STAFF'S STATUS REPORT

Case No. GS-2004-0257

City Utilities of Springfield

April 2009

BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI

In the Matter of an Investigation into City Utilities of Springfield Plastic Pipe Failures and the Adequacy of its Leak Survey Procedures, Installation Procedures and Replacement Criteria.	))))	Case No. GS-2004-0257

VERIFICATION

STATE OF MISSOURI)
)
COUNTY OF COLE)

I, Richard A. Fennel, Utility Technical Specialist II in the Commission's Energy – Safety/Engineering Department, of lawful age, on oath state: that I participated in the preparation of the Status Report that is being filed in the above case on April 30, 2009, consisting of twenty (20) pages to be presented in this case; that information in the Status Report was given by City Utilities of Springfield; that I have true knowledge of the matters set forth in such Status Report; and that such matters are true to the best of my knowledge and belief.

Richard A. Fennel

Subscribed and sworn to before me this 30th day of April, 2009.

NOTARY PUBLIC SEAL STATE OF MISSOURI

SUSAN L. SUNDERMEYER
My Commission Expires
September 21, 2010
Callaway County
Commission #06942086

NOTARY PUBLIC

EXHIBIT A

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STAFF'S STATUS REPORT
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This is Staff's fifth regularly scheduled status report concerning City Utilities' ongoing program of monitoring, evaluating, and replacing the plastic pipe in City Utilities' system.

BACKGROUND:

On June 18, 2003, a natural gas incident occurred in Springfield, Missouri at the Ozark Empire Fairgrounds, in which natural gas leaking from a damaged plastic pipe resulted in an explosion at the Frisco Building. An employee of the Ozark Empire Fair was fatally injured. The leak in the plastic pipe was the result of a rock impingement that damaged the pipe causing it to release gas which resulted in natural gas escaping into the lower level of the Frisco Building. The Commission's Energy Department–Gas Safety/Engineering Staff (Staff) conducted a formal investigation of the incident and filed its Gas Incident Report (Case No. GS-2004-0040) on December 16, 2003.

During the incident investigation, Staff reviewed City Utilities' records and discovered other instances of rock impingement causing stress-induced cracks on plastic pipe. Based upon that information, Staff recommended the Commission establish a separate case (Case No. GS-2004-0257) for the purpose of examining and evaluating City Utilities' plastic pipe failures, leak survey techniques, installation and backfill procedures, replacement criteria, and adequacy of its program activities.

The Commission opened this case on December 30, 2003, as an investigatory case to receive information and conduct an investigation into the failure mechanisms of both plastic mains and service lines used by City Utilities of Springfield. On June 16, 2004, Staff filed its report in Case No. GS-2004-0257, which summarized Staff's investigation into City Utilities' plastic mains and service lines. The Report contained eight (8) recommendations for City Utilities to undertake in development of a comprehensive plastic pipe replacement program. Staff requested the Commission issue an order directing City Utilities to file a response regarding the recommendations within 60 days of the filing of Staff's report. On August 16, 2004, City Utilities filed its response to Staff's recommendations. On September 10, 2004, the Commission issued an order for Staff to file a Status Report, no later than October 12, 2004, on the ongoing nature of the monitoring, evaluation, and replacement of the plastic pipe in City Utilities' system.

On October 12, 2004, Staff filed its Status Report, which contained an analysis of City Utilities' August 16, 2004 response to the eight (8) recommendations contained in Staff's report filed June 16, 2004. This filing also included a proposal for Staff to file another status report on June 16, 2005. In its June 16, 2004 Status Report, Staff stated that City Utilities satisfactorily complied with seven (7) of Staff's recommendations as outlined in the **APPENDIX** to this report.

As ordered by the Commission, on June 16, 2005, Staff filed a status report indicating that City Utilities continued to comply with Staff's June 2004 recommendations. Staff recommended that the Commission order City Utilities to comply with the recommendations in Staff's June 16, 2004 report. Staff filed a comprehensive update with the Commission during the summer of 2006 that included an analysis of the plastic pipe replacement program and leak survey data provided from City Utilities' semi-annual reporting for the last half of 2005 and first half of 2006. The Commission ordered City Utilities of Springfield to comply with the recommendations set out in Staff's June 16, 2005 report.

As ordered by the Commission, on June 27, 2006, Staff filed a status report indicating that City Utilities continued to comply with Staff's June 2004 recommendations. Staff recommended that the Commission continue with the current recommendations as proposed in Staff's June 16, 2004 report and as ordered by the Commission on February 2, 2006. Staff also recommended that City Utilities conduct a leak survey during calendar year 2007 over all pre-1983 plastic piping operating at high pressure (60 psig) that was not currently annually leak surveyed. Staff proposed to review the results of this survey to determine if program requirements should be enhanced.

In addition, Staff proposed to file an update report during the first quarter of 2007, which would include plastic pipe replacement data and leak survey data from City Utilities' semi-annual reporting for the last half of 2006. Calendar year reporting would allow Staff to review and report the leak surveys completed for the entire year verses reporting only the leak surveys that have been completed prior to Staff's June update reports.

On March 30, 2007, Staff filed its Status Report detailing the current status of City Utilities' plastic pipe monitoring, evaluation, and replacement program. Based upon the number of rock impingement leaks on pre-1983, high pressure piping documented in the report, Staff believed there was a need to adjust requirements to meet the program's goals and objectives. Staff believed this should include accelerating the replacement program for pre-1983 pipe operating at high pressure in a rock-dirt mix environment. Staff's report recommended

several changes to the current plastic pipe replacement program. City Utilities responded with several objections to certain recommendations.

After a series of responses, and further negotiations, Staff and City Utilities filed a Joint Recommendation Concerning Pipeline Replacement Schedule (Joint Recommendation) in which the two parties agreed to modifications of the replacement program for calendar years 2008 and 2009. Staff and City Utilities would then evaluate the effectiveness of this two-year replacement program and determine the recommendations for a program that will begin in calendar year 2010. The Commission adopted the Joint Recommendation on November 1, 2007. The replacement program criteria for 2008 and 2009 are listed in the **Replacement Criteria for Calendar Year 2008** section of this report.

REPORT OVERVIEW:

Subsequent to the filing of STAFF'S STATUS REPORT on March 30, 2007, Staff and City Utilities made several filings negotiating modifications to the replacement program for calendars years 2008 and 2009. On October 23, 2007, Staff and City Utilities filed A JOINT RECOMMENDATION CONCERNING PIPELINE REPLACEMENT SCHEDULE. On November 1, 2007, the Commission issued an ORDER ADOPTING JOINT RECOMMENDATION in which the Commission directed the parties to implement the terms of the Joint Recommendation. Furthermore, the Commission ordered Staff to file its next status report no later than April 30, 2009.

The following Status Report pertains to Staff's on-going investigation into plastic pipe leaks due to rock impingement and City Utilities' plastic pipe replacement program. This Status Report summarizes data obtained from City Utilities' semi-annual reporting for calendar years 2007 and 2008, during Staff's ongoing monitoring, evaluation, replacement of plastic pipe in City Utilities' system, and leak survey techniques and results. Since the modifications to the program, listed in the Joint Recommendation, began on January 1, 2008, this report will separately report leaks, replacements and leak surveys for calendar years 2007 and 2008, respectively.

STAFF'S STATUS REPORT

Information for Calendar Year 2007

1. Plastic Main and Service Line Leaks and Replacements

Leaks

During the time period of January 1, 2007 through December 31, 2007, City Utilities has experienced 23 leaks due to rock impingement (five of these leaks were on service lines, and eleven of the leaks were on main segments that were not previously included on the "Plastic Pipe Failure Master List). Upon discovery, the leaking service lines were replaced, main-to-meter. The mains where these leaks were found have been added to the "Plastic Pipe Failure Master List", and will be leak surveyed annually and included in the replacement program to be replaced within three (3) years of discovery. Since implementation of the replacement program, there have been 24, 20, 25, and 23 rock impingement leaks for the 2004, 2005, 2006 and 2007 calendar years, respectively.

Records indicate 91% of rock impingement leaks have been on pre-1982 piping and 80% have been on piping operating at high pressure (60 psig). These percentages have essentially remained constant throughout the duration of the current program (June 2004 through December 2007).

Replacements

During this reporting period (January 2007 through December 2007), City Utilities replaced 5.33 miles of plastic main, 305 associated plastic service lines, and 5 additional service lines, all from the "Plastic Pipe Failure Master List" (See Appendix - Items 1 and 4, pages A-1 & A-2). Between (June 2004 – December 2007), 11.62 miles of main piping and the associated services lines have been replaced. The total miles of main replaces above the 5.233 miles is piping replaced beyond piping (from the "Master List") that was in the same work order number because the piping was installed in the same time period and could have been installed using the same methods and in the same environmental conditions. The original 7.1 miles of plastic piping on the "Plastic Pipe Failures Master List" was all replaced as of August 13, 2007.

City Utilities has focused its replacement efforts on plastic pipe that has experienced or could have failures due to rock impingement. As of December 31, 2007, there were about 6.54 miles of piping on the "Plastic Pipe Failures Master List" still to be replaced. This piping was included in the "Plastic Pipe Failures Master List" due to rock impingement leaks and the "spot-checks". Approximately 5.5 miles of this piping is comprised of pre-1982 pipe operating at high pressure (60 psig). As they are discovered, the rock impingements leaks are immediately repaired and the associated piping must be replaced within a minimum of 3 years from the date of discovery. The service lines that were added to the list were immediately replaced, main-to-meter.

Since the beginning of the program, more than 11 miles of pre-1982 plastic pipe operating at high pressure has been replaced, leaving approximately 61 miles of pre-1982 high pressure pipe left in the system

2. Main-to-Meter Replacements of Partially Replaced Plastic Service Lines

City Utilities continues to do main-to-meter replacements of any newly discovered leaking service lines, which have been damaged by rock impingement. Immediate replacement of plastic service lines, main-to-meter, when new leaks are discovered continues to be successful and, therefore, Staff recommends that this replacement rate be maintained.

3. Leak Report Forms and Related Training

Effective January 1, 2005, City Utilities modified its "Plastic Pipe Failure Report" form, "Gas Leak" form and "Gas Leak Repair" form to include a specific category for "Rock Impingement". Its computer "Integrated Gas" database was also modified to track the new rock impingement category from the leak forms beginning with the 2005 leak data.

City Utilities' employees involved in these efforts received adequate training on the proper identification of leaks due to rock impingement and how to report the leaks.

These modifications have greatly enhanced City Utilities' ability to identify and report leaks due to rock impingement. These modifications have also enhanced City Utilities' ability to track rock impingement leaks for replacement prioritization.

4. Exposed Plastic Piping Inspections

January 2007 through December 2007, City Utilities conducted 999 plastic pipe inspections. The plastic pipe should only have clean backfill to protect the pipe from damage due to rocks. Of these locations, 18% were found to have a rock-dirt mix backfill around the pipe, which could lead to pipeline damage. This compares to 14% having a rock-dirt mix backfill around the pipe found during the previous reporting period (June 2006 through December 2006). Since implementing the "Exposed Plastic Gas Piping" inspection form on September 14, 2004, City Utilities has recorded approximately 5,176 plastic piping inspections through December 2007. Of these 5,176 locations approximately 81.5% had acceptable backfill around the pipe.

City Utilities has found it impractical to fully excavate each location where rock-dirt mix bedding is found, as was recommended by Staff. As a result, all main segments where rock-dirt mix or other suspect bedding conditions are found are placed into an annual leak survey list (See the **Leak Surveys and Repairs** section of this report for the leak survey results). If a leak due to rock impingement is found on this piping, the piping will be immediately repaired and then added to the "Plastic Pipe Failures Master List" to be replaced within three years of discovery of the leak.

The results of the exposed pipe inspections are used to prioritize pipe replacement and to schedule pipe replacement in other areas in a consistent manner. It is critical that any upward trends of bad backfill in new locations be identified and evaluated promptly to prevent possible rock impingement leaks.

The on-going field monitoring program, designed to identify other pipes exposed to rock impingement, where action to prevent leaks, is an integral part of the replacement program.

5. New Plastic Main and Service Line Installations

Plastic service line casing is being plowed-in and the gas service line piping is installed in the casing. The casing pipe is in contact with the earth and is used as a protective sleeve for the service line piping. In addition, following Staff's recommendation in its June 16, 2004 Report, City Utilities revised its Gas Construction Standards to specifically require a minimum of four to six inches of bedding material around all newly installed plastic service lines in an open trench. This bedding is typically limestone sand and is used regardless of the trench conditions. Protective bedding material has been used on all newly installed plastic piping, regardless of the trench conditions since June 2004.

City Utilities no longer uses the type of plastic pipe identified as a concern in the replacement program. Generally, the thermoplastic pipe that is currently used is very ductile and can undergo considerable deformation without damage. However, proper installation techniques are required to ensure that the pipe is evenly supported and physically shielded from potential damage. Backfilling plastic pipe in accordance with sound bedding procedures, such as those now being practiced by City Utilities, should help ensure that rocks and other objects do not come in contact with the pipe, greatly reducing the possibility that the pipe may be damaged.

6. Leak Surveys and Repairs

Quarterly leak surveys of the downtown business district (the entire district is considered as a vent-restrictive location) were conducted during January, April, July and December 2007. During these surveys no underground leaks were found. It should be noted that City Utilities treats all leaks on plastic piping as either a Class I or Class II leak, assigning them a higher leak repair priority than may otherwise be required, resulting in expedited repairs.

The annual leak survey of the remaining segments of piping listed on the "Plastic Pipe Failure Master List" was conducted during summer and fall of 2007. During this survey two (2) underground leaks were found, one (1) of which was due to rock impingement. Any service lines that were only partially replaced have all been replaced main-to-meter (completed July 2005) and are no longer required to be annually surveyed. The next leak survey over the same category of piping was

conducted throughout 2008 and the results are reported in the **Information for Calendar Year 2008** Section of this report.

Also, on August 29, 2006, the Commission issued an order directing City Utilities to conduct a leak survey over all pre-1983 plastic piping operating at high pressure. This leak survey was completed December 5, 2007 and 25 underground leaks were found, four (4) of which were due to rock impingement.

Annual surveys are conducted at locations where exposure of the plastic piping indicated rock-dirt mix backfill around the pipe. Leak surveys of the pipe, where the exposed pipe reports indicated rock-dirt mix as the bedding material in 2004, 2005 and 2006, were conducted during the last half of 2007. During this survey five (5) underground leaks were found, one (1) of which was due to rock impingement. The results of the annual leak surveys are used to evaluate the remaining locations to determine the appropriate remedial action and replacement prioritization.

Beginning with the 2005 routine leak surveys, City Utilities began tracking service lines located under vent restrictive surfaces. A vent restrictive surface exists when the service line riser piping is surrounded by a non-porous material, such as concrete or asphalt. When this type of condition is found, City Utilities samples the subsurface atmosphere by drilling bar-holes at the riser location and using a combustible gas indicator (CGI). To date, of the 708 vent restrictive locations surveyed, no leaks were detected. From January 2007 through December 2007, 76 additional locations were tested and added to the Vent Restrictive Surface Master List.

While the increased frequency of leak surveys demands more personnel time and effort, the extra leak surveys help in achieving the program's goals of early detection of leaks and prioritization of replacements. These leak survey frequencies exceeds MoPSC minimum pipeline safety regulations that require 1-year and 3-year leak surveys on business districts and on most residential areas, respectively.

Staff believes that the timely repairs of observed leaks prior to the subsequent leak survey provides better information to detect any upward trends in leakage rate totals. City Utilities treats and repairs all leaks, including Class III leaks, on plastic piping as a Class I leak, or Class II leak. This exceeds the MoPSC minimum pipeline safety

regulations that require any Class III leak to be monitored every 6 months until repaired (within five (5) years of discovery).

For these reasons, Staff recommends that City Utilities continue to conduct leak surveys at the current frequency over the current categories of plastic piping. Staff also recommends that City Utilities continue treating and repairing all leaks on plastic piping as a Class I leak, or a Class II leak.

Staff continues to recommend that City Utilities conduct a leak survey over all of the pre-1982 piping operating at high pressure (60 psig) during calendar year 2008 that is not included in the current annual leak surveys.

7. Spot-Checks of Plastic Mains

City Utilities has reviewed the individual leak reports for prior main-leak locations (1983-2004), as recommended by Staff, to spot-check and determine the pipe bedding condition near the pipe wall.

City Utilities completed these spot-checks during July and August 2005. 23 locations were found to have a rock-dirt mix around the plastic pipe. 12 of these spot-check locations were on main segments involving pre-1983 piping operating at high pressure. With five (5) of these locations already on the "Plastic Pipe Failure Master List" 18 locations were added to the master failure list to be replaced by the end of August 2008. Twelve (12) of these spot-check locations were on main segments involving pre-1983 piping operating at high pressure.

Information for Calendar Year 2008

(Note: The recommendations agreed upon by Staff and City Utilities in the October 23, 2007 Joint Recommendation are listed below followed by the current status of each recommendation).

Replacement Criteria for Calendar Year 2008 (These Criteria are also in effect for 2009)

1. City Utilities shall replace a minimum of six (6) miles of Aldyl 'A' polyethylene (PE) piping annually (service lines 1¼ inches and larger and mains) during calendar years 2008 and 2009. These replacements will be segments on the "Plastic Pipe Failure Master List" and segments that have been identified from the exposed pipe reports and spot checks as being in a rock-dirt backfill.

The "Plastic Pipe Failures Master List" has been changed to "Plastic Pipe Failure-Rock/Dirt Mix Master List". During calendar year 2008, City Utilities experienced 10 leaks due to rock impingement (two of these leaks were on service lines and five of the leaks were on main segments that were not previously included on the "Plastic Pipe Failure-Rock/Dirt Mix Master List"). The leaking service lines were replaced, main to meter, upon discovery. The mains where these leaks were found have been added to the "Plastic Pipe Failure-Rock/Dirt Mix Master List" for replacement. This compares to 25 and 23 rock impingement leaks during 2006 and 2007 respectively. 218 locations where exposed plastic pipe reports indicated plastic mains or service lines in a rock-dirt backfill were added to the "Plastic Pipe Failure-Rock/Dirt Mix Master List."

Records indicate 94% of rock impingement leaks have been on pre-1985 piping and 81% have been on piping operating at high pressure (60 psig operating systems).

During calendar year 2008, City Utilities replaced six (6) miles of plastic main and the associated service lines.

2. The Replacements will be prioritized based on risk factors, such as, Maximum Allowable Pressure (MAOP), date of installation, installation in rock-dirt mix backfill, continuous pavement areas, areas of high population density, areas of previous leakage, and other appropriate criteria.

City Utilities' Assistant Manager Natural Gas Engineering evaluates each location per the above criteria before assigning jobs.

3. Staff believes the primary focus of the replacement program should be extended to include 1983 and 1984 Aldyl 'A' pipe. Therefore, the primary focus of the replacement program should be on Aldyl 'A' piping that was manufactured before 1985 (pre-1985) that is installed in a rock-dirt mix backfill.

City Utilities has adjusted its replacement program to include Aldyl 'A' pre-1985 piping in the evaluation of the job before assigning. City Utilities will include the footage in the total annual mileage.

4. In early 2009, City Utilities will identify Aldyl 'A' service lines prior to 1990 that are 1¼-inch diameter and larger as part of a new geographic information system (GIS) that is being developed. The replacement footages of 1¼-inch diameter and larger service

lines, based on risk factors noted above, that were installed prior to 1990 can be counted toward the required total annual mileage of replacements.

City Utilities has identified 1,559 1¼-inch diameter and larger service lines that were installed during and prior to 1990. These service lines will be counted toward the annual required mileage when replaced.

5. Staff and City Utilities will evaluate the effectiveness of this two-year replacement program and determine the recommendations for a program that will begin in calendar year 2010.

Staff and City Utilities have discussed the need to develop a program that will begin in calendar year 2010. Staff will use the information in this and previous update reports, as well as available 2009 information to work with City Utilities to develop a recommendation for a program beginning January 2010 and beyond. At this point, Staff believes the program should at least continue as currently established, with replacements continuing to at least the current rate, until a new program is approved by the Commission.

Non-Replacement Criteria for Calendar Year 2008 (These Criteria are also in effect for 2009)

In addition to the above replacement program, City Utilities will continue to meet the following requirements of the original agreement.

6. An annual leakage survey will be conducted over pre-1983, 60 psig plastic piping. In addition, City Utilities will begin conducting annual leakage surveys over 1983 and 1984, 60 psig piping.

City Utilities completed leak surveying pre-1985 Aldyl 'A', 60 psig plastic piping in December 2008. During this leak survey four (4) underground leaks were found, one (1) of which was due to rock impingement.

7. Quarterly leak surveys of the downtown business district.

City Utilities conducted leak surveys of the downtown business district during July and December 2008. During these leak surveys no underground ground leaks were found.

8. Any exposed plastic piping will be inspected for proper backfill, and if rock-dirt mix backfill is found, the main segments or larger diameter service line (1¼-inch diameter and larger) shall be added to the Plastic Pipe Failure-Rock/Dirt Mix Master List for replacement.

City Utilities Administrator-Natural Gas Compliance has reviewed the Exposed Plastic Pipe Reports for 2008. 51 locations that meet the above criteria have been added to the Plastic Pipe Failure-Rock/Dirt Mix Master List.

9. Semi-annual reports and monthly updates will be submitted to Staff.

City Utilities continues to submit semi-annual reports covering the previous six (6) months of the program to include the results of leak surveys of plastic piping beneath vent restrictive surfaces, results of annual leak surveys and the status of plastic main and service line replacements to date. City Utilities will also continue to submit monthly updates covering rock impingement leaks. Staff will continue to review these monthly updates and semi-annual reports.

10. The mileage of pre-1985, 60 psig mains that remain in the distribution system will be provided to Staff.

City Utilities had approximately 70.4 miles of pre-1985 high pressure (60 psig) plastic gas main in the distribution system at the beginning of the program. City Utilities has replaced approximately 14.7 miles of pre-1985 high pressure (60 psig) plastic gas main since the beginning of 2004 City Utilities' replacement program. To date, approximately 55.7 miles of pre-1985 high pressure plastic gas main remain in City Utilities distribution system.

11. Staff and City Utilities will continue to monitor the effectiveness of the replacement program. If at any time, Staff determines that the program requirements should be enhanced, it will immediately bring its concerns and recommendations to the Commission.

City Utilities reports it is closely monitoring its plastic gas piping system and that as leaks due to rock impingement are identified, these main segments are added to the master list and annually leak surveyed until they are replaced. Factors such as location, pressure, and number of leaks are being taken into consideration. As plastic gas mains

are being renewed, City Utilities is replacing all of the plastic service lines installed prior to June 2004 along with the main. In addition, Staff will continue to review the monthly updates and semi-annual reports (see item 9 above) and, if needed, make immediate recommendations to the Commission.

FINAL SUMMARY (Calendar Years 2007 and 2008)

The recommendations contained in Staff's June 16, 2004 report and the enhancements contained in the October 23, 2007 Joint Recommendation, which have been implemented into City Utilities' gas safety program are the foundation of City Utilities' continuing plastic pipe replacement program. All of these recommendations must be considered together in order to achieve the purpose of the replacement program, which is protection of the public's safety, and each, therefore, complement the other.

As previously mentioned in the **BACKGROUND s**ection of this report, Staff believed there was a need to adjust requirements to meet the program's goals and objectives. Staff believed this should include accelerating the replacement program for pre-1983 pipe operating at high pressure in a rock-dirt mix environment. Staff proposed several modifications to the replacement program and these modifications were implemented into City Utilities' program beginning January 1, 2008 and will continue in calendar year 2009.

As previously mentioned in this report, there were 10 rock impingement leaks found on pre-1985 pipe operating at high pressure during calendar year 2008. This compares to 25 and 23 rock impingement leaks during 2006 and 2007 respectively. Since the beginning of the program, approximately 94% of rock impingement leaks have been on pre-1985 piping and approximately 81% have been on piping operating at high pressure.

The number of rock impingement leaks found on pre-1985, high pressure piping decreased significantly during 2008 indicating that the current program may be addressing the problem. City Utilities is focusing its replacement efforts on replacing plastic pipe that has experienced or could have failures due to rock impingement and has been concentrating efforts on renewing piping from the "Plastic Pipe Failure-Rock/Dirt Mix Master List" as the other replacements are completed. Staff agrees with this approach because the level of replacements of pipe to date has now lowered the rock impingement leak rate for 2008 on pre-1985 pipe operating at high pressure that is in a rock-dirt mix backfill.

Based upon these observations, Staff recommends continuing the current replacement and leak survey schedule (based upon the replacement criteria for calendar years 2008 and 2009 listed in this report) through the end of 2009. Staff and City Utilities will evaluate the effectiveness of this two-year replacement program (calendar years 2008 and 2009 to date) and determine the recommendations for a program that will begin in calendar year 2010. Staff notes that the main focus of the program is to replace pre-1985 pipe operating at high pressure, in a rock-dirt mix backfill. Following the filing of this update report, the Staff will focus on development of a program for calendar year 2010 and beyond. Staff believes this program should be developed in a timely manner to allow for budgeting and scheduling. At this time, Staff recommends the program should at least continue as currently established, with replacements continuing to at least the current rate, until a new program is approved by the Commission.

Note:

Staff expects City Utilities to continue its practice of replacing nearby or adjacent pipe segments that are beyond the specific piping in the same work order number because the piping was installed in the same time period and could likely have been installed using the same methods and in the same environment (See the **Replacements** section of this report for more details of this practice).

Staff has been and will continue to monitor the effectiveness of City Utilities' plastic main and service line replacement program and leak surveys. If at any time, Staff determines that the program requirements should be enhanced, it will immediately bring its concerns and recommendations to the Commission.

APPENDIX

Staff's Recommendations in June 16, 2004 Report

1. City Utilities began tracking leaks due to rock impingement in 1998, and has added some additional leak locations dating back to 1991, based upon information found during the investigation. These prior leak locations were compiled into a "Plastic Pipe Failure Master List." Since that time, this list has been the primary source for performing Gas Main Renewals in the City Utilities Gas System.

   The Plastic Pipe Failure Master List contained 97 locations where a leak occurred due to rock impingement, and was subsequently repaired. In 37 of the 97 locations, City Utilities replaced the piping that was installed under the same work order number for the main segment in question. At each prior leak location, City Utilities reviewed its record to determine the length of pipe that was installed under the work order number for the main segment number in question. This method was chosen because it was felt that the length of pipe installed under the same work order number on a main segment would most likely have been installed using the same methods and in the same environmental conditions.

   These sections of plastic pipe are included in a replacement program. The remaining sections of pipe on the Plastic Pipe Failure Master List totaled 7.1 miles of piping yet to be replaced. City Utilities began replacing these sections over a three (3) year period, on August 16, 2004. City Utilities indicated that 861 associated service lines will also be replaced concurrently with these main replacements.

   Any new segment of plastic pipe (as described above) where a failure due to rock impingement is discovered will be repaired immediately, leak surveyed annually and replaced (as described below) within a minimum of three (3) years from the date of its discovery. City Utilities will review records to determine the length of pipe that was installed under the same work order number for the main segment number in question and replace all of the associated plastic piping installed under that work order. Factors, such as, the number of leaks, operating pressure and environmental conditions shall be considered when prioritizing the replacement of the pipe.

City Utilities' current policy is to replace the gas service line from the main to meter if a leak due to rock impingement is found and verified. There are 181 past locations on the referenced list where only a portion of the service line, where the leak occurred, was replaced. City Utilities agreed to replace all of these plastic services in their entirety from the main to the meter by December 31, 2005.

City Utilities has also agreed to replace the associated plastic service line concurrently with any mains that have to be relocated due to other construction projects. In addition, City Utilities is replacing all plastic service lines that were installed prior to June 16, 2004, when performing plastic main renewals. Also, all plastic service lines installed prior to 1983 are being replaced when renewing a steel main or performing a relocation of a main.

2. City Utilities has modified its Plastic Pipe Failure Report form to include a specific category for "Rock Impingement" and a place for comments. City Utilities has also developed written instructions to guide field employees in completing this form. City Utilities' field employees are currently using the new form.

3. City Utilities conducted training regarding the proper way to complete this form for all affected employees on September 14, 2004. Staff attended this training session.

4. City Utilities has developed a Plastic Pipe Exposed Pipeline Condition Report form to document the backfill conditions surrounding the plastic piping. City Utilities has also developed instructions to guide field employees in completing this form each time a plastic pipe (main or service) is exposed. City Utilities conducted training on the proper way to complete this form for all affected employees on September 14, 2004 (attended by Staff). City Utilities field employees are currently using this new form.

   If it is discovered that the backfill conditions surrounding the plastic piping contains rocks or other debris that could be detrimental to the piping, City Utilities will extend the excavation in both directions until suitable conditions are found. If extending the excavation in both directions is impractical, an engineering evaluation will be performed to determine the appropriate remedial action.

5. City Utilities modified its Gas Construction Standards on June 16, 2004, to require a minimum of four to six inches of bedding material around all newly installed plastic gas service lines that involve open trenches. This bedding material will typically be limestone sand. City Utilities has proposed that other suitable materials or alternate protection methods, such as, rock shield sleeves may be evaluated and used in the future.

   Staff's review of City Utilities' Construction Standards indicated that since 1977, its standards have contained specifications to use select dirt or AG limestone backfill in rocky areas during installation when directed by the Engineering Department. The revised standard specifically requires the use of four to six inches of limestone bedding material around plastic pipe when being installed.

6. City Utilities will continue its current practice of performing quarterly leak surveys of the downtown business areas.

   City Utilities will perform an annual leak survey on the following items: the remaining non-replaced segments of pipe contained within the "Plastic Pipe Failure Master List," the plastic services that were only partially replaced (until such time as they are renewed), and the plastic segments where gas main leaks were repaired, but were not verified to be due to rock impingement.

   City Utilities, during routine FI leak surveys as required by the Missouri Pipeline Safety Regulations, will perform a bar-hole reading using a Combustible Gas Indicator (CGI) near the service riser where no opening exists around the riser for plastic services located under vent-restrictive surfaces. City Utilities has developed and implemented written procedures for this bar-hole survey over vent restrictive surfaces.

   City Utilities has also conducted an instrument leak survey of <u>all</u> pre-1983 plastic gas piping during the first half of 2004. During this survey, City Utilities treated all underground leaks on plastic piping as either a Class 1, or a Class 2 leak, giving them a higher priority than they may have otherwise had. City Utilities will continue to classify all underground leaks on all plastic piping (mains and services) as either Class 1, or Class 2. City Utilities' Operations and Maintenance Manual has been changed to reflect these procedures.

7. (This item refers to a list of plastic pipe leak repairs on mains from 1983-2004 in which the primary leak cause description was vague, or unclear, as to whether rock impingement was involved, or not. Staff proposed that these locations be spot-checked for backfill conditions and if rocks and other debris were found against the pipe wall, these mains would be systematically replaced). City Utilities reports that of the 255 prior leak locations included on Staff's list, 56 locations were duplicated on the Plastic Pipe Failure Master List and either have been, or will be replaced. City Utilities will perform the recommended spot checks on the remaining 199 locations and will document the results. City Utilities proposed that 33% (or 66 locations) be checked each year until all locations are checked. Any locations that are found to have rocks or other debris against the pipe wall will be added to the list of plastic piping to be replaced as discussed under Item 1.

In addition, City Utilities agreed to provide the Staff semi-annual reports as outlined below:

- Results of the quarterly business district leak surveys.
- Results of leak surveys of plastic piping beneath vent restrictive surfaces.
- Results of annual leak surveys.
- The status of plastic service line and main replacements made to date.
- Schedules and records of training for personnel who are involved in documenting leak repairs of plastic pipe due to rock impingement, determining backfill conditions and whom is responsible for determining the extent of plastic piping that is in an environment conducive to rock impingement.