatch was also made. In addition, CIS reports will be periodically generated and reviewed by supervisors to ensure the accuracy of documentation of field orders created by Station 21 staff and to assess staff performance.	Linda Cox	Complete* 5-08-2007
J. Objective:	**To ensure accurate and clear performance measure reporting**	
Gas Utility		
1. Appropriate support for reported performance measures will be retained for a minimum of three years after the measures are initially reported.	Angela Baldwin Terrill Booker	9-30-2008
2. Calculations and determinations of performance measures will be reviewed by independent staff to ensure that measures are proper and accurate.	Angela Baldwin Terrill Booker	9-30-2008
3. Appropriate language will be used to clarify what the "emergency response" performance measure represents.	Tim Potter	9-30-2008

*Per department, action plan step has been completed as of indicated date. Completion will be verified during the audit follow-up process.