BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI

In the Matter of Union Electric Company d/b/a Ameren Missouri Concerning a Natural Gas Incident at 3404 Georgia Street in Louisiana, Missouri	))))	**File No. GS-2016-0159**

STAFF GAS INCIDENT REPORT

COMES NOW the Staff of the Missouri Public Service Commission and states as follows:

1. On December 21, 2015, Staff filed *Staff's Motion to Establish a Case for Investigation of a Gas Safety Incident* ("Motion") which occurred on November 27, 2015, in Louisiana, Missouri, an area served by Union Electric Company d/b/a Ameren Missouri ("Ameren Missouri"). The Motion recommended that the Commission establish a case for purposes of receiving a report resulting from the investigation of the incident by the Commission's Safety Engineering Unit.

2. On January 6, 2016, the Commission issued an *Order Opening File and Directing Filing* in which the Commission opened this investigatory docket (GS-2016-0159).

3. On March 24, 2017, pursuant to a request by Staff, the Commission issued an *Order Extending Time to File* in which the Commission extended the deadline for Staff to file a report resulting from its investigation of this incident until May 31, 2017.

4. Pursuant to the Commission's Order issued on March 24, 2017, contemporaneously herewith Staff is filing its Gas Incident Report concerning the incident which is the subject of this investigatory docket.

WHEREFORE Staff submits the accompanying Gas Incident Report.

Respectfully submitted,

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CERTIFICATE OF SERVICE

I hereby certify that copies of the foregoing have been mailed, hand-delivered, or transmitted by facsimile or electronic mail to counsel of record this 31st day of May 2017.

/s/ Jeffrey A. Keevil

Missouri Public Service Commission

Staff's Gas Incident Report

3404 Georgia Street
Louisiana, Missouri
November 27, 2015

Ameren Missouri
File No. GS-2016-0159

Commission Staff Division
Operational Analysis Department
Safety Engineering Unit
May 31, 2017
Jefferson City, Missouri

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I. EXECUTIVE SUMMARY

At approximately 2:40 p.m. Central Standard Time (CST) on November 27, 2015, a natural gas fire occurred along the ground and side of the El Carnaval Restaurant building at 3404 Georgia Street in Louisiana, Missouri (See Appendix B, Figure 1 for approximate location). The restaurant building was destroyed as a result of the subsequent structure fire. A Union Electric Company d/b/a Ameren Missouri (Ameren) gas service worker standing nearby when the fire occurred was not injured. The Ameren gas service worker made contact with the restaurant owner, and then the owner and other occupants evacuated the restaurant to a safe location. There were no injuries requiring medical attention. The Missouri Public Service Commission's Safety Engineering Unit Staff (Staff) investigated the incident.

Ameren provides natural gas service in Louisiana, Missouri. The El Carnaval Restaurant at 3404 Georgia Street was supplied natural gas through a polyethylene (PE) service line connected to an 8-inch diameter PE main (See Appendix B, Figure 2 for main and service line approximate locations). The natural gas main was operating at approximately 29 pounds per square inch gauge (psig) at the time of the incident.

At 1:09 p.m. on November 27, 2015, an Ameren call center representative received a call regarding an outside gas odor and dispatched an Ameren gas service worker to the location. The Ameren gas service worker responding to the outside odor call arrived at 1:19 p.m. He performed testing and found several small leaks on the above ground piping, but did not find any subsurface leaks. He then shut off the flow of gas to the customer's meter and repaired fitting leaks on the aboveground gas meter set. After he repaired these leaks, he restored the flow of gas to the gas meter and tested his repairs to verify that no leaks remained

on the meter set. He was facing the building and meter set when a flash occurred in front of him and a fire started along the ground and side of the building.

After the natural gas fire started, the Ameren gas service worker attempted to use the fire extinguisher from his truck but it did not work. The Ameren gas service worker may have been able to extinguish the fire if his fire extinguisher had functioned correctly. As a result of this incident, Ameren has changed the type of fire extinguisher it provides to gas service workers in its Missouri operations and will be using a qualified maintenance contractor to service the new fire extinguishers. These changes are intended to prevent a reoccurrence of a non-functional fire extinguisher. Staff recommends that Ameren provide notification to Staff when the changes are fully implemented.

The source of the natural gas leak that ignited was an underground compression coupling[1] in the PE service line. One end of the PE service line pipe separated from the compression coupling. Since the Ameren gas service worker did not detect a subsurface gas leak during underground tests he performed prior to the incident, the separation of the service line from the compression coupling may have occurred during the work that the Ameren gas service worker performed on the above ground piping. A possible mechanism for this could have been forces exerted on the service line when the Ameren gas service worker disassembled and reassembled pipe fittings in the meter set with pipe wrenches. Further analysis of the compression coupling failure was limited due to a lack of information about the coupling and its installation.

The original service line installation record is missing; therefore, the exact installation date and some additional information about the service line are unknown. Since Staff does

[1] Compression coupling (also called compression fitting) is a type of mechanical fitting used to join pipe.

not know the installation date for the service line to 3404 Georgia Street and some other pertinent information about the compression coupling that failed, Staff cannot determine if there were violations of applicable regulations for PE joints. However, the failed joint would not have met current regulatory requirements for PE joints, which result in making compression coupling joints that are stronger than the PE pipe when less than 4-inch diameter.

Prior to the incident, Ameren had implemented a Distribution Integrity Management Program (DIMP) in accordance with regulations[2] to identify and evaluate the relative risk of threats to its distribution pipelines and determine if additional corrective measures are warranted. The Ameren DIMP addresses the threats of compression coupling failures and data gaps such as the missing service line installation record. Staff is making two recommendations to Ameren regarding the Ameren DIMP in the *STAFF RECOMMENDATIONS* section of this report.

II. STAFF ANALYSIS OF INCIDENT AND CONCLUSIONS

A. Natural Gas Escape and Migration

Analysis:

The PE gas service line to 3404 Georgia Street was ¾-inch PE at the connection to the main, and was reduced to ½-inch PE prior to connection to the gas service riser (See Appendix B, Figure 3). Natural gas escaping from a separated compression coupling on the ½-inch diameter service line exited at a pressure of approximately 29 psig. Since natural gas

[2] 4 CSR 240-40.030(17)

is lighter than air,[3] it tends to migrate along pathways of least resistance through the soil and upward into the atmosphere. The leaking coupling involved in this incident was located under a building slab surrounded by a paved parking lot, so the building slab and area pavement would have restricted the upward migration of the natural gas to areas with openings to the atmosphere (e.g., openings in the pavement). There were some openings in the pavement near the outside gas meter and along the surrounding building walls that would have allowed natural gas to escape to the atmosphere.

The outside gas meter was installed at a location that was surrounded by three building walls (See "Gas Riser" location on Figure 3 of Appendix B and Photograph 1 of Appendix C). After the natural gas ignited, natural gas would have continued escaping through openings in pavement near the gas meter fueling the fire. Large amounts of water were applied to this area during the firefighting activities, and water would have accumulated on the ground surface in the vicinity of the gas meter. This water accumulation eventually restricted and stopped the migration of natural gas to the atmosphere at the gas meter location, which stopped the natural gas fire. Natural gas escaping from the compression coupling would have continued migrating in other unknown directions until Ameren used a squeeze-off tool[4] to stop the flow of gas through the service line at approximately 9:15 p.m.

Conclusion:

Natural gas leaking from the gas service line migrated upward to the building slab and area pavement, and began escaping to atmosphere through pavement openings at and near the gas meter location at 3404 Georgia Street.

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[3] Natural gas has specific gravity of approximately 0.6 while air has a specific gravity of 1.0.

[4] A squeeze-off tool is used to clamp the pipe shut, stopping the flow of natural gas downstream of the tool.

B. Natural Gas Ignition

Analysis:

The outside gas meter location was surrounded by three building walls for 3404 Georgia Street (See "Gas Riser" location on Figure 3 of Appendix B and Photograph 1 of Appendix C). These three walls formed a somewhat enclosed space around the outside gas meter. Natural gas migrating up through the ground could escape directly upward past the building walls, and laterally in one direction, but was confined in three lateral directions by building walls. Natural gas escaping at ground level would have entered this somewhat enclosed space and travelled upward and outward to the atmosphere. As the escaping natural gas mixed with air, at some locations it would have formed gas-in-air mixture concentrations within the flammable range[5] and was ignited. The source of ignition was not determined.

Conclusion:

Natural gas escaping to atmosphere at the gas meter location was ignited by an undetermined source.

C. Service Line Failure

Analysis:

The fire at the outside building wall was consistent with a large-volume natural gas leak as the source. This type of large volume could have resulted from natural gas escaping from the high-pressure service line, but could have less likely been a result of gas escaping from the low pressure side of the service regulator. Prior to the ignition, the Ameren gas service worker had opened the gas riser valve allowing gas to flow through the meter to the customer's piping. Due to the fire at the meter set area, Ameren could not access the gas riser

[5] The ignition range for natural gas in air is from about 4.5 percent gas-in air to about 14.5 percent gas-in-air.

valve after the fire started and it was still open following the fire (See Appendix C, Photograph 4).

According to Ameren personnel present at the incident, natural gas was not escaping out of the open pipe end at the former location of the gas meter[6] during the time period following the fire and prior to Ameren squeezing off the service line upstream of the separated coupling. If the service line was still fully connected from the main to the service riser (and assuming no blockage of the pipe), natural gas should have been escaping out of the open pipe end at the service riser. The absence of such a gas flow could be explained by a break in the service line.

Ameren discovered a separated compression coupling in the ½-inch PE service line when making an excavation at the service riser. No other sources of gas leaks were identified. Subsequent leak surveys and pressure tests of the remainder of the service line between the main and the gas riser valve detected no leaks other than the separation at the compression coupling.

Laboratory testing confirmed that air could flow from the separated compression coupling to the open pipe end at the former location of the gas meter. This indicated that the service line was not blocked, and would have allowed gas to flow from the main to the open service riser if the line had not been separated at the compression coupling. Although the gas riser valve was open following the fire (See Appendix C, Photograph 4), natural gas was not flowing out of the open pipe end during the time period prior to when Ameren squeezed off the service line upstream of the separated coupling. If the service line was still fully connected, natural gas would have been flowing out of the open pipe end. This indicates that

[6] The aluminum gas meter melted during the fire.

the service line was not connected somewhere between the squeeze-off location and the open pipe end. The only possibility left after testing is the separated compression coupling.

Separation of certain compression couplings can occur when subjected to pull-out forces on the pipe.[7] Natural forces could involve settlement of soil and backfill over years since installation. It is unknown if there was prior settlement at this location, and if so, how much. Other natural forces could include soil movement due to freeze/thaw cycles since installation. The aboveground meter set piping was disassembled and reassembled with wrenches to repair thread leaks just prior to the incident, which could have pulled the service line and as a result applied forces at the location of the compression coupling. Since the Ameren gas service worker did not detect a subsurface gas leak during underground tests he performed prior to the incident, the separation of the service line from the compression coupling may have occurred during the work that the Ameren gas service worker performed on the above ground piping.

Laboratory observations indicate the service line pipe was not fully inserted into the compression coupling at the time of failure per a marking on the inside pipe wall. It could not be determined whether the compression coupling was incorrectly installed this way or had gradually pulled out over time.

The installation date, coupling manufacturer/model, joining procedure, and the person who made the joint are unknown to Ameren since the service line installation record was missing. The compression coupling was likely manufactured by Continental® based on Staff's observations and comparisons to other compression couplings. The service line was black PE

[7] Current regulations at 4 CSR 240-40.030(6)(G) require mechanical joints less than 4-inch diameter to be made with joining procedures that result in a joint stronger than the pipe.

pipe. Ameren purchased black PE pipe from the mid-1970's to 1984, so it is unknown if the compression coupling was installed before or after the pipeline safety regulation for plastic pipe joints was changed in 1980. Ameren does have a record that the service line was successfully pressure tested at the time of transfer to a new plastic main in 2003.

Operators of natural gas distribution systems were required to implement a Distribution Integrity Management Program (DIMP) by August 2, 2011.[8] Staff performed an inspection on the initial Ameren DIMP Plan in September of 2012. The requirements to report mechanical fitting failures began with a requirement to report mechanical fitting failures that occurred in 2011;[9] therefore, little information was available related to the threat of coupling failures at the time of the initial DIMP Plan development or Staff's first DIMP inspection of Ameren. Ameren's revised DIMP Plan (effective 08/02/2016) includes consideration of the threat of compression coupling failures based on analysis of failure data collected and reported since 2011, and Ameren must continue to track and evaluate the relative risk of compression coupling failures. Staff will continue to review and evaluate the threat of compression coupling failures through inspections of Ameren's DIMP.

Another element of DIMP is that the operator must identify additional information needed on its system and provide a plan for gaining that information over time through normal activities conducted on the pipeline. Ameren was missing the installation record for this service line, and may be missing similar information for additional service lines. If such information is missing on additional service lines, this record gap needs to be addressed in the

[8] 4 CSR 240-40.030(17)(C)

[9] 4 CSR 240-40.020(7) and 49 CFR 191.12

Ameren DIMP. Staff will evaluate Ameren's progress in gaining missing information over time through inspections of Ameren's DIMP.

Conclusions:

1) The compression coupling separated due to pull-out forces exceeding the pull-out strength of the coupling. This may have been due to an inadequate insertion of the pipe into the coupling at the time of installation, but the pipe also could have pulled out gradually over time.

2) The lack of an installation record and other information limits further conclusions about the failure.

3) The Ameren DIMP needs to continue evaluating the relative risk of compression coupling failures and needs to address gaps in service line records and information.

D. Emergency Response

Analysis:

Fire extinguishers are provided to Ameren gas service workers and they are trained to put out gas fires using a fire extinguisher. Following the natural gas ignition, the Ameren gas service worker attempted to use the fire extinguisher from his vehicle to extinguish the natural gas fire, but the extinguisher did not work. Under normal circumstances, a trained service worker can extinguish the fire if there is an operating fire extinguisher at a short distance from the ignition of a natural gas leak.

Conclusion:

If the fire extinguisher had been working properly, the Ameren service worker may have been able to extinguish the fire at the source before the restaurant building was damaged.

E. Regulations for Plastic Pipe Joining

Analysis:

Regulations from March 12, 1971 to July 1, 1980

On August 19, 1970, the U.S. Department of Transportation-Office of Pipeline Safety (DOT-OPS) promulgated 49 CFR part 192 and prescribed in §192.13(a) that the regulations regarding installation applied to pipeline segments "readied for service after March 12, 1971." The Missouri Public Service Commission (Commission) adopted 49 CFR part 192 after it was issued by DOT-OPS. Subpart F, titled *Joining of Materials Other Than by Welding*, contained §§192.271 through 192.281. In §192.273 titled *General*, paragraphs (a), (b) and (c) stated:

> (a) The pipeline must be designed and installed so that each joint will sustain the longitudinal pullout or thrust forces caused by contraction or expansion of the piping or by anticipated external or internal loading.
>
> (b) Each joint must be made in accordance with written procedures that have been proved by test or experience to produce strong gastight joints.
>
> (c) Each joint must be inspected to insure compliance with this subpart.

In §192.281 titled *Plastic Pipe,* paragraph (e) stated:

> (e) *Mechanical joints.* Each compression type mechanical joint on plastic pipe must comply with the following:
>
> (1) The gasket material in the coupling must be compatible with the plastic.
>
> (2) A rigid internal tubular stiffener, other than a split tubular stiffener, must be used in conjunction with the coupling.

A revision in January 1, 1980, added §192.285 requiring qualification of persons making plastic joints:

§192.285 Plastic pipe: Qualifying persons to make joints.

(a) No person may make a joint in a plastic pipe unless that person has been qualified under the applicable joining procedure by:

(1) Appropriate training or experience in the use of the procedure; and

(2) Making a specimen joint from pipe sections joined according to the procedure, that is-

(i) Visually examined and found to have the same appearance as a joint or photographs of a joint that is acceptable under the procedure; and

(ii) In the case of heat fusion, solvent cement, or adhesive joint, ...

(b) No person determined to have made three or more unacceptable joints under an applicable joining procedure within any 12-month period may be considered qualified under that procedure in accordance with paragraph (a) of this section until that person has been requalified under paragraph (a)(2) of this section.

(c) Each operator shall establish a method to determine that each person making joints in plastic pipelines in his system is qualified in accordance with this section.

Regulations from July 1, 1980 to December 15, 1989

A revision in July 1, 1980, added a requirement to §192.283(b)(4) that procedures for mechanical joints less than 4 inches in diameter produce joints that withstand greater tensile force than the body of the pipe:

§192.283 Plastic pipe: Qualifying joining procedures.

(b) *Mechanical joints.* Before any written procedure established under §192.273(b) is used for making mechanical plastic pipe joints that are designed to withstand tensile forces, the procedure must be qualified by subjecting 5 specimen joints made according to the procedure to the following tensile test:

…

(4) Pipe specimens less than 4 inches in diameter are qualified if the pipe yields to an elongation of no less than 25 percent or failure initiates outside the joint area.

Ameren Compliance with Plastic Pipe Joining Regulations

If the ½-inch compression coupling was installed after July 1, 1980, the coupling and its joining procedure would have been required to produce a joint that could withstand more longitudinal pullout force than the tensile strength of the ½-inch PE pipe. If the ½-inch compression coupling was installed before July 1, 1980, the coupling would have been required to sustain the longitudinal pullout or thrust forces caused by contraction or expansion of the piping or by anticipated external or internal loading (which could be less than the tensile strength of the ½-inch PE pipe). The ½-

inch compression coupling had an internal stiffener and compression components, so it had an unknown amount of pullout resistance if properly joined. Due to the missing installation record for this service line, it is unknown whether the service line was installed before or after July 1, 1980. Since the manufacturer and model of the compression coupling is also unknown, it is unknown if the compression coupling was designed to withstand more longitudinal pullout force than the tensile strength of the ½-inch PE pipe.

As discussed in the *Service Line Failure* section of this report, it is not known if the ½-inch PE pipe was inserted to the proper depth within the ½-inch compression coupling. It also is not known if the service line was installed after January of 1980 when the joiner would have been required to be trained and qualified to make the compression coupling joint.

Conclusions:

The service line failure in this incident occurred when the ½-inch PE pipe pulled out of a ½-inch compression coupling without deformation to the ½-inch PE pipe, so that compression coupling and its joining procedure would not have met the joining regulations if installed after July 1, 1980. If installed prior to July 1, 1980, the anticipated longitudinal pullout forces at the time of installation are unknown so it is not clear if the joining regulations were met. Without knowing the coupling manufacturer/model and installation date, or whether it was correctly joined, Staff is unable to make conclusions about whether the joining regulations were met for this compression coupling joint that failed.

F. Regulations for Service Line Records

Analysis:

On August 19, 1970, DOT-OPS promulgated 49 CFR part 192 and it was later adopted by the Commission. The regulation at §192.13(a) required that:

> "No person may operate a segment of pipeline that is readied for service after March 12, 1971, unless that pipeline has been designed, installed, constructed, initially inspected, and initially tested in accordance with this part."

There were no specific requirements related to recordkeeping or record retention associated with this regulation.[10]

On December 15, 1989, the Commission added a requirement in 4 CSR 240-40.030(10)(I)2. that a record of the service line pressure test must be made and retained for the life of the service line. The original service line installation record for the ½-inch black PE service line at 3404 Georgia Street that would have included the pressure test record is currently missing. However, Ameren does have a record of the pressure test of this service line when in was transferred to the 8-inch PE main in 2003. This pressure test in 2003 is the most recent pressure test and the one that is pertinent to the service line at the time of the incident.

Conclusions:

The missing installation record for the original service line is not a violation of a regulation. Ameren had a pressure test for the service line as installed at the time of the

[10] Current regulations at 4 CSR 240-40.030 (17)(D)1.E. require the DIMP to contain procedures that provide for the capture and retention of data on any new pipeline installed to at least include the location where the new pipeline is installed and the material of which it is constructed.

incident, so the missing pressure test record for the original installation did not contribute to the incident.

G. Regulations for Emergency Response and Fire Extinguishers

Analysis:

At the time of the incident, Ameren was required to have an emergency plan as required by 4 CSR 240-40.030(12)(J) with a written procedure for responding promptly and effectively to notice of a fire located near or directly involving a pipeline facility. Ameren has submitted its emergency plan to Staff as required by 4 CSR 240-40.030(1)(J). Staff reviewed Ameren's actions in light of its written emergency plan and the work that the Ameren gas service worker was assigned to perform, and did not find any violations.

Fire extinguishers are assigned to Ameren gas service workers for use when responding to a natural gas fire. Ameren is also required by 4 CSR 240-40.030(13)(X) to provide a fire extinguisher when a hazardous amount of gas is being vented into open air during maintenance of pipeline facilities. Ameren was not intentionally venting a hazardous amount of gas when performing maintenance on the meter set; however, gas was unintentionally released as a result of the underground leak.

Conclusion:

Staff found no violation of Commission regulations.

III. STAFF RECOMMENDATIONS

1) Staff recommends that Ameren take actions to ensure that working fire extinguishers are available for its personnel to use in an emergency response to natural gas fires. Ameren has begun a process of changing to pressurized fire extinguishers and arranging

maintenance services for these fire extinguishers.[11] Ameren anticipates having a qualified maintenance services contractor in place by June 30, 2017, and will implement the change when this contractor is in place.

Staff accepts this plan of action by Ameren and recommends that Ameren notify Staff when the maintenance services contractor is in place and the change to pressurized fire extinguishers is implemented.

2) Staff recommends that Ameren determine the extent of missing service line records and information, and implement a plan to gain this information going forward as required by DIMP regulations. This should include but not be limited to the installed locations of service lines with missing records so that such lines can be found quickly in emergency situations.

3) Staff recommends that Ameren continue to track and evaluate the relative risk of compression coupling failures in the Ameren DIMP. This includes but is not limited to:

a. Periodic re-evaluation of all identified threats and risks (including compression coupling failures) on its Missouri pipeline system at intervals not exceeding 5 years,
b. Annual monitoring of the number of occurrences of compression coupling failures and comparison of this to the established baseline, and
c. Annual consideration based on monitoring and comparison to the established baseline if additional measures are needed to reduce the risk from failures of compression couplings.

[11] As discussed in the *Ameren Fire Extinguishers* section of Appendix A, Ameren has reviewed its fire extinguisher protocol, decided to change to pressurized fire extinguishers, obtained an adequate supply of pressurized fire extinguishers, and started the process for maintenance services.

APPENDIX A

Discussion of Facts and Staff's Investigation

NOTE: The information presented in Appendix A was obtained through Staff's investigation, records/reports of Ameren Missouri, and records/reports of other entities.

A. The Incident

At approximately 2:40 p.m. CST on November 27, 2015, a natural gas fire occurred outside of and near to the El Carnaval Restaurant at 3404 Georgia Street in Louisiana, Missouri. This natural gas fire resulted in a subsequent structure fire.

B. Personal Injuries

An Ameren gas service worker was standing about eight feet from the outside natural gas fire at the time of ignition. The service worker was not injured and reported no physical effects such as burns or singed hair. The service worker made contact with the restaurant owner soon after the natural gas fire ignition, and then the owner and other occupants evacuated the restaurant to a safe location.

C. Property Damage

The restaurant building at 3404 Georgia St. was destroyed as a result of the natural gas fire and subsequent structure fire. The Ameren service worker's truck was parked next to the building and sustained some water damage in addition to getting covered by soot. The Ameren natural gas meter was aluminum and melted during the fire, and the other aboveground meter set piping sustained scorching and heat exposure.

D. Site Description

Louisiana, Missouri is bounded by Highway 54 on the west and north, and the Mississippi River on the northeast. Georgia Street is a primary arterial street that runs along

the southeast side of town from the southwest end to the downtown area at the northeast end. The 3400 block of Georgia St. is in a commercial area in the southwest part of Louisiana. Appendix B, Figure 1 shows the approximate location of 3404 Georgia St. in Louisiana, Missouri. The structure at 3404 Georgia St. was located on the southeast side of Georgia St., with the front of the structure facing northwest. Appendix B, Figure 2 presents a sketch of the site location prior to the incident.

The business at 3404 Georgia St. was a single-story building of wood-frame construction with both asphalt-shingled and metal-covered roofs and was the El Carnaval Restaurant at the time of the incident[12]. Additions had been made to the building over time. The original structure had become the northeast part of the building that existed at the time of the incident and that portion was built over a basement. The southwest part of the building was an addition to the original structure and was built on a concrete slab. Later there was another, small addition on the southwest side of the building for a take-out window.

The area surrounding 3404 Georgia St. is zoned primarily for multiple-family residences and neighborhood commercial properties. In addition, Louisiana R-2 High School is located nearby at 3321 Georgia St.[13]

E. Meteorological Data and Conditions

On Thursday, November 26, 2015, the sky was overcast for most of the day. The temperature was in the mid-50s degrees Fahrenheit (°F) to high-60s °F and 0.15 inches of

[12] The Investigation Report from the Missouri State Fire Marshal's Office states: "The structure had been the location of numerous businesses over the years including different types of restaurants" and in the field interviews section, the business owner "advised that he had opened the restaurant in May of this year [(2015)]." (See Appendix D)

[13] The high school was not affected by the incident.

precipitation was recorded by the Pittsfield Penstone Municipal Airport (Pittsfield, Illinois is 20 miles northeast of Louisiana, Missouri).

On Friday, November 27, 2015, the day was overcast with periods of rain throughout. The temperature steadily dropped from 58 °F at 12:15 a.m. to 38 °F at 2:35 p.m., just prior to the time of the incident. The wind was blowing south-southeast at approximately 14 mph. Pittsfield Penstone Municipal Airport reported 1.09 inches of precipitation.

F. Natural Gas System

Natural gas service in Louisiana, Missouri is provided by Ameren Missouri. An 8-inch diameter PE natural gas main is located along the southeast edge of Georgia St. from 3404 Georgia St. to the northeast. The 8-inch diameter PE main reduces to 6-inch diameter PE main at 3404 Georgia St. and the 6-inch main continues to the southwest along Georgia St. These PE mains were installed during a cast iron main replacement project in 2003 and are part of a high-pressure distribution system with a maximum allowable operating pressure (MAOP) of 40 psig. At the time of the incident, the distribution system was operating at a pressure of approximately 29 psig.

Natural gas was delivered to 3404 Georgia St. through a PE service line consisting of different segments. The first segment was a short length of ½-inch CTS[14] yellow PE that was installed at the time of the main installation in 2003 to connect the new 8-inch main to the existing PE service line. The second segment of service line was ¾-inch IPS[15] black PE pipe and extended from the yellow PE segment at the main to a location under the southwest

[14] CTS is the abbreviation for copper tube size. Since all of the ½-inch PE pipe discussed in this report is CTS, this qualifier is only used in this report section.

[15] IPS is the abbreviation for iron pipe size.

building wall. Most of the second segment was inserted through two sections of steel casing pipe (likely this steel casing pipe was a previous, abandoned steel service line). The third segment of service line was a short piece of black PE pipe that reduced from ¾-inch IPS to ½-inch CTS and was joined to the second and fourth segments with compression couplings. The fourth segment of service line was ½-inch CTS black PE pipe that was joined to the fifth segment by a compression coupling. The fifth segment of service line was the prefabricated riser that started with ½-inch CTS black PE pipe below ground that was inserted in a pre-bent steel casing to the aboveground pipe end. The prefabricated riser extended aboveground to the outside meter set located next to the southwest wall of the building. Appendix B, Figure 3 shows the sections of the service line installed close to the building. Ameren has a record for the 2003 transfer of the service line from a cast iron main to the 8-inch PE main, which documents that the entire service line was pressure tested at 100 psig for 15 minutes on March 24, 2003. The installation date(s) of the older black PE remainder of the service line to 3404 Georgia St. is unknown as it was replaced prior to the main replacement project and the service card for this installation is missing.

In response to a Staff survey in 1997, Union Electric (Ameren Missouri's predecessor) indicated that Missouri Edison (predecessor to Union Electric in Louisiana) installed Phillips® high-density black PE pipe from the mid-1970s through 1984. Union Electric began purchasing medium-density yellow PE pipe system-wide in 1985. Ameren confirmed this information was still correct to the best of its knowledge and added that installation of black PE pipe could have continued from storeroom stock into 1985 through 1986.

Ameren did not have an explanation for why steel casings were used with this service line or for the unusual aspects of this service line such as using two diameters, having two ½-

inch couplings installed in the ½-inch portion of the service line to the service riser instead of one coupling, and extending the service line past the meter set and beneath the building before looping back to the meter set.

The aboveground meter set consisted of a quarter-turn service line valve with a lockwing (hereafter referred to as the gas riser valve), a service regulator, and a gas meter connected by pipe fittings (See Appendix C, Photograph 1). The service regulator reduces the natural gas pressure from the distribution system pressure in the service line to the customer delivery pressure of approximately 0.25 psig.

G. Prior Leakage Surveys, Active Leaks, and Prior Excavations

Ameren conducts leakage surveys of the gas distribution mains and service lines in Louisiana every third year. The previous leakage surveys for the entire town of Louisiana were conducted from April 22, 2014 to June 2, 2014. The leakage survey in the area including 3404 Georgia St. was conducted on May 21, 2014, and no leaks were discovered within the 3400 block of Georgia St. At the time of the incident, Ameren had no active leaks in the 3400 block of Georgia St.

In the twelve months prior to the incident, Ameren received no notifications of intent to excavate at 3404 Georgia St.

H. Odorization

The records of odor intensity tests performed by Ameren in the Louisiana distribution system demonstrated that the natural gas was readily detectable at a gas-in-air concentration

of approximately 0.25 percent gas-in-air[16] during the month prior to the incident. On November 28, 2015, Ameren performed odorant intensity tests at 3328 Georgia St. and 3428 Georgia St. that found gas to be readily detectable at a concentration of 0.25 percent gas-in-air.

I. Ameren Notification and Actions

Friday, November 27, 2015 was a work day for Ameren (Thursday, November 26, 2015 was the Thanksgiving holiday). At 1:09 p.m. on November 27, 2015, an Ameren call center representative received a call regarding an outside gas odor. An Ameren gas service worker was dispatched to 3404 Georgia St. at 1:12 p.m. and arrived at 1:19 p.m. The service worker began his investigation by placing bar holes[17] at 2 feet and 5 feet in front of the gas service riser to the meter set. He checked these bar holes with his combustible gas indicator (CGI) and found no sustained readings; however, he did have an initial unsustained reading of 2% of the Lower Explosive Limit (LEL)[18] in the bar hole located 2 feet from the riser. He also used his CGI to measure gas-in-air concentrations along cracks in the pavement in the vicinity of the gas service riser and along the adjacent building wall and found no gas. He soaped the meter set and found 3 to 4 leaks on pipe fitting threads. He then shut off the meter and went to get pipe fittings.

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[16] Based upon a lower explosive limit (LEL) at 4.5 percent gas-in-air, MoPSC regulation 4 CSR 240-40.030(12)(P)1. requires the odorant in natural gas to be readily detectable at a concentration of less than 0.90 percent gas-in-air.

[17] A bar hole is a hole that is made in soil or paving for the specific purpose of testing the subsurface gas-in-air concentration.

[18] LEL is an abbreviation for Lower Explosive Limit, which is 4.5% gas-in-air for typical pipeline natural gas. In this case, 2% LEL equates to 0.09% gas-in-air or 900 ppm (parts per million).

According to Ameren's account of the events leading up to the incident, the service worker returned with the pipe fittings and parked near the meter set. He used pipe wrenches to disassemble the meter set and then rebuilt the meter set using two new pipe fittings (See Appendix C, Photograph 1). He turned on the flow of gas to the meter, soaped the repaired meter set, and documented that the repaired meter set had no leaks. He performed a low flow test[19] of the meter and then soaped the meter connections, which had no leaks. He was facing the building and meter set about 8 feet away when a flash occurred in front of him.

According to Ameren's account of the incident, the fire started at approximately 2:40 p.m. and was along the ground and side of the building. After getting the fire extinguisher from his truck, the service worker hit the plunger to charge the fire extinguisher but it did not work. Contact was made with the restaurant owner and the restaurant was evacuated. An attempt was made to use the restaurant's fire extinguisher but the Ameren service worker stated that the fire had become too large to extinguish.

The service worker notified his supervisor of the fire at 2:57 p.m. and requested additional help. Ameren received notification from the Louisiana Fire Department at 3:06 p.m.

An Ameren supervisor arrived at 3:31 p.m. and a crew arrived at 4:10 p.m. Due to the location of the fire at the meter set area, the gas riser valve could not be accessed to turn it off. Leak checks were made around the property border of 3404 Georgia St. and the strip mall next door. No gas was detected during initial checks or during continued monitoring. Emergency valves on the main were located, but were not used because the fire at 3404

[19] Performing a low flow test is part of Ameren's procedure for reestablishing service to existing customers following a gas turn off. It consists of allowing a small amount (low flow) of gas to flow through the meter to ensure that the meter test hand will register flow prior to performing a leak test of customer piping.

Georgia St. had spread and involved the entire structure. The crew had difficulty locating the service line. The service line was not in the initial excavation made near the street. The fire department had the fire under control and assisted the crew's removal of debris at the meter set location. An excavation made at the service riser filled with water and bubbles were noted. As the excavation continued to expose the riser and service line piping, a leak was discovered at a ½-inch compression coupling. A squeeze-off tool was used to stop the flow of gas through the service line at approximately 9:15 p.m.

Further excavation found the end of a steel casing which was used to locate the service line towards the street. An excavation was made in the parking lot away from the building and the service line was capped. When the service line at the building was removed from the excavation, the piping was separated at the compression coupling that had been leaking. The removed piping was taken to the Ameren office in Louisiana.

J. MoPSC Reporting Requirements

The incident reporting requirements in 4 CSR 240-40.020(3), (4) and (5) were completed as follows:

1. Ameren made the initial telephone notification of a possible natural gas incident to a Staff member at approximately 4:13 p.m. on November 27, 2015.[20]
2. Ameren notified the United States Department of Transportation-Pipeline and Hazardous Materials Safety Administration (DOT-PHMSA) of a natural gas incident at approximately 9:58 p.m. on November 27, 2015 (NRC Report Number 1073090).

[20] MoPSC regulation 4 CSR 240-40.020(4)(A) requires the operator to notify designated commission personnel by telephone within two hours following discovery, unless efforts to protect life and property would be hindered, for each event which meets the natural gas incident reporting requirements.

3. DOT-PHMSA form PHMSA F 7100.1 titled "Incident Report – Gas Distribution System" was completed by Ameren (dated December 27, 2015) and submitted electronically to Staff on December 29, 2015. Ameren also electronically submitted that initial report to PHMSA and has submitted supplemental reports to Staff and PHMSA.

K. Missouri Public Service Commission Staff Investigation

Date of Incident

Friday, November 27, 2015, was a State holiday following the Thanksgiving holiday on November 26, 2015. Staff did not travel to Louisiana on November 27, 2015, but was in contact with Ameren personnel throughout the evening getting updates over the phone. At approximately 9:53 p.m., Ameren personnel reported they had excavated the service line near the meter-set piping and found gas leaking from a coupling on the service line. At that time Ameren personnel and Staff thought the fire could be the result of gas leaking underground from the Ameren service line near the meter-set location. Staff determined that an on-site investigation should be conducted the following day.

Initial Incident Site Investigation

On Saturday November 28, 2015, a Staff member arrived at approximately 2:00 p.m. and conducted an on-site investigation with several Ameren personnel and the restaurant owner. The restaurant owner and an employee confirmed that they did not smell gas inside and there was no fire inside before the outside fire.

Staff observed the extensive building damage (See Appendix C, Photograph 2). Staff proceeded to Ameren's office in Louisiana and examined the service line piping and riser that had been removed from outside the restaurant the day before. An attempt was made to

configure the piping at the office similar to how it was configured at the restaurant (See Appendix C, Photograph 3). The piping and riser were secured by Ameren personnel for future laboratory examination.

Follow-up Incident Site Investigation (December 15, 2015)

Ameren had made an excavation in the parking lot on November 27, 2015 to locate and squeeze off the service line. Staff was not present when the excavation was made, but observed the location during this follow-up investigation. The service line was 26 inches deep near the building as measured at the end of the steel casing pipe. The PE service line piping was ¾-inch IPS diameter inside the casing. The PE service line between parking lot excavation and the building excavation was tested with air at 30 psig and there were no leaks.

Staff went to Ameren's office in Louisiana to conduct checks on the gas detector used by the gas service worker on November 27, 2015. The Fire Department had sprayed water on the service worker's truck to minimize fire damage and the gas detector had been submerged in water. The gas detector was checked using 2.5% gas and 100% gas and it was still able to register natural gas readings.

Two Ameren supervisors who were present on-site when Ameren excavated the service line stated that when the service line was excavated at the meter, the hole was filled with water. The service line near the meter riser was under water and the gas was "bubbling" in the water.

Scientific Expert Analysis (SEA) Laboratory Testing (February 18, 2016)

The service line portion that had been secured from the incident site included service line segments upstream and downstream of the separated compression coupling. "As received" observations, photographs and measurements were made. No manufacturer print

lines were visible on the plastic pipe. The service regulator and metal piping past the gas riser valve were removed to facilitate a water bath leak test. Both service line segments were subjected to a water bath leak test at an air pressure of 4.5 psig and no leaks were observed.

Both of the ½-inch compression couplings were measured and labeled, and the PE pipes were taped at each end of the coupling (there is a compression nut at each end). The couplings were disassembled and the components were observed and measured. The interior of the PE pipes were observed and interior marks (discoloration lines) were noted that corresponded to the ends of the inserted metal stiffeners.

Two pages of examination notes from the SEA Lab report are attached (See Appendix B, Figures 4 and 5) and measurements are tabulated on the second page. The first column is labeled "Pipe End Inspection" and provides the designation for each pipe end that was inspected. Pipe end "1B" is where the pipe had separated from the coupling, so there was no coupling end to mark. Pipe end "E2A (exemplar)" involved the reassembly of coupling end 2A with the metal stiffener fully inserted in a new pipe end until the first hard resistance, in order to have an example joint for comparison of the measurements. The second column is labeled "Dist. to Nut Marking Tape" and provides the distance from the pipe end to the marking tape that was placed on the pipe at the end of the coupling. The third column is labeled "Dist. To ID Marks" and provides the distance from the pipe end to mark on the interior of the pipe.

For coupling 1 and the PE pipe end that was still joined, the metal stiffener had been fully inserted 1.2 inches into the PE pipe end (which was similar to the exemplar distance of 1.1 inches). For the pipe end that had separated from the coupling 1, the metal stiffener had only been inserted 0.6 inches into the PE pipe end. This meant that the metal stiffener was

not fully inserted into the PE pipe as intended, and less than the intended length of PE pipe was inside the compression nut gasket. For coupling 2 that was still joined at each end, the results showed that metal stiffeners had been inserted 1.0 and 0.85 inches in the PE pipe ends (which approached the exemplar distance of 1.1 inches).

Follow-up Incident Site Investigation (March 22, 2016)

Staff observed Ameren personnel excavate and cap the service line at the main. The PE service line was pulled out of the steel casing end nearest to the main and there was no visible printline[21] on the black PE service line.

Missouri State Fire Marshal's Office Report and Open Gas Riser Issue

Staff learned that an investigator from the Missouri State Fire Marshal's Office traveled to Louisiana on November 27, 2015, arriving at 6:20 p.m. to conduct an investigation. Staff requested and received a copy of the Investigation Report and accompanying photographs of the scene. Staff has obtained permission to use the report and photographs in its incident report. A copy of the Investigation Report (with personal information pages removed and personal identity information redacted) is attached in Appendix D. In addition to the fire scene examination, this report includes fire department information and interviews of the Ameren gas service worker and the business owner on November 27.

Staff reviewed the report and photographs and discussed with the investigator. In photographs taken during the investigation by the State Fire Marshal's Office, the gas riser valve was in the open position in the midst of the fire scene debris (See Appendix C,

[21] PE pipe used in natural gas mains and service lines must be marked by the manufacturer in accordance with ASTM D2513.

Photograph 4). Based on this photographic evidence and information provided by Ameren, this gas riser valve remained open during and following the fire, was open during the State Fire Marshal Office's investigation, and was not closed until later work by Ameren. The piping above the open gas riser valve was open to the atmosphere after the gas meter melted.

Based on verbal discussion with the Louisiana Fire Chief, the Louisiana Fire Chief noted that upon his arrival there was a large natural gas fire along the building wall near the meter location. The Louisiana fire department sprayed water on the roof above the gas fire for a period of time, and then observed that suddenly the gas fire went out on its own. Since the flow of gas from the main to the service line had not yet been squeezed off, and since the gas riser valve was open at this time, it was unclear why the flow of gas would have stopped escaping from the open gas pipe or why the fire would have gone out on its own. Ameren confirmed that the gas was not escaping from the open pipe up through the time when the gas riser valve was later turned off, and had no explanation for why fire would have gone out without closing this valve.

One possible explanation as to why the flow of gas would have stopped prior to squeezing off the service line would be that something had physically blocked the inside of the pipe (e.g. debris or melted materials). To rule out the possibility of a blockage in the piping or riser due to debris or melted PE pipe, a second laboratory test was conducted to determine if air could flow through the pipe from the compression coupling through the riser pipe and up though the open pipe end.

Second SEA Laboratory Testing (October 7, 2016)

Air was introduced at the upstream end of three service line segments at a low pressure (about 2 to 3 psig) and allowed to flow in the downstream direction through each

segment. The first segment was the PE service line segment that had been connected on the upstream side of the separated compression coupling. The second segment started at the downstream side of the separated compression coupling and ended at the gas riser valve. The third segment was the piping from the gas riser valve to the inlet meter swivel and included the service regulator. Air was able to flow through each of these three segments and exit from the downstream end of each segment.

The spring housing cap on the service regulator had been melted so the spring housing was open to the atmosphere. During the flow test of the segment containing the service regulator, a check to see if air was also flowing out of the spring housing found that air was exiting through the open end of the spring housing. This indicated that fire damage was allowing some leakage past the regulator diaphragm.

Compression Coupling

The manufacturer label and lettering on the compression couplings was no longer legible. Staff has compared the partial label markings on one of these couplings to label markings on a Continental® compression coupling photographed in the Incident Report filed in Case No. GS-2004-0264 – this fitting had also been buried for a long time and Staff finds a close resemblance in the label type and color. Staff also has a Continental® compression coupling from 1989 with a factory label and there is a match with a couple of the letters on the labels. Further, the coupling design, material and components are a match. Ameren confirmed that Continental® was a common manufacturer of this type of coupling used in its system.

Ameren Fire Extinguishers

Fire extinguishers are assigned to Ameren gas service workers for use when responding to a natural gas fire. At the time of the incident, these fire extinguishers had CO_2 gas cartridges that would be activated at time of use to charge the extinguisher and allow the dry-chemical powder to be expelled through the hose and nozzle. The fire extinguisher that was to be used to put out this natural gas fire did not expel powder when squeezing the discharge handle. A later examination of this fire extinguisher found the CO_2 gas cartridge had been punctured and was empty, and powder was still inside the extinguisher. The examination found no evidence to support that the extinguisher failed mechanically, so it was inconclusive why the fire extinguisher failed to function during the incident.

Ameren met with the fire extinguisher service provider, reviewed records, and performed a field visit to the contractor's premises on May 20, 2016 to enhance communications regarding the service and maintenance processes. Ameren then performed an audit of assigned fire extinguishers and no anomalies were reported. Later in 2016, Ameren made plans to switch from cartridge-operated fire extinguishers that were factory-equipped with a stem indicator to pressurized fire extinguishers that are factory equipped with a full-face dial indicator. The full-face dial indicator will provide rapid visual assurance, better helping an employee discern the status of an extinguisher’s readiness condition. After completing the switch to pressurized fire extinguishers, Ameren will discontinue allowing employees to perform field maintenance of fire extinguishers. Only the qualified fire extinguisher service contractor will perform maintenance. On March 10, 2017, Ameren responded to a Staff data request that it has obtained an adequate supply of pressurized fire extinguishers for continuous use in all gas operating centers in Missouri and is in the process

of issuing a purchase order for maintenance services that will include required inspections, tests, and servicing of discharged extinguishers to maintain an adequate supply. Ameren anticipates having the maintenance services contractor in place by June 30, 2017.

Ameren's Distribution Integrity Management Program

Consistent with federal pipeline safety regulations, Missouri pipeline safety regulations require operators of natural gas distribution systems to implement a Distribution Integrity Management Program.[22] The DIMP is required to address certain elements,[23] including *Knowledge*; *Identify threats*; *Evaluate and rank risk*; *Identify and implement measures to address risk*; *Measure performance, monitor results, and evaluate effectiveness*; and *Periodic evaluation and improvement.* Ameren timely submitted its initial DIMP Plan[24] to Staff. Staff performed a DIMP inspection on this initial plan in September of 2012. The requirements to report mechanical fitting failures began with reporting mechanical fitting failures that occurred in 2011;[25] therefore, little information was available related to this threat at the time of the initial DIMP Plan development or Staff's first DIMP inspection of Ameren.

DIMP regulations require periodic evaluation and improvement, with a maximum frequency of review not to exceed five years. In response to this requirement, Ameren revised its DIMP Plan (effective 08/02/2016) and has provided Staff with a copy. The revised DIMP

[22] 4 CSR 240-40.030(17) and 49 CFR 192 Subpart P

[23] 4 CSR 240-40.030(17)(D)

[24] The requirement for initial development and implementation of a written DIMP was August 2, 2011.

[25] 4 CSR 240-40.020(7) and 49 CFR 191.12

Plan includes consideration of the threat of mechanical coupling failures based on analysis of mechanical fitting failure data collected and reported since 2011.

One element of a DIMP program is that the operator must identify additional information needed on its system and provide a plan for gaining that information over time through normal activities conducted on the pipeline. As explained above, Ameren is missing installation records for the older service lines in the Louisiana area and has limited information about the compression couplings and compression fittings that were used to make joints in these service lines.

APPENDIX B

Figures

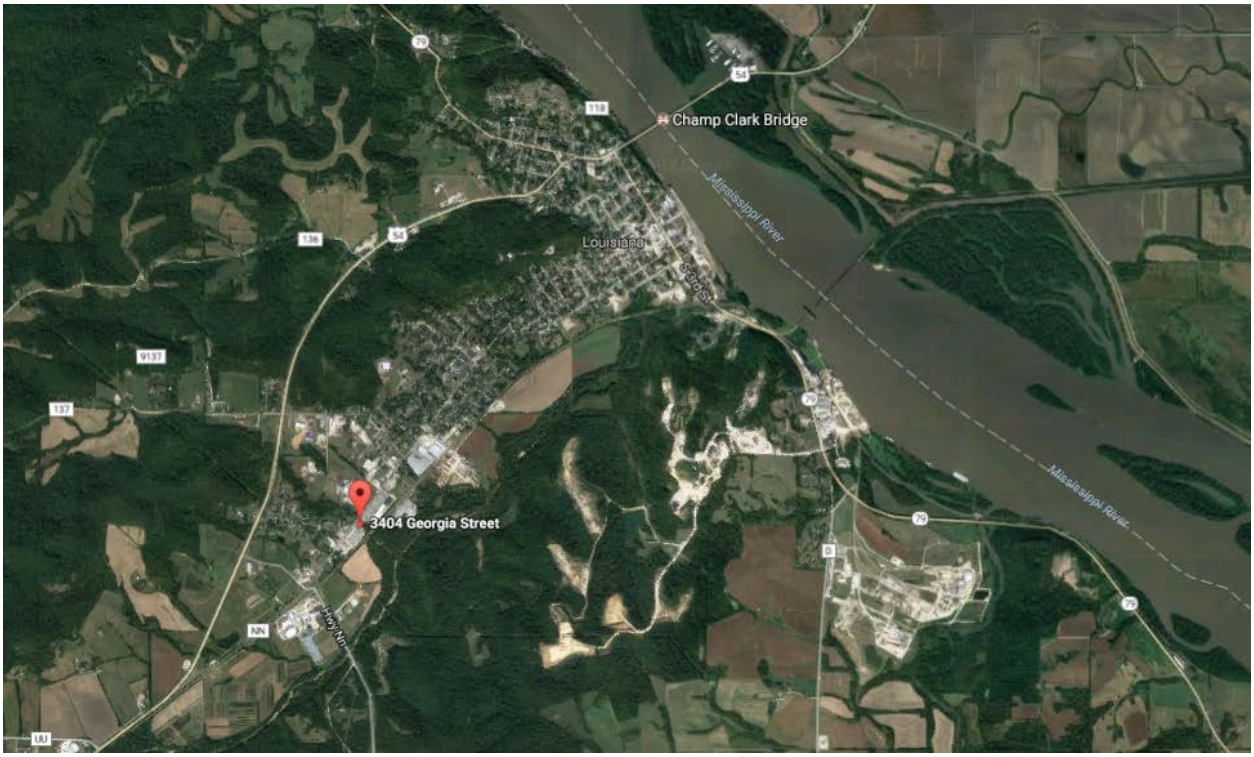


Figure 1: Approximate Location of 3404 Georgia Street, Louisiana Missouri (Source: Google Maps)

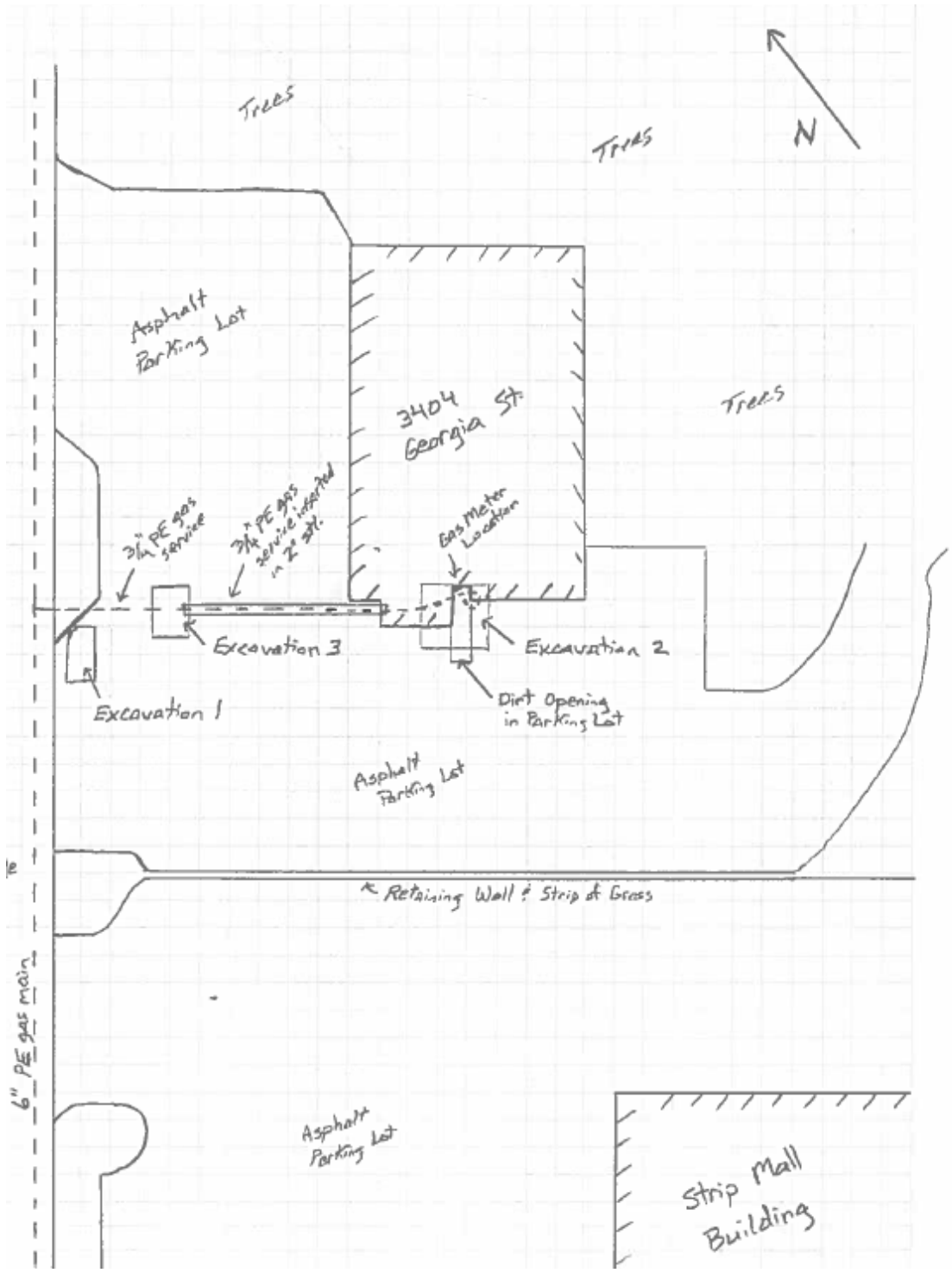


Figure 2: Ameren's sketch of 3404 Georgia Street Plan View. The areas labeled "Excavation 1", "Excavation 2" and "Excavation 3" refer to excavations Ameren made subsequent to the incident. (Source: GS-2016-0159, Ameren's response to Staff data request 0001). Note this sketch does not show the 6-inch to 8-inch transition on the main. At the location where the 3/4-inch PE gas service line connects to the main, the main is 8-inch.

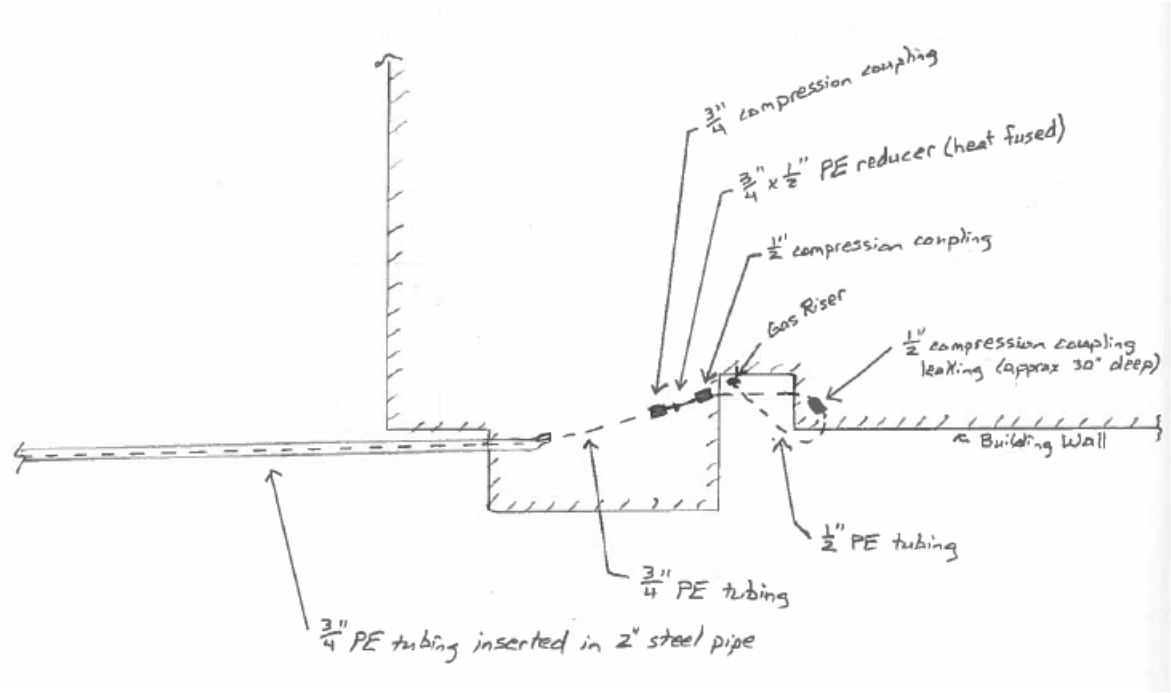


Figure 3: Ameren's sketch of the portion of service line to 3404 Georgia Street nearest the building. (Source: GS-2016-0159, Ameren's response to Staff data request 0001).

S-E-A
Scientific Expert Analysis

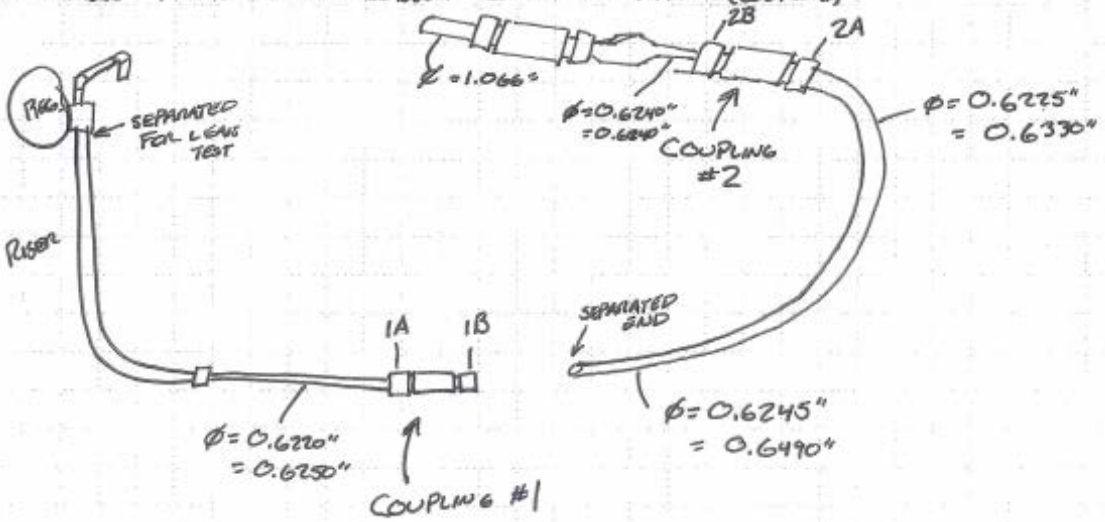
LAB EXAM
- SEA STL

311924

FOREST
2/18/2016

ARTIFACTS EXAMINED
- RISER & B/G PIPE SECTION
- SEPARATED B/G PIPE SECTION
- MISC ARTIFACTS (PIPE SLEEVE & FIELD CUT END OF PIPE FROM PRIOR EXAM)

NO VISIBLE MARKINGS ON SUBJECT COMPRESSION FITTINGS (COUPLING)



AIR LEAK TEST IN WATER BATH @45 PSIG - NO LEAKS OBSERVED
- ENDS PLUGGED

COUPLING 1
L = 5.5925"
PIPE END

COUPLING 2
L = 5.543"

Figure 4: First Page of Excerpt from SEA Laboratory Report showing the parts of the service line delivered to the laboratory (Source: GS-2016-0159, Ameren's response to Staff data request 0027).

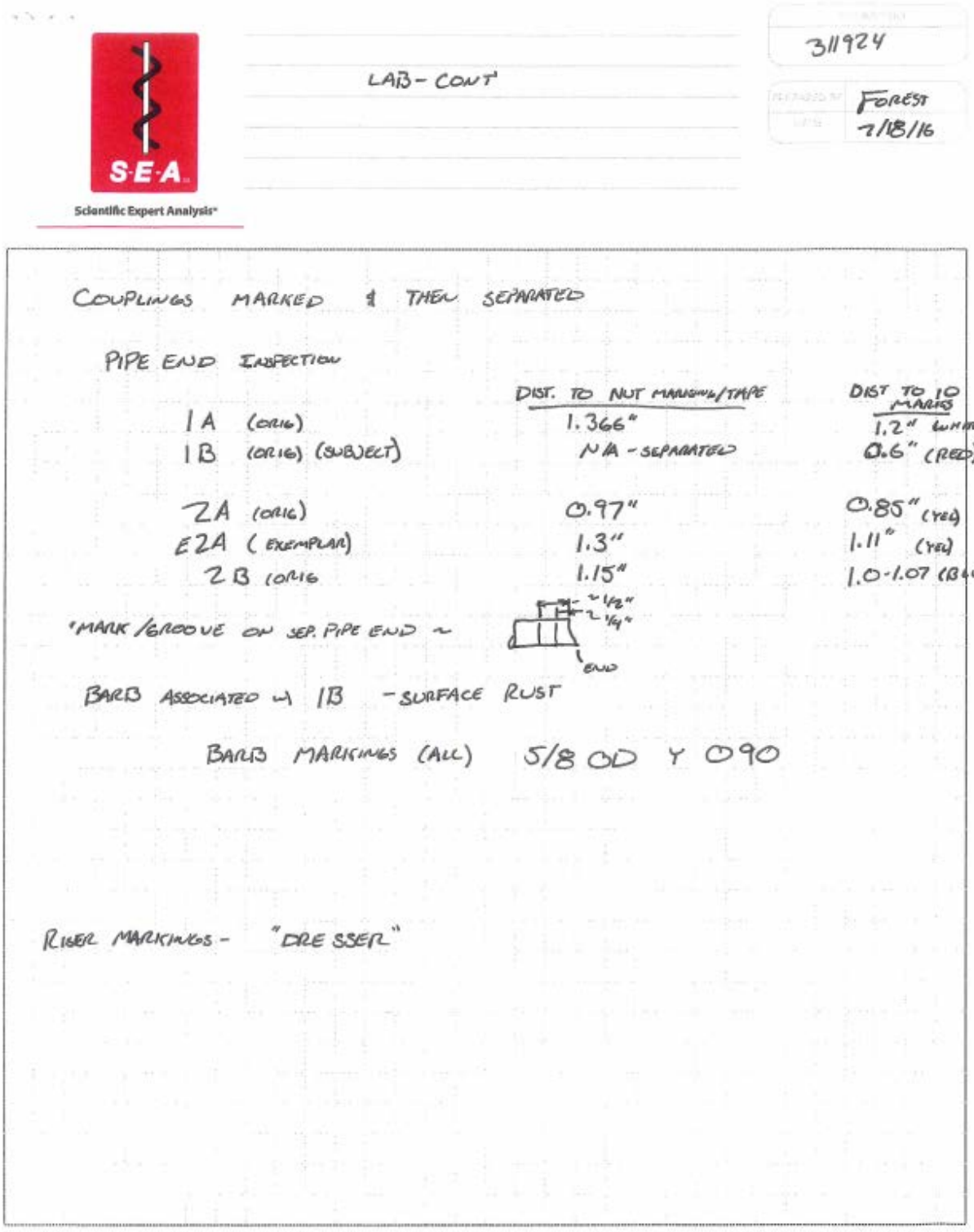


Figure 5: Second Page of Excerpt from SEA Laboratory Report showing measurements (Source: GS-2016-0159, Ameren's response to Staff data request 0027).

APPENDIX C

Photographs

Photograph 1: Photograph of Meter Set and Riser taken by Ameren Service Worker during repair of meter set leaks (Source: GS-2016-0159, Ameren's response to Staff data request 0029). Note the pipe wrench on the gas riser pipe and the soap solution on the fittings above the pipe wrench. Ameren indicated this picture is of the existing fittings prior to the repairs being completed (Source: GS-2016-0159, Ameren's response to Staff data request 0001.1).

Photograph 2: 3404 Georgia Street following incident, photograph taken from behind building looking towards the entrance from Georgia Street. (Source: Staff Photograph taken November 28, 2015).

Photograph 3: Removed section of service line from 3404 Georgia Street following incident (Source: Staff Photograph taken November 28, 2015).

Photograph 4: Photograph of Natural Gas Service Riser Showing Valve in Open Position (Source: Missouri State Fire Marshal's Office Investigation Photographs).

APPENDIX D

Investigation Report

Missouri State Fire Marshal's Office

NOTES:

1) The attached email provides written permission from the Deputy Chief for the PSC to use any part of the Investigation Report in publications or other forms of distribution. Redaction has been added by Staff to conceal personal identity items in the report and three pages with personal information have been removed. The final two pages of the report have also been removed – one was blank and the other was a signature page.

2) The attached email also provides written permission from the Deputy Chief to include, in Staff's report and investigation, any of the Fire Marshal's Office photographs taken in the course of this investigation. One of these photographs is included in Appendix C with the Missouri State Fire Marshal's Office noted as the source. See Appendix C, Photograph 4.

[redacted]

Sent: Wednesday, February 01, 2017 2:46 PM
To: Kottwitz, John
Subject: Report authorization

Mr. Kottwitz,

This is to authorize the use by the Missouri Public Service Commission of Missouri Division of Fire Safety investigation report #11-27-15-0343 concerning the investigation of a fire in Loulsiana, MO, as prepared by Investigator [redacted]

Any part of the report and photographs may be used by the PSC in publications or other forms of distribution.

Please contact me if your need further.

[redacted]
Deputy Chief
Investigations and Explosives Enforcement Unit
Missouri State Fire Marshal's Office
[redacted]

MISSOURI DIVISION OF FIRE SAFETY
OFFICE OF THE STATE FIRE MARSHAL
INVESTIGATION REPORT

Incident Type: Fire / Accidental
Result Type:
Agency Incident ID: 11-27-15-0343
BATS ID: i- 398604

Incident Date/Time/Location

Status
Investigation Closed

Jurisdiction
Primary

Start Date/Time
11/27/2015 14:51 Friday

Address - Street Address
3404 Georgia

City/State/Zip
LOUISIANA , MO 63353

County
PIKE

Investigator Information

Name	Phone	Email
[redacted]	[redacted]	[redacted]

Title
Investigator

Property Use or Target Information

Type	Subtype
Assembly	Restaurant / Cafeteria

Custom Agency Information

Report Status	Information Type
Unclassified	Non-Criminal

MISSOURI DIVISION OF FIRE SAFETY
OFFICE OF THE STATE FIRE MARSHAL
INVESTIGATION REPORT

Incident Type: Fire / Accidental
Result Type:
Agency Incident ID: 11-27-15-0343
BATS ID: i- 398604

Scene Details

Area of Origin/Device Placement

Area of Origin

Structural Areas

Fire Descriptors

Damage and Casualties

Est. Damage

$150000.00

Miscellaneous Information

Sky Conditions

Other

Wind Speed/Direction

11 MPH / SE

Temperature

38F

Humidity

96%

Latitude

39.432072

Longitude

-91.071842

Investigator Right of Entry

Exigent Circumstances

MISSOURI DIVISION OF FIRE SAFETY
OFFICE OF THE STATE FIRE MARSHAL
INVESTIGATION REPORT

Incident Type: Fire / Accidental
Result Type:
Agency Incident ID: 11-27-15-0343
BATS ID: i- 398604

Narrative(s)

Title	Author
Incident Report	[redacted]

Description

On 11-27-15 at approximately 16:25 hours, I was advised by the Louisiana Police Dispatch Center that the Louisiana Fire Department was on the scene of a commercial structure fire and was requesting an investigator.

I arrived on the scene at approximately 18:20 hours and met with Louisiana Fire Chief [redacted] and other members of the Louisiana Fire Department who had secured the scene until my arrival. There were several other fire departments assisting the Louisiana Fire Department with the suppression efforts.

Also on the scene were several employees of Ameren Missouri gas crew who were attempting to locate and shut off the gas service to the property.

MISSOURI DIVISION OF FIRE SAFETY
OFFICE OF THE STATE FIRE MARSHAL
INVESTIGATION REPORT

Incident Type: Fire / Accidental
Result Type:
Agency Incident ID: 11-27-15-0343
BATS ID: i- 398604

Title

Fire Scene Investigation

Author

[redacted]

Description

The scene was a single story wood frame structure with both asphalt shingled and metal covered roof, which housed a Mexican Restaurant. The structure had been the location of numerous businesses over the years including different types of restaurants. The front of the structure faced in a northern direction. Utilities in service at the time of the fire consisted of electricity and natural
gas service.

Exterior Examination

Exterior examination found the structure had been completely destroyed by the fire and fallen inward. A backhoe was being used by the fire department to move the piles of debris in order to extinguish the fire.

The entire roof and roof supports had been completely consumed by the fire. All of the exterior walls had been consumed by the fire. There was a small section of the southwest corner of the structure standing.

An Ameren Missouri service truck was observed parked next to the west end of the building. A section of the west wall had fallen outward against the truck. The truck sustained smoke damage.

A west wall of one of the walk-in coolers had fallen outward as well.

The natural gas service meter and risers were located in the northwest corner of the building near the Ameren Missouri truck. The meter sustained some fire damage. A strong smell of what is associated with natural gas was detected at this corner of the building.

Ameren Missouri representatives were then allowed to try and find the leak in order to get the flow of gas shut off. While digging in the area of the meter the hole would fill with muddy water. The water then started to bubble up and a strong odor of what is associated with natural gas was detected.

Further digging in the area of the parking lot and ground near the northwest corner of the building had to be done to find the leak. The leak appeared to be coming from a supply line that was under the ground near the corner of the building. Ameren employees were able to find the leak and crimp the line to stop the flow of the gas.

Incident Type: Fire / Accidental **Result Type:**

Agency Incident ID: 11-27-15-0343 **BATS ID: i-** 398604

Interior Examination

Interior examination found the scene had been completely destroyed by the fire and the demolition to get to the flames under the debris. A small section of an interior wall was observed standing in the northwest area of the structure.

Due to the interior collapse and smoldering debris no interior examination was able to be conducted.
Conclusion

Based on witnesses statements as well as the examination of the scene it appeared that a leak occurred in the natural gas piping running under the ground in the northwest corner of the building. The gas was able to migrate up through the ground where it reached an unknown ignition source and ignited the natural gas. The fire then spread throughout the building.

This fire is therefore classified as being accidental in nature.

MISSOURI DIVISION OF FIRE SAFETY
OFFICE OF THE STATE FIRE MARSHAL
INVESTIGATION REPORT

Incident Type: Fire / Accidental
Result Type:
Agency Incident ID: 11-27-15-0343
BATS ID: i- 398604

Title

Fire Department Information

Author

[redacted]

Description

On 11-27-15, while on the scene I spoke with Louisiana Fire Chief [redacted] as well as other members of the fire department including Lieutenant [redacted] who had attempted to enter the structure with a suppression crew in an effort to extinguish the fire.

Chief [redacted] stated that when they arrived the west end of the building was heavily involved in flames. The fire spread quickly throughout the structure. Due to the unsafe conditions they had to change to an exterior attack.

Lieutenant [redacted] advised that he took a crew inside the structure through the front door. As they were entering the structure the ceiling tiles started falling inward. He could see flames traveling throughout the void above the ceiling tile. Lieutenant [redacted] advised that due to the amount of fire traveling above the ceiling tile that it was not safe to be inside. They then exited the building and went into an exterior attack.

MISSOURI DIVISION OF FIRE SAFETY
OFFICE OF THE STATE FIRE MARSHAL
INVESTIGATION REPORT

Incident Type: Fire / Accidental
Result Type:
Agency Incident ID: 11-27-15-0343
BATS ID: i- 398604

Title

Field Interview of [redacted]

Author

[redacted]

Description

On 11-27-15, while at the scene I spoke with [redacted] service person with Ameren Missouri Gas crew. Bell stated that he was dispatched to the scene in reference to an outside gas leak at the business.

[redacted] stated that he smelled the gas and upon checking the meter and gas riser found some leaks. [redacted] said that he repaired the leaks and checked them again. [redacted] stated that the leaks he found and fixed were not leaking.

[redacted]advised that he was then going to go inside and relight the pilots on the gas appliances inside the business. [redacted] stated that as he stepped forward that he kicked a rock. [redacted] said that the next thing he knew there was fire all around the west side of the ground and building. [redacted] stated that it surprised him so much that he dropped the keys to his truck and was unable to find them. [redacted] stated that he also grabbed the fire extinguisher from his truck but that it did not work. He then got an extinguisher from the business but the fire was too big to get extinguished.

MISSOURI DIVISION OF FIRE SAFETY
OFFICE OF THE STATE FIRE MARSHAL
INVESTIGATION REPORT

Incident Type: Fire / Accidental
Result Type:
Agency Incident ID: 11-27-15-0343
BATS ID: i- 398604

Title

Field Interview of Business Owner

Author

[redacted]

Description

On 11-27-15 while on the scene I spoke with the owner, [redacted] in reference to the incident. [redacted] advised that when he arrived at the business that he smelled natural gas outside along the west side of the building. [redacted] stated that he called and reported the smell to the gas company.

[redacted] stated that he did not smell any gas inside the structure. [redacted] said that an employee of the gas company showed up to fix the leak.

[redacted] stated that he was inside the building when the fire started. [redacted] said that the fire was at the west end of the building.

[redacted] stated that he had not had anything worked on recently or had any problems with anything or anyone. [redacted] advised that he had opened the restaurant in May of this year.

BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI

In the Matter of Union Electric Company d/b/a Ameren Missouri Concerning a Natural Gas Incident At 3404 Georgia Street in Louisiana, Missouri	)))	Case No. GS-2016-0159

AFFIDAVIT OF JOHN D. KOTTWITZ

STATE OF MISSOURI)
) ss
COUNTY OF COLE)

COMES NOW John D. Kottwitz and on his oath states that he is of sound mind and lawful age; that he contributed to the foregoing *Staff's Gas Incident Report*; and that the same is true and correct according to his best knowledge and belief.

Further the Affiant sayeth not.

John D. Kottwitz

JURAT

Subscribed and sworn before me, a duly constituted and authorized Notary Public, in and for the County of Cole, State of Missouri, at my office in Jefferson City, on this 26th day of May, 2017.

Dianna L. Vaught
Notary Public

DIANNA L. VAUGHT
Notary Public - Notary Seal
State of Missouri
Commissioned for Cole County
My Commission Expires: June 28, 2019
Commission Number: 15207377

BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI

In the Matter of Union Electric Company d/b/a Ameren Missouri Concerning a Natural Gas Incident At 3404 Georgia Street in Louisiana, Missouri	)))	Case No. GS-2016-0159

AFFIDAVIT OF KATHLEEN A. MCNELIS

STATE OF MISSOURI)
) ss
COUNTY OF COLE)

COMES NOW Kathleen A. McNelis and on her oath states that she is of sound mind and lawful age; that she contributed to the foregoing *Staff's Gas Incident Report*; and that the same is true and correct according to her best knowledge and belief.

Further the Affiant sayeth not.

Kathleen A. McNelis

JURAT

Subscribed and sworn before me, a duly constituted and authorized Notary Public, in and for the County of Cole, State of Missouri, at my office in Jefferson City, on this 25th day of May, 2017.

Notary Public

DIANNA L. VAUGHT
Notary Public - Notary Seal
State of Missouri
Commissioned for Cole County
My Commission Expires: June 28, 2019
Commission Number: 15207377

BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI

In the Matter of Union Electric Company d/b/a Ameren Missouri Concerning a Natural Gas Incident At 3404 Georgia Street in Louisiana, Missouri	)))	Case No. GS-2016-0159

AFFIDAVIT OF EVAN P. NEUNER

STATE OF MISSOURI)
) ss
COUNTY OF COLE)

COMES NOW Evan P. Neuner and on his oath states that he is of sound mind and lawful age; that he contributed to the foregoing *Staff's Gas Incident Report*; and that the same is true and correct according to his best knowledge and belief.

Further the Affiant sayeth not.

Evan P. Neuner

JURAT

Subscribed and sworn before me, a duly constituted and authorized Notary Public, in and for the County of Cole, State of Missouri, at my office in Jefferson City, on this 30th day of May, 2017.

Dianna L. Vaught
Notary Public

DIANNA L. VAUGHT
Notary Public - Notary Seal
State of Missouri
Commissioned for Cole County
My Commission Expires: June 28, 2019
Commission Number: 15207377