Exhibit No.:	
Issues:	Copper service replacements and leak surveys
Witness:	Michael J. Loethen
Sponsoring Party:	MoPSC Staff
Type of Exhibit:	Direct Testimony
Case No.:	GO-99-155

MISSOURI PUBLIC SERVICE COMMISSION

UTILITY OPERATIONS DIVISION

DIRECT TESTIMONY

OF

MICHAEL J. LOETHEN

CASE NO. GO-99-155

Jefferson City, Missouri
January 5, 2000

BEFORE THE PUBLIC SERVICE COMMISSION

OF THE STATE OF MISSOURI

In the matter of Laclece Gas Company)		
Regarding the adequacy of Laclede's)		
service line replacement program and)	Case No. GO-99-155	
Leak survey procedures.)		

AFFIDAVIT OF MICHAEL J. LOETHEN

STATE OF MISSOURI	)	
	)	ss
COUNTY OF COLE	)	

Michael J. Loethen, of lawful age, being duly sworn, on his oath states: My name is Michael J. Loethen, I hereby swear and affirm that my answers contained in the attached direct testimony to the questions, therein propounded, consist of 25 pages to be presented in the above case; that I have knowledge of the matters set forth in such answers; and that such matters are true and correct to the best of my knowledge and belief.

Michael J. Loethen

Subscribed and sworn to before me this 5th day of January, 2000.

Notary Public

Joyce C. Neuner
Notary Public, State of Missouri
County of Osage
My Commission Exp. 06/18/2001

My commission expires _____

DIRECT TESTIMONY

OF

MICHAEL J. LOETHEN

LACLEDE GAS COMPANY

CASE NO. GO-99-155

Q. Please state your name and business address.

A. My name is Michael J. Loethen, and my business address is P.O. Box 360, Jefferson City, Missouri 65102.

Q. By whom are you employed and in what capacity?

A. I am employed by the Missouri Public Service Commission (MoPSC or Commission) in the Utility Operations Division as a Utility Engineering Specialist III in the Gas Safety Section of the Gas Department (Staff).

Q. Please review your educational background and work experience.

A. I have a Bachelor of Science degree in Electrical Engineering from the University of Missouri-Rolla and a Bachelor of Science degree in Administrative Management from the University of Missouri-Columbia. Since April 19, 1993, I have been on the Staff of the MoPSC. During my employment with the Commission, I have conducted inspections, evaluations and investigations of natural gas operators for compliance with applicable State and Federal pipeline safety regulations. I have successfully completed the seven courses prescribed by the U.S. Department of Transportation at the Transportation Safety Institute regarding the enforcement of the Federal Pipeline Safety Regulations (49 CFR, Parts 191 and 192). In addition, I have

attended numerous other courses and seminars directly related to pipeline safety, incident investigation subjects, and utility rates design. My responsibilities while with the Commission have developed into the monitoring of all phases of natural gas utility plant design, installation, operation, and maintenance. I conduct on-site natural gas facility inspections, review and analyze pipeline operator records, investigate natural gas related customer complaints and incidents, and assist in the development of the Commission's pipeline safety rules.

I am an Engineer-In-Training under the laws of the State of Missouri. I am a member of the National and Missouri Societies of Professional Engineers, the National Association of Corrosion Engineers, and the National Association of Fire Investigators.

Q. Are you familiar with and have you reviewed the filings made by both Staff and Laclede Gas Company (Laclede or Company) pertaining to Case No. GO-99-155?

A. Yes, I have.

Q. Are you familiar with the natural gas operations of Laclede Gas Company?

A. Yes, I have conducted several on-site annual inspections of Laclede's records and facilities for compliance with the Commission's minimum pipeline safety regulations. Also, over the past six to seven years, I have been directly involved in the on-site investigations and report preparations of eight docketed Commission gas incident investigations (five of which involved Laclede), as well as several informal investigations involving Laclede.

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to support the direct-buried copper service line replacement program for Laclede as presented in Staff's August 31, 1999 final report filed in this case. I intend to present sufficient data in my testimony, based upon six natural gas incidents involving Laclede's direct-buried copper services, that identifies inadequacies and limiting parameters within the Company's current copper service replacement program that commenced in 1991. I believe this data and analysis supports an order, requiring Laclede to undertake, without delay, a concise, systematic replacement program of all its direct-buried copper services which supercedes the Company's existing program.

Q. For the purposes of Case No. GO-99-155, what type of pipeline facilities are being addressed for replacement within the Staff's August 1999 proposed replacement program?

A. The leak survey issues addressed in Case No. GO-99-155 covered all types of service lines regardless of the material type they were made of, however, the scheduled replacements addressed only direct-buried copper services.

Q. Is Laclede currently performing certain copper service line replacements?

A. Yes, Laclede is currently conducting a direct-buried copper service line replacement program that began in 1991.

Q. Why should Laclede be required to expand its copper replacement program beyond the existing program, which was established in 1991?

A. Public safety is without question the primary reason. Three natural gas incidents have occurred since October 1998. Tragically, one has resulted in a death, while another resulted in two persons suffering severe bodily burns. All three incidents occurred

after the initiation of a copper service line safety program that included provisions for additional studies to be conducted by Laclede.

The 1991 copper service line program should be expanded because I strongly believe that: 1) examples from the last three incidents (to be discussed later in my testimony) substantiate that a perplexed replacement program, like Laclede's existing program, hampers the effectiveness of the program itself; 2) years of data collection, analysis, and reports from consultants hired by Laclede have not conclusively identified the exact mechanism of corrosion; 3) the nature of the corrosion involved necessitates a replacement program that goes beyond the consideration of currently leaking copper services; 4) a concise, systematic replacement schedule that has proven to be effective in previous Commission ordered replacement programs, needs to be incorporated; 5) implementation of a long-term, systematic program should not be further delayed while waiting for submission of additional information that may have little or questionable value. I will address shortly, Laclede's current copper service program, not for the purpose of repeating the modifications recently reached between the Staff and Laclede, but to discuss the effects of setting overly restrictive parameters on a replacement program, and to identify concerns warranting attention in any future replacement program.

In constructing a future replacement program, I believe that the results of other Commission-ordered replacement programs should be considered. Specifically, the effectiveness of long-term, systematic replacement programs, extending beyond simply repairing existing leaks, where substantial replacements occurred early within the program, and modifications to the original schedule were approved by the Commission.

The success of these programs should be considered, as well as their similarities to the Staff's proposed program in this case.

For example, by Commission regulations that became effective in December 1989 to address incidents due to corrosion of unprotected steel service lines, a Missouri natural gas operator was required to replace approximately 26,500 service lines annually. In Case No. GO-92-295, the replacement schedule was reduced by the Commission to approximately 21,000 service lines per year. The Commission later granted this natural gas operator's request to reduce the replacements previously ordered, after adequate and convincing data supported such a decision. Two very important points should be noted from this example. First, after the long-term, systematic replacement program was initiated, no further incidents involving corrosion of unprotected steel service lines have occurred. Second, this shows that after substantial replacements have been made and valuable experience has been gained, existing programs may be modified upon the presentation of additional evidence with Staff support and Commission approval.

LACLEDE'S CURRENT COPPER SERVICE PROGRAM

Q. Exactly how many direct-buried copper service lines are there in Laclede's natural gas system?

A. The total number of direct-buried copper services within Laclede's natural gas distribution system has been identified in Staff incident reports, but that number has fluctuated. The reported number of such services has varied from approximately 78,000 in 1991, to less than 78,000 in October 1998, to approximately 85,000 in April 1999. The figure provided to the Staff in April 1999 is considered the most accurate and includes all direct-buried copper services, even those that have been partially replaced prior to 1999.

In April 1999, Laclede stated it was committed to conducting main to meter replacements of copper services, except during emergency repairs. As a result, the main to meter replacements conducted from April 1999 to commencing a Commission ordered replacement program will reduce the approximated figure of 85,000 services and should be considered when establishing a replacement rate. For purposes of the Staff's proposed expanded replacement program, only main to meter replacements will be considered in calculation of the total number of replacements of direct-buried copper services. Considering the replacements made by Laclede up to January 1, 2000, approximately 82,000 – 83,000 direct-buried copper services remain.

Q. Please explain the established replacement program for direct-buried copper services that has been agreed upon between the Staff and Laclede?

A. Commission Case No. GS-90-326 ("Ringer Road") was the last of three Staff natural gas incident reports prior to 1991 involving corrosion on Laclede's direct-buried copper service lines. Each of the three incidents occurred within Laclede's distribution system. To resolve the cases, Laclede proposed a settlement that Staff agreed to, with some concerns. The Commission approved this Settlement Agreement ("Ringer Road Agreement") in March 1991 involving Laclede's direct-buried copper services. Within the Ringer Road Agreement, Laclede adopted procedures that included, but were not limited to:

1) The substitution of an annual instrument leak survey over all direct-buried copper service lines operating at specified pressures, in lieu of a special mobile copper service line survey;

2) An expansion of the replacement of copper services, by replacing copper service lines on either side of a copper service line that was being replaced due to corrosion;

3) Within a ten year period, completion of the replacement of copper service lines within the right-of-way as identified by the criteria denoted by the replacement program; and,

4) An annual completion of specified summaries attesting to the results of the replacement program.

The intentions of this program were to identify and monitor areas of the Company's operations where known areas of copper corrosive conditions existed and to initiate the replacement of corroded sections of the copper service lines, as well as the replacement of service lines adjacent to those that were leaking.

Q. You previously indicated that the Staff "had some concerns" in 1991 with the Ringer Road Agreement. What concerns did the Staff have and were they communicated to Laclede?

A. Yes, the Staff addressed its concerns with other related topics in a January 16, 1991, letter to Laclede. This letter is in the case file of Case No. GS-90-326. I have described below certain areas which the Staff believed, at that time, warranted the Company's attention. Interestingly, several of the same Staff concerns expressed in 1991 have been implemented by Laclede as modifications to the Ringer Road Agreement in 1998 and 1999.

1) Staff expressed concern with the Company's replacing only leaking right-of-way segments. In 1991, almost all copper corrosion leaks were thought to occur on the section of the service line in the street right-of-way. Staff

initially expressed concerns, however, that replacing only right-of-way segments may not be justified when the remaining segment might also be exposed to a corrosive environment in the future.

2) All direct buried copper service lines in the area of the leak should be considered for replacement, in addition to the adjacent service lines. The policy at that time only required replacement of long-sided services (services where piping extends from the main, then under the street, and then to the house being served) adjacent to a leaking service. When an adjacent long-sided service has already been replaced, a supervisor determines any additional long-sided service replacements that need to be made.

3) Areas of Laclede's operations meeting the criteria of the special mobile survey procedure should be placed in a systematic replacement program. Staff suggested an annual replacement of 10 percent or more of those service lines in areas meeting the special copper survey procedure criteria. The Staff already noted in 1991 that the policy did not require any replacements until a new leak occurs, and then would only address services adjacent to the leaking one.

4) Staff requested Laclede to evaluate the three copper service line incidents (incidents prior to 1991) for any related circumstances, or trends, which deserved special consideration. Staff agreed that the use of deicing salts was a common factor, but questioned at that time why Laclede believed it was the only common factor. The Staff addressed further questions, such as, "What type of study or review was conducted to determine related trends?

How were the factors of septic tanks, water table/drainage, soil types, and proximity to the Meramec and Mississippi Rivers considered? Has the area of incidents had a higher leak frequency than average, and if so, why?"

5) The Staff requested that Laclede detail the economic impact of replacing the riser piping in conjunction with the right-of-way segment (long-sided and short-sided) and the added costs to replace the customer premise segment by method of installation. Staff believed the additional cost to "pull" in a polyethylene tubing to replace the customer premise segment from the property line to the meter may be minimal when right-of-way and main excavations are already being made and service is already being disrupted. Staff noted this was especially true when the riser pipe excavation and replacement are already being conducted.

Q. You previously indicated there have been modifications to the Ringer Road Agreement. Why were modifications made?

A. In 1998, seven years after commencing the original Ringer Road Agreement, three natural gas incidents occurred, Case No. GS-98-422 (Pralle Lane), Case No. GS-98-423 (Bergerac Drive), and Case No. GS-99-371 (Valley Park) involving corrosion on Laclede's direct-buried copper service lines. These incidents showed a need for significant modifications to this program. Modifications focused on two general areas of the Ringer Road Agreement, leak surveys and replacements of direct-buried copper service lines. Individually, each of these three incidents provided examples of inadequacies in the original agreement; together they support the implementation of a long-term, systematic replacement program that advances beyond simply replacing currently leaking copper service lines.

Ringer Road Agreement Leak Survey Modifications

Q. Generally explain any leak survey modifications made to the Ringer Road Agreement.

A. Modifications to Laclede's leak survey procedures over direct-buried copper services are not new topics of discussion. In 1982, Laclede initiated a program on their own to conduct mobile leak surveys over copper services after tracking leaks on copper service lines since 1975. As mentioned previously, Laclede stepped up their leak survey procedures in 1991 by agreeing to conduct annual walking leak surveys over all direct-buried copper service lines in specified pressure regions, to assure that these service lines were leak surveyed annually over their entire length. Previously, the mobile survey was only done over that portion of the service in the street/road right-of-way and only in areas of known active corrosion.

Q. Did these annual leak surveys over direct-buried copper services meet the Commission's minimum pipeline safety regulations?

A. Yes, Laclede's attempt to conduct annual walking leak surveys over the entire length of these services exceeded the Commission's minimum pipeline safety regulation of 4 CSR 240-40.030(13)(M)2. Paragraph (13)(M)2. requires residential service lines, excluding unprotected steel yard lines and unprotected steel service lines, be leak surveyed once each three (3) years. However, the results of the annual walking leak surveys' effectiveness appear diminished in hindsight when considering that service line locations were difficult, at best, to identify.

Q. Please explain why you believe these annual walking leak survey results appear diminished.

A. Leak surveys following the Pralle Lane, Bergerac Drive, and Valley Park incidents detected several leaks that were not previously detected during leak surveys conducted prior to the incidents. During 1998-1999 on-site investigations, I witnessed Company personnel conducting leak surveys, similar to the annual walking surveys, and noted the difficulty and uncertainty involved with leak surveying over the entire length of the service when only an address was provided. No maps or locations of pipeline mains were available to assist these leak surveyors. Because of the apparent evasiveness shown of some leaks on copper services, and leak surveys not performed over the service lines, I believe the results of these annual walking surveys are less significant.

Q. Is it common for natural gas operators to utilize pipeline maps during leak surveys?

A. Yes. Generally, leak surveyors have at a minimum, the locations of the natural gas mains. Measurements with main and service line tap locations are now provided by Laclede, which helps personnel align themselves over the tap and with the service riser. This provides for a more accurate identification of the service line location, resulting in more effective leak detection. The location measurements, however, are only as accurate as the installation records depict.

Q. Explain the significance of the above mentioned leak survey modifications to Laclede's copper service replacement program.

A. Accuracy of leak surveys are essential for identifying those copper services currently leaking, and establishing a program that is prioritized to eliminate, in an expedited manner, the direct-buried copper services that present the greatest potential for hazard. This is essential when consultant reports have indicated that, if significant moisture levels are

present in combination with mechanical leaks or soil contaminants, a relatively rapid external pitting attack could result. Also, keeping in mind that previous leak survey modifications have been made in the past, a series of leak surveys, extending beyond Laclede's proposed Year 2000 bar hole survey, should be required to determine whether this modified method, incorporating a bar hole, of leak surveying is the most effective.

In referencing the leak survey results stated within the Pralle Lane and Valley Park reports, three facts should not be forgotten. First, a bar hole leak investigation the day before the Pralle Lane incident identified the contributing leak as a Class 3 leak, by definition a Class 3 leak does not constitute a hazard to property or to the general public. Second, the corroded service line involved in the Pralle Lane incident was actually more than 10 feet away from where the installation measurements depict. Third, bar hole leak investigations were made just three weeks prior to, and within 20 feet of, the corroded service line involved in the Valley Park incident, without detecting the contributing leak. Again, the effectiveness of the leak surveys are very significant to the prioritization schedule of a replacement program.

Q. What surveys are now being conducted over direct-buried copper services?

A. The Company conducted a bar hole leak survey over all direct-buried copper services in 1999 and has proposed conducting an additional bar hole survey by July 2000. The 1999 bar hole survey covered approximately 84,700 direct-buried copper services and identified 3,145 leaks. I believe that leak surveys incorporating one or more bar holes should continue until a more effective method, if any, can be identified. Measurements of

the service tap locations must also be utilized during these surveys, with the understanding the measurements are only as good as construction records depict.

Replacements under the Ringer Road Agreement

Q. Were there any modifications in 1999 addressing the replacement of copper service lines on either side of a copper service line that is being replaced due to corrosion?

A. Yes. In an April 16, 1999, correspondence, Laclede stated it would modify the existing program and was committed to replacing 7,044 direct-buried copper service lines by March 15, 2001. The 7,044 number of proposed replacements now goes outside the "known areas of active corrosion" by including the scheduled replacement of all existing below ground leaks on direct-buried copper services. As a result of the number of existing leaks on direct-buried copper services, the intentions of the modification is to replace the highest priority direct-buried copper services, those that have been detected as leaking. However, the number of proposed replacements of 7,044 is based upon the intentions of the original 1991 replacement program.

Staff believed the intention of the original Ringer Road Agreement was for Laclede to replace the copper services adjacent to a leaking copper service repaired due to corrosion. This would remove non-leaking copper services from areas where corrosive conditions have occurred on other copper services. The phrasing of the replacement expansion, as its written within the Ringer Road Agreement, can be somewhat misleading, however, if one is not knowledgeable of Laclede's program criteria.

In reading Laclede's proposed commitment under the Ringer Road Agreement to replace copper service lines in areas susceptible to corrosion, one might believe that adjacent

copper services on either side of a leaking copper service being replaced would be replaced either at the same time or shortly thereafter. What is not immediately apparent on the surface are the specifics of the program's criteria. The copper service being replaced must be due to corrosion and must be in the "known areas of active corrosion" (which has its own criteria); and then, under the discretion of a supervisor, each adjacent service must also be evaluated to determine whether it too is susceptible to corrosion. Additionally, short-sided services did not even meet the criteria of the Ringer Road Agreement. The Bergerac Drive and Valley Park incidents both involved short-sided services and have proven this to be an inadequate and/or restrictive criterion. Because more replacements were not made earlier within the original program and narrowly defined criteria were used, a modification was necessary at that time to replace the highest priority copper services.

Q. How was the quantity of 7,044 direct-buried copper services derived?

A. The 7,044 number of direct buried copper services was generated by Laclede. During investigations following the Pralle Lane and Bergerac Drive incidents, the Staff requested the number of direct-buried copper service lines adjacent to copper service lines that Laclede had replaced due to leakage since commencing the Ringer Road Agreement. Staff was told that service lines, adjacent to these repaired due to corrosion leakage, were not always replaced at the time of repair, but instead a "back log" of adjacent services had developed. Laclede indicated that a true number was not available at that time and an estimate would be provided. In October 1998, during discussions between Staff and Laclede, a multiplier of 1.5 times the number of corrosion leaks identified through 1991 and 1998 that were outside of the areas set forth under the Ringer Road Agreement was used to estimate a total. Therefore, Laclede utilized a multiplier as an estimate to determine the

number of required replacements for non-leaking, adjacent copper service lines as opposed to a direct count of each adjacent copper service line located in areas susceptible to corrosion. This figure was added to the number of currently existing leaking copper services.

Q. Does this calculation provide for an accurate count of the number of required replacements under the Ringer Road Agreement?

A. Staff discussions with Laclede addressed, among other issues, the types of leak replacements being made, i.e., replacement of leaks as opposed to a systematic replacement in one particular area susceptible to corrosion, and current resource capacities of personnel and equipment. It was then mutually agreed that the 7,044 figure would satisfy the intentions of meeting the Ringer Road Agreement, unless another Commission order was made. It was very difficult for the Staff to determine the 7,044 replacement figure with the information provided. As explained to the Staff, the 1.5 multiplier considered partially replaced adjacent copper services and copper services located at street junctures, where the adjacent service would be located across a public street. These partially replaced copper services were excluded from the 7,044 number, and the 1.5 multiplier was used as an estimate of the services adjacent to the copper service repaired due to corrosion. As previously mentioned, the narrowly focused parameters set by Laclede, which were agreed to by the Staff and approved by the Commission, provides for data that could be used to argue "for" or "against" this 7,044 number.

Q. Why was it difficult to determine the correct number of copper service replacements?

A. The number of corrosion leaks outside the active areas of corrosion during 1991-1998 does not necessarily have to be used. Because of the Ringer Road Agreement's narrowly defined parameters, many of the corrosion leaks outside the defined corrosive regions most likely would not qualify as being in "known areas of active corrosion" and, therefore, would be excluded from the program criteria, not to mention that short-sided services were not considered within the parameters of the Ringer Road Agreement. With these narrowly focused parameters, I can understand the difficulty Laclede must have experienced in tracking the number of adjacent services. I believe the Company's 7,044 figure is conservative, and could be higher.

Q. Explain how this 7,044 figure could actually be higher.

A. A corrosion leak on any direct-buried copper service should have qualified, and a multiplier of 2 or more should have been used. Three incidents since March 1998 support that the original agreement is inadequate, and should raise some questions to why more replacements than the estimated 7,044 should not be required at this time. Agreeing to meet the requirements of the original Ringer Road Agreement, already shown to be inadequate, only indicates that an inferior standard has been reached. Therefore, I believe higher standards of replacements should be made.

Q. Under the Ringer Road Agreement, how many copper services was Laclede required to replace annually?

A. There was no fixed annual rate of replacements for direct-buried copper services. Laclede was only required to replace leaking copper services by the minimum pipeline safety regulations 4 CSR 240-40.030(14)(C)3., which requires a Class 3 leak to be replaced within five years of detecting the initial leak, but before the end of the ten-year

Ringer Road Agreement. Class 1 leaks require immediate attention, and Class 2 leaks require repairs within 45 days, unless the leak is reclassified. There were no replacement time limits for adjacent services classified under the Ringer Road Agreement. These replacements could possible extend beyond the ten-year period of the original Ringer Road Agreement.

Q. Are there any other areas of the Ringer Road Agreement that you believe are inadequate?

A. Yes. I believe there are other inadequacies warranting concern. First, the Ringer Road Agreement indicated Laclede would proceed with additional studies recommended by Staff to evaluate copper service line incidents regarding factors that might contribute to corrosion such as septic tank involvement, water table, soil types and other considerations. Second, the agreement stated Laclede would compile a summary of copper service line replacements that were leaking due to corrosion denoting whether the leak location was in the right-of-way or in the yard. In addition, Laclede was to compile a summary of the copper service line replacements where there was no leak detected. These summaries were to be compiled for each calendar year. The agreement did not necessarily state the summaries should be compiled annually. These provisions were inadequate because there were no time limits on the completion of studies, or summaries. The Company was not required to provide the results of any summaries or studies to the Commission.

Q. Did Laclede voluntarily submit any studies or summaries to the Staff prior to the Pralle Lane and Bergerac Drive incidents in March 1998?

A. No, Laclede did not.

Q. Did the Staff request any of this information from Laclede prior to the Pralle Lane and Bergerac Drive incidents that occurred in March 1998?

A. No, the Staff did not request the studies or summaries prior to the Pralle Lane and Bergerac Drive incidents that occurred in March 1998.

Q. Had the Staff reviewed any information pertaining to the Ringer Road Agreement prior to the Pralle Lane and Bergerac Drive incidents?

A. Yes, while conducting on-site annual inspections of Laclede's records and facilities, Staff selectively reviewed records that indicated leak surveys over direct-buried copper services were made, as well as records of individual leak repairs on copper services. Company personnel indicated the repair records were reviewed and qualifying direct-buried copper service line repairs were placed on maps to identify known areas of active corrosion.

Q. Are there any other concerns with regards to the Ringer Road Agreement?

A. Yes. The most significant concerns are: (1) why corrosion is taking place on the direct-buried copper services; (2) what is the rate at which the corrosion occurs; and, (3) how to eliminate the occurrences of incidents. Unfortunately, Laclede's tracking of leaks on copper services since 1975; modifying leak survey practices several times over the past fifteen years; conducting soil analyses; and hiring of consultants to analyze corroded sections of copper services have still not determined the actual cause and rate of corrosion, or identified which copper services are corroding but have not yet begun to leak.

Q. When did Laclede and Staff begin actively discussing the need for studies to be made identifying causes of corrosion on Laclede's direct-buried copper services?

A. In 1991, Laclede was first requested by the Staff to conduct studies on this safety issue. In 1998, after the Pralle Lane and Bergerac Drive incidents, Laclede hired a consultant, who after nine months produced a report that was inconclusive in determining which copper services were corroding. Laclede now has proposed that within a few weeks following a bar hole leak survey to be completed in July 2000, the Staff review all survey reports and summaries; analyze the Company's new consultant's report to determine whether the data contains any sufficiently conclusive information; and then agree upon on a replacement schedule.

The Staff's experience in analyzing leak and corrosion data submitted by gas operators, or their consultants, is that it was usually very difficult to predict how long it would take to review, analyze and respond to those studies and make comparative studies to existing data. The difficulty lies in identifying which primary factors, acting alone, or in combination, are causing the corrosion on the copper services. As previously mentioned, a consultant hired by Laclede after the Pralle Lane and Bergerac Drive incidents reported that mechanical leaks in combination with moisture or soil contaminants can produce a relatively rapid external pitting. This in essence indicates that almost any underground leak on a direct-buried copper service has the potential of developing corrosion in the form of actual pitting of the base metal, and the corrosion process could be accelerated. The rate of the pitting, however, was not determined.

The mechanisms for corrosion are described in the Bergerac Drive, Pralle Lane, and Valley Park incident reports and will not be analyzed within my testimony. However, road salt usage, climate conditions, material manufacturers, installation methods, soil types, depth of cover, and even levels of cathodic protection are just a few of the items that can not

be completely ignored in this discussion pertaining to the unique corrosive conditions on Laclede's direct-buried copper service lines. Considering the history of Laclede's direct-buried copper service lines and the difficulty of identifying the actual mechanism of corrosion responsible for these failures, it is time to put a long-term, systematic program in place now and not continue to delay that decision while waiting for still more studies to be conducted.

Q. Do you wish to address any other modifications to the Ringer Road Agreement at this time?

A. No, not at this time.

STAFF'S PROPOSED REPLACEMENT SCHEDULE

Q. Please explain Staff's proposed replacement schedule.

A. Staff recommends a replacement schedule that includes all remaining direct-buried copper services, including those previously partially replaced, at a rate of 10 percent annually. The 10 percent annual rate will be applied to the remaining direct-buried copper services in operation as of January 1, 2001.

Q. Explain how Staff proposed an annual replacement rate of 10 percent.

A. The analysis and reports provided thus far in this Case have qualified all direct-buried copper services in Laclede's operations as candidates for potentially being susceptible to external corrosion. Therefore, all direct-buried copper services have been included within the Staff's proposed replacement program, approximately 83,000 total.

The differences between the Staff and Laclede involve the rate of replacements of direct-buried copper services. In its considerations, Staff has included, among others, the (1) safety-driven urgency to get a more systematic program put in place; (2) existing

Commission-ordered replacement programs, and modifications to such programs upon receipt of additional credible evidence; (3) inconclusive analyses and studies of six natural gas incidents from Laclede and their consultants; (4) leaks contributing to incidents that went undetected during prior leak surveys; (5) undetermined rate of corrosion on copper services; and (6) no proven method of identifying exactly which copper services are in corrosive environments. With many very important essentials still unknown, Staff believes a replacement program must advance beyond simply replacing currently leaking copper services.

The Staff proposes its 10 percent rate for two reasons. First, previous 10 percent replacement programs are in place and have been successful in protecting the public. I would like to reemphasize the success of these programs, in that, no further incidents involving corrosion of unprotected steel service lines occurred after the programs were initiated. Second, the Staff believes a rate of 10 percent will move Laclede ahead of the problem and position them so that the development of additional analyses and studies is not rushed, and public safety is not threatened. The considerations mentioned above, and more, are all instrumental in determining a rate of replacements. Commission-ordered replacement programs that I have mentioned previously also support a fixed rate of replacements, where substantial replacements are made under a prioritized schedule. There is also similar evidence of effective systematic replacement schedules involving Laclede, such as Case No. GO-93-343, where approximately 1,200 unprotected steel service and yard lines are replaced annually (although most of these pipelines operate at low pressure and no incidents involving Laclede have occurred).

Q. How will Staff's proposed replacement schedule differ from Laclede's current replacement schedule?

A. Staff's proposed replacement schedule will increase the replacement rate of direct-buried copper services to approximately 8,000 annually. The Staff's replacement schedule also differs in that a known fixed number of replacements will be required for each year. Laclede will be required to annually submit to the Commission, or Staff, summaries containing the results of the replacement program. This program would be proactive and prioritize replacements based on current known leaks, as well as remove direct-buried copper service lines before leakage occurs. This differs from the Ringer Road Agreement which unfortunately has developed into a "back loaded" program, where increasing operational and maintenance attention and expenditures have occurred later in the program. Staff has concerns with this "back loaded" program's effects on other operational and maintenance programs and previously ordered replacement programs involving Laclede, and intends to work more closely with Laclede as it makes its transition into a systematic replacement schedule.

Q. What areas of the Company's current operations and maintenance program will be affected upon implementation of the Staff's proposed replacement rate?

A. There will be certain areas of Laclede's operations and maintenance program that will experience decreases in work load when the Staff's program is implemented. While Laclede's replacement efforts will increase as it meets the Staff's replacement schedule, Laclede should reap benefits from some avoided operations and maintenance efforts. The Staff believes benefits should occur when Company efforts

decrease in the following areas: 1) annual bar hole leak surveys over copper services will be replaced by required leak surveys every three years, without a bar hole; 2) leak inspections as a result of public notifications of detected leaks on copper services should decrease; 3) recheck leak investigations on leaking copper services will be avoided; and 4) partial repairs will be limited to emergency repairs only (Staff incident reports have shown where partial repairs conducted on different dates that have been made at the riser and tap, all before the entire service is then replaced).

Q. Why has the Staff proposed Laclede be directed to commence the Staff's proposed program in early 2001 and not immediately following this February hearing?

A. Similar to Staff's need to review and analyze data related to copper corrosion in this case, the Staff understands Laclede needs a realistic time period to allow for proper training of any additional personnel and the appropriate allocation of resources. Staff believes that a Commission Order following the February hearing will provide for more preparation time to analyze a budget for the fiscal year and to commence a program on schedule than Laclede's requested time period of six-months from an order date.

Q. Have any parameters been established to prioritize the replacements of direct-buried copper services?

A. Staff and Laclede have agreed that currently leaking copper services should be given high priority. Laclede identifies the majority of its direct-buried copper services as operating within a "Pressure Region 1" (system pressures normally operating above 35 psig) or "Pressure Region 2" (system pressures normally operating below 35 psig) and has placed a higher priority of replacement on copper services within Pressure Region 1. Operating

pressures, while not a cause of external corrosion on copper services, have naturally been given some weight in risk analysis for leaking service lines considering that higher pressures supply a greater force behind leak migration. Laclede has also indicated it gives stronger consideration to focusing on copper services in "Pressure Region 1" because each of the copper services in each of the six incidents have operated at Pressure Region 1 pressures at some time prior to each incident. However, in four of the six gas incidents, the actual operating pressure at the time of the incident was within the pressure range defined by Pressure Region 2, less than 35 psig. This shows the migration potential of leaking natural gas at operating pressures within Pressure Region 2 levels also warrants concern (actually, the four service lines were operating below 25 psig at the time of their respective incident).

While the Ringer Road Agreement parameters excluded too many copper services from the program, Staff believes parameters should be established to prioritize a systematic replacement of copper services. The exact parameters for prioritizing facilities for an extended replacement program have not been fully established between the Staff and Laclede at this time. To have a Commission Order in place as early as possible, which establishes the parameter of known number of annual replacements, will enable Staff and Laclede to direct more focus on identifying and establishing the other priority parameters.

Q. Does this complete your discussion of the Staff's replacement schedule?

A. Yes, it does.

Q. Please summarize your testimony.

A. My testimony emphasizes that the Commission should take notice that six natural gas incidents have occurred and no solution is in place to deal effectively with the corrosion problem on Laclede's copper service lines. Data collection, analyses, and

consultant reports have been conducted for several years. A 1991 Laclede replacement program for direct buried-copper services did not provide for an adequate number of replacements or adequate prioritization of copper services warranting replacements. The last three incidents have guided Laclede and Staff in addressing and agreeing upon changes to the original Ringer Road Agreement, but Staff believes those incidents show that an increase in replacements is needed.

Without further delay, the Commission should order a 10 percent annual replacement of Laclede's direct-buried copper services. Any further delay postpones not only the removal of corroded copper services, but also the total focus on prioritization of replacements, which is the only known method of dealing with corroded copper services. There is nothing to prevent the Commission from modifying the ordered program later, when and if additional information of value is developed and presented. The Commission has previously made modifications to existing replacement programs upon receipt of persuasive information.

Q. Does this conclude your direct testimony?

A. Yes, it does.