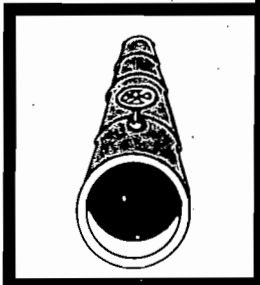
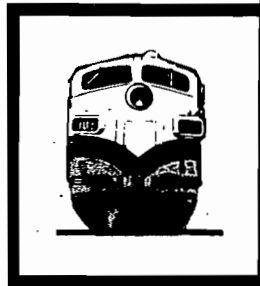
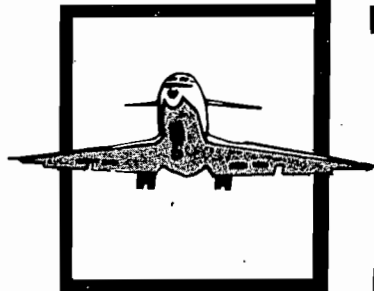


PB83-916501



NATIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D.C. 20594

PIPELINE ACCIDENT REPORT

**THE GAS COMPANY OF NEW MEXICO
NATURAL GAS EXPLOSION AND FIRE
PORTALES, NEW MEXICO
JUNE 28, 1982**

NTSB-PAR-83-1

UNITED STATES GOVERNMENT

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<p>16. Abstract</p> <p>At 3:20 a.m., m.d.t., on June 28, 1982, an explosion demolished a house, killed five persons, and critically injured one person at 827 West 18th Street in Portales, New Mexico; the critically injured person died later at a burn treatment center. The gas service line to the house had been damaged 37 days earlier.</p> <p>The National Transportation Safety Board determines that the probable cause of the accident was the failure of the gas company to carefully inspect a damaged service line and to apply a pressure test from the gas main to the meter once the line was reconnected. Contributing to the accident was the failure of the gas company to provide complete information to the contractor regarding the location of service lines due to incomplete and dated information on its maps and records of its distribution facilities.</p>			
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PIPELINE ACCIDENT REPORT

Adopted: January 13, 1982

**THE GAS COMPANY OF NEW MEXICO
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JUNE 28, 1982**

SYNOPSIS

At 3:20 a.m., m.d.t., on June 28, 1982, a natural gas explosion demolished a house, killed five persons, and critically injured one person at 827 West 18th Street in Portales, New Mexico; the critically injured person died later at a burn treatment center. The gas service line to the house had been damaged 37 days earlier when a contractor's backhoe pulled up the line during conduit excavation work for the local telephone company. At the same time the line was pulled out at the excavation site, the line was pulled out of a compression coupling buried under the street. The pullout at the excavation site was repaired, but the pullout under the street was not repaired until after this accident because the gas company did not detect it when it happened.

The National Transportation Safety Board determines that the probable cause of the accident was the failure of the gas company to carefully inspect a damaged service line and to apply a pressure test from the gas main to the meter once the line was reconnected. Contributing to the accident was the failure of the gas company to provide complete information to the contractor regarding the location of service lines due to incomplete and dated information on its maps and records of its distribution facilities.

INVESTIGATION

Events Preceding the Accident

On April 19, 1982, an independent contractor, hired by the Mountain Bell Telephone Company to install approximately 2,800 linear feet of 4-inch-diameter, plastic conduit under West 18th Street from State Highway 18 to a point beyond South Avenue I in Portales, New Mexico, began excavating a conduit ditch with a backhoe at State Highway 18. (See figure 1.) Working westerly along the south side of West 18th Street, the contractor reached Golden Acres Road on May 20, 1982, where an employee of the Gas Company of New Mexico (gas company) marked the location of a 2-inch-diameter gas main. Using hand tools, the contractor excavated and exposed the gas main before proceeding. The gas main's coating was damaged during the excavation. The contractor stated that the gas company employee who marked the gas main location informed him that there were no gas lines between Golden Acres Road and South Avenue I and that all service lines for the residential housing on West 18th Street were run from the alley behind and not from the front of the property on the street. The gas company has denied that the gas company employee gave the contractor such information.

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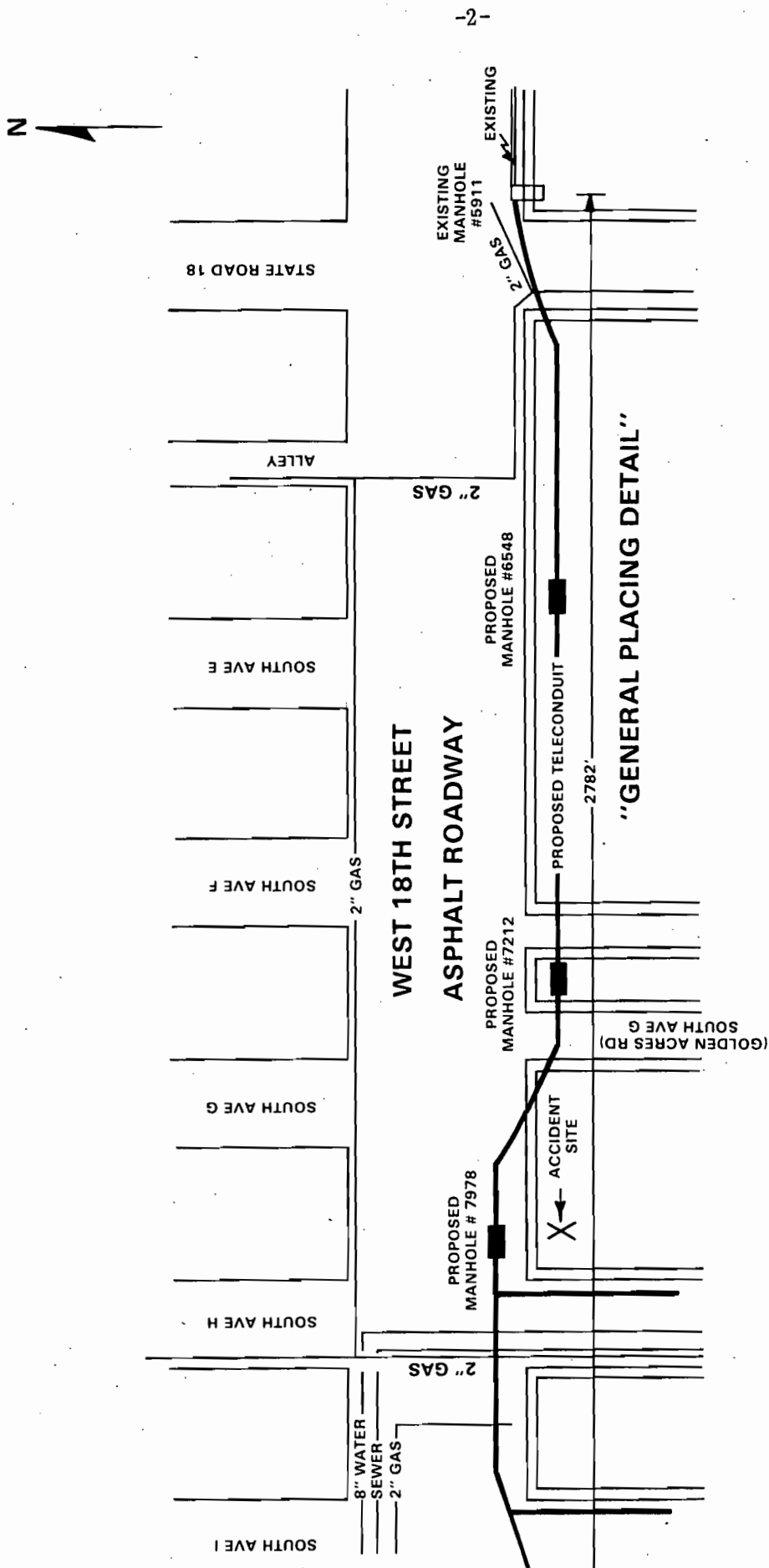


Figure 1.--Route map of Mountain Bell telephone conduit.

The contractor continued to dig, and by Saturday evening, May 22, 1982, the ditch had been dug up to the east side of the concrete driveway of a house at 827 West 18th Street. The contractor talked with a resident of the house about digging across the driveway and was told that there would be no problem since the residents could use a rear exit leading to the alley behind the house. The contractor began digging across the driveway on Sunday, May 23, 1982. The contractor did not notify the gas company that he would be working on Sunday, nor did he ask for any line locations.

After the contractor had dug the ditch across the driveway and was in front of the house, he heard the engine of the backhoe labor as he attempted to remove soil from the ditch. The contractor stopped the backhoe, dug out the area by hand, and uncovered a 1 1/4-inch-diameter steel line running perpendicular to the ditch. The contractor could not identify the line, and since it did not appear to be damaged, he continued to excavate with his backhoe. The line was later identified as an abandoned gas service line.

After digging a little farther, the backhoe contacted and pulled up a 3/4-inch-diameter steel line running perpendicular to the ditch, without the contractor detecting any laboring of the backhoe. The line was pulled up and out of the ground on the south side of the ditch, while the line remained about 28 inches below the surface on the north side of the ditch. The line was badly bent and crimped in at least two places where it was struck by the backhoe bucket. The contractor stated that the free end of the line on the south side of the ditch appeared to be plugged with dirt and that he did not detect an odor or visible indication that gas was contained in the line. He stated that he thought it might be a water line and decided to cut the line flush with the north side of the ditch to get it out of his way. However, when he began to cut the line with a hacksaw, he smelled the odor of gas; he stopped and wrapped the unfinished cut with tape.

The contractor saw a gas company vehicle pull up at a nearby store and told the gas company employee in the vehicle about the line. The gas company employee telephoned a gas company serviceman who came to the site, determined that it was a gas service line, cut the line at the north side of the ditch, and plugged it with a 3/4-inch-diameter rubber plug. When the line was cut, the sound of escaping gas was heard, and the odor of gas was detected by both the contractor and the gas company employee. The section that was cut from the line was neither measured nor examined carefully by the gas company employee or the contractor.

After the line was plugged, a gas company employee told a resident of the house at 827 West 18th Street that the gas service had been interrupted because of the service line break, and that service would be restored in the morning; the resident approved of the decision. The gas company serviceman recorded the incident on a leak report and rated it as a Grade I leak. 1/

At 8:15 a.m., m.d.t., on May 24, 1982, a gas company construction and maintenance foreman and a senior crewman were dispatched to 827 West 18th Street to repair the gas service line. The foreman asked the contractor about the location of the section of line that had been removed because he wanted to measure it to determine more accurately the amount of pipe needed for reconnecting the line. The foreman was told that the damaged section of line was on the contractor's trailer, but the foreman did not find it on the trailer or elsewhere. The contractor estimated that he pulled up 10 to 12 feet of the line,

1/ The Southern Union Company (parent company) Policy Manual, Maintenance Leakage Control issued April 1, 1974, revised September 4, 1981, defines a Grade I leak as: "Any leak that represents an existing or probable hazard to people or property and requires immediate repair or continuous action until the conditions are no longer hazardous."

and the gas company employees who had been at the scene on Sunday estimated that 6 to 7 feet of the line had been pulled up. The contractor and the gas company employees were not sure of their estimates.

The foreman, using a backhoe, excavated between the curb and the sidewalk to uncover the customer's service line, a 1 1/4-inch-diameter steel line which extended approximately 30 feet from the gas meter at the front of the house to the property line, where it was coupled to the gas company's 3/4-inch gas service line, which extended another 63 feet to a 2-inch-diameter gas main under the north side of West 18th Street. The foreman found that the line had been pulled out of the coupling, which was about 7 feet from the plugged end of the 3/4-inch line at the north side of the ditch. To reconnect the line, the foreman first welded onto the 1 1/4-inch line a 7-foot-long section of 3/4-inch wrapped line which included a 1-inch-diameter pipe nipple and a 1 1/4-inch-diameter pipe nipple to make the transition from the 3/4-inch line to the 1 1/4-inch line. To connect the 7-foot section of line to the existing 3/4-inch line, a 3/4-inch compression coupling was installed on the open end of the replacement line, the plug was removed from the existing line, the compression coupling was positioned over the ends of the replacement line and the existing line, and the coupling was tightened.

The foreman later stated that "we then probed in the customer's yard, in the bank of the contractor's ditch toward the street under the blacktop, and at the service tap. The only reading was a trace (2 percent LEL) ^{2/} picked up in the ditch by the cut." The welds and the compression coupling joint were tested for leaks using a soap solution; no leakage was noted. The service line from its connection with the gas main to the meter at 827 West 18th Street, approximately 93 feet, was not pressure tested. The foreman backfilled the area between the curb and the sidewalk at 9:30 a.m. and telephoned for a gas serviceman to relight the customer's appliances. The gas serviceman relit two water heaters at the owner's request and, after checking their operation, left. The contractor completed the excavation, installed the telephone conduit, backfilled the ditch, and poured a 4-inch-thick protective cap of concrete to finish the excavation later in the day.

Telephone company personnel inserted telephone cables into the newly installed conduit and connected the sections of cables within the manholes. The telephone company requires its personnel to use combustible gas indicators (CGI) to test the atmosphere in manholes and vaults before they enter these structures. Work in the manhole at the southwest corner of West 18th Street and South Avenue I was completed on June 21, 1982. From May 24 through June 21, 1982, telephone company personnel working in this area neither heard sounds nor detected the odor of leaking gas. Gas company records indicate no reports of gas odor in this area during this period.

The Accident

At 3:30 a.m., m.d.t., on June 28, 1982, an explosion followed by an intense, gas-fed fire destroyed the house at 827 West 18th Street. The sides of the house were blown outward and the front wall was blown into and across the street by the blast. The roof was blown upward and portions of the roof landed in the front and back yard. (See figure 2.) Of the six persons inside the house at the time of the explosion, five died as a result of the explosion or fire and one was critically injured.

^{2/} For natural gas, the LEL (lower explosion limit) is between 5 to 15 percent gas in a gas-air mixture.



Figure 2.--Destroyed house at 827 West 18th Street.

Firefighters arrived at the scene at 3:41 a.m. and notified the gas company of gas odors at 3:49 a.m. Three gas company employees arrived around 4 a.m. After searching in the alley behind the house for the gas meter, which firefighters had been unable to locate, they searched the front of the house and saw the meter riser almost hidden under debris. Firefighters extinguished the fire and cooled the debris adjacent to the meter, and the gas company employees turned off the gas at 4:38 a.m. A gas company backhoe was brought to the accident site, and the gas service line was excavated at its connection with the 2-inch gas main on the north side of West 18th Street; the service line was then shut off at the gas main at 6:29 a.m. The gas-fed fires soon were extinguished.

After the fire was extinguished, gas company employees tested for gas in the ground around the houses at 821, 825, and 827 West 18th Street and along the gas main and the telephone conduit. A high CGI reading of 79-percent gas was obtained over the gas service line's connection with the gas main, and a high CGI reading of 90-percent gas was obtained at the south curb over the service line. Varying CGI readings were obtained around the houses, in the yards, over the gas main, and over the telephone conduit. (See figure 3.) The gas company excavated by the sides of the houses at 821, 825, and 827 West 18th Street to allow any accumulated gas to escape. (Gas company employees continued CGI tests for gas accumulation in the accident area until July 5, 1982. When these tests indicated only a minimal amount of gas remaining in the ground, testing was ended.)

At noon on the day of the accident, the gas company pressure tested the entire service line from its connection with the gas main to the valve at the meter; the service line did not hold pressure. The service line was excavated in the area of the May 24, 1982, repair where the compression coupling had been installed and the area backfilled.

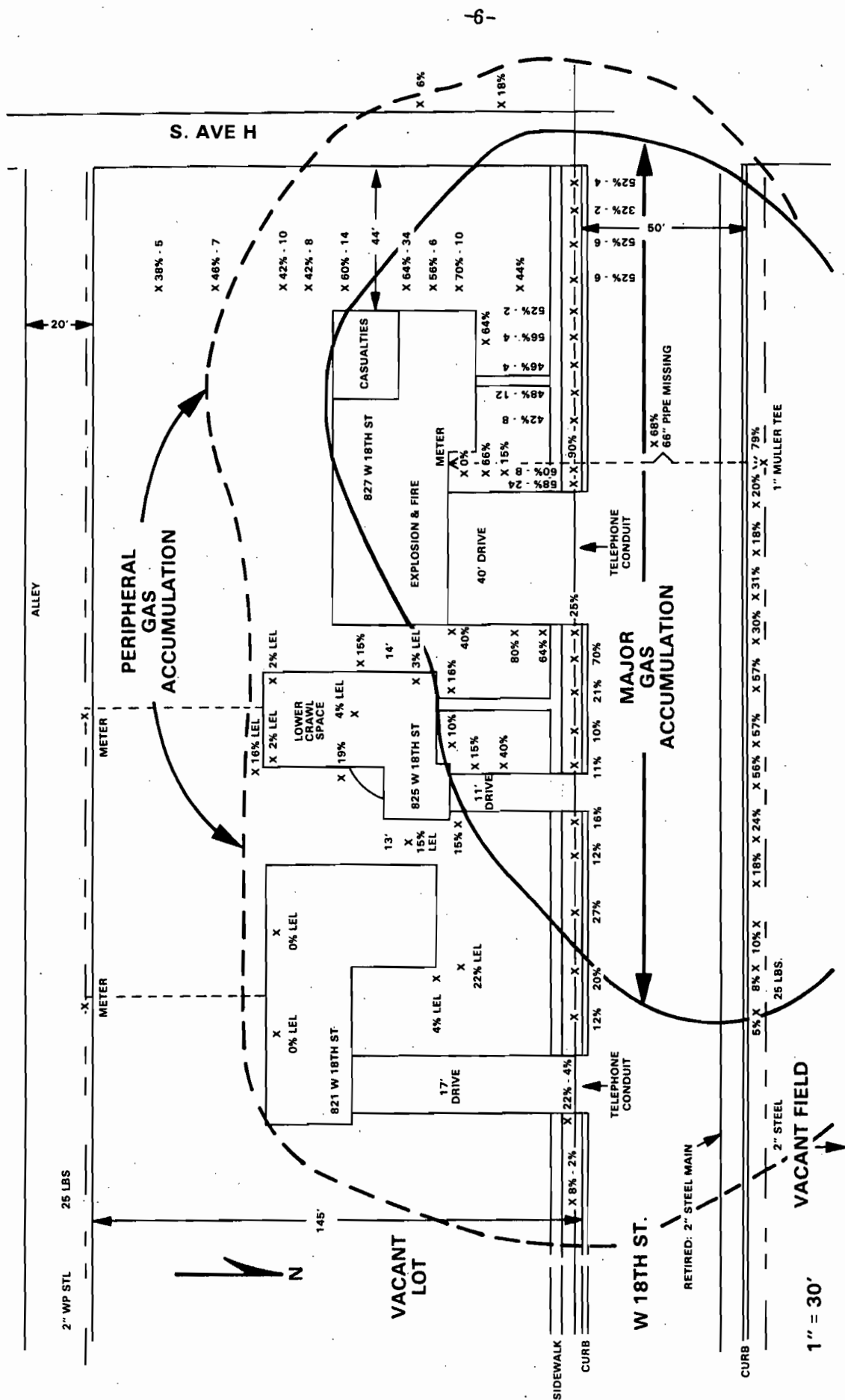


Figure 3. --Gas saturation measured at accident site.



Figure 4.--Service line compression coupling in concrete.

with dirt. The coupling was found embedded in the 4-inch-thick concrete cap that had been installed by the contractor over the backfilled conduit. (See figure 4.) The line and compression coupling appeared to be bent as though they had been pulled upward. The line between the coupling and the gas meter was tested; the line held pressure. Next, the line between the coupling and the gas main connection was tested; it did not hold pressure. After excavating and exposing the service line under West 18th Street, gas company employees discovered that the service line was separated by 65 inches where it had been pulled out of a compression coupling under the middle of the street. (See figure 5.)

Injuries to Persons

<u>Injuries</u>	<u>Operating Personnel</u>	<u>Other</u>	<u>Total</u>
Fatal	0	6	6
Serious	0	0	0
None	0	0	0
Total	0	6	6

Pipeline System

The Gas Company of New Mexico, with headquarters in Albuquerque, supplies natural gas to 286,000 customers throughout New Mexico. In Portales, it distributes gas to approximately 3,900 residential, commercial, industrial, and irrigation customers.



Figure 5.--Line separation in West 18th Street.

It is a Division of the Southern Union Company, a natural energy company with major interests in oil and gas exploration and production, crude oil refining and gas processing, gas gathering and transmission, and gas distribution at the retail level throughout the southwest.

The gas service line involved in this accident was part of a typical residential gas service operation. The 3/4-inch-diameter gas service line extended approximately 63 feet from the 2-inch-diameter gas main to the property line of 827 West 18th Street, where it was connected to the customer's 1 1/4-inch-diameter service line, which extended 30 feet to the gas meter on the front of the house. The gas in the system was transmitted at a 25-psig to 60-psig pressure. The gas main and service line were buried at a depth of 28 inches. The house at 827 West 18th Street was the only one on that block that had gas service from the front. Other gas service lines in the area were connected to a 2-inch gas main in an alley behind the 800 block of West 18th Street.

In 1966, the gas company replaced an old 2-inch-diameter gas main along West 18th Street with a new, coated, wrapped, and cathodically protected 2-inch-diameter steel main. At that time, the bare steel 1 1/4-inch-diameter service line to 827 West 18th Street was replaced with a new 3/4-inch-diameter, coated, and wrapped steel line. The

old line was abandoned in place, and the new line was connected with a compression coupling to the existing 1 1/4-inch customer service line at the property line. Later in 1966, the city of Portales installed a water line in the middle of West 18th Street, and to facilitate the construction of the water line, the city asked the gas company to cut the gas service line to 827 West 18th Street. When the water line installation was completed, the gas company reconnected the gas service line by installing two compression couplings and reconnecting the service line. The area was then backfilled, and the road surface was repaved.

The company has a center in Albuquerque for the training of both parent and subsidiary company personnel. The four gas company employees involved in the May 23 and 24 service line pullout and repair also responded following the June 28 explosion and fire. The following lists their position, years in position, and training:

Service Supervisor--8 years in grade; attended the Leak Detection Surveillance and Control course for 2 days on July 11 and 12, 1979

Construction and Maintenance Foreman--5 years in grade; attended the following courses:

- Construction and Maintenance Crewman - 80 hours - 1978
- Construction and Maintenance Foreman - 40 hours - 1979
- Combustible Gas Indicator - 8 hours - 1979
- Pipeline Inspection - Part I - 40 hours - 1980
- Controlled Fire Welding - 24 hours - 1981
- Pipeline Inspection - 8 hours - 1981

Crewman--1 1/2 years in grade; attended the 72-hour Construction and Maintenance Crewman course in 1981

Serviceman--30 years in grade; attended the following courses:

- Basic Service No. 2 - 1967
- Advanced Service No. 3 - 1968
- Combustible Gas Indicator - 8 hours - 1979
- Leak Detection Surveillance and Control - 24 hours - 1981

The training courses which would have been relevant to this accident sequence were the Combustible Gas Indicator course, the Leak Detection Surveillance and Control course, and the Maintenance Foreman and Crewman courses, which also cover leak detection.

Meteorological Information

Rainfall in Portales, New Mexico, as recorded by the Eastern New Mexico University for the period from May 1, 1982, through June 29, 1982, totaled 1.17 inches. (See appendix B.)

Fire

The Portales Fire Department was notified by telephone of the explosion and fire at 3:39 a.m. Three firefighting units arrived at 3:41 a.m., and four additional units arrived shortly thereafter. Seventeen firefighters fought the fire. The firefighters found the house engulfed in flames and an attached frame garage on fire. One of the firefighters smelled the odor of gas, and at 3:49 a.m., the gas company was requested to "send some personnel." While attempting to extinguish the flames, small pockets of natural gas in and

under the burning debris ignited from time to time with a "popping" sound. The firefighters did not shut off the gas service line at the meter because the gas meter could not be located.

Gas company employees located the meter and turned off the gas at 4:38 a.m. Fire department personnel stated that the gas company employees told them that they believed the house was above a "pocket of gas," and they were not sure that closing the valve at the meter had stopped the flow of gas completely. The gas company has denied that its employees made this statement.

After the gas was shut off at the gas main at 6:29 a.m., all but one fire department unit, which remained at the site to cool the debris and to extinguish any rekindled fires, left the scene.

The source of the ignition of the gas could not be determined.

Medical and Pathological Information

The six persons in the house at 827 West 18th Street died from injuries sustained in the explosion and fire.

Survival Aspects

A 63-year-old man survived the explosion. He was found in the yard with second- and third-degree burns over 33 percent of his body. He also had a fractured collar bone and broken ribs believed to have been sustained when he was blown out of the house by the force of the blast. He was transported by ambulance to a hospital in Roswell, New Mexico, for examination and treatment and later was transported to a burn and trauma unit at a hospital in Albuquerque, where he died of his injuries on July 21, 1982.

Tests and Research

After the accident, gas odorization tests were conducted at adjacent houses, and the gas was found to be odorized as required by Title 49 Code of Federal Regulations, Section 192.625, Odorization of gas, which states:

A combustible gas in a distribution line must contain a natural odorant or be odorized so that at a concentration in air of one-fifth of the lower explosive limit, the gas is readily detectable by a person with a normal sense of smell.

After the accident, an independent testing laboratory was retained to collect and to test the soil along the 3/4-inch gas service line from the 65-inch separation under West 18th Street up to the sidewalk in front of 827 West 18th Street. Six soil samples, averaging 250 cubic centimeters per sample, were taken from the side and just below the depth of the service line at 6-foot intervals. (See figure 6.) Samples 1, 2, and 3 contained little or no moisture (these were directly under the paved road) and had a recognizable odor similar to that added to gas. Samples 4, 5, and 6 "contained moisture in relative amounts that increased with distance from the center of the road. It was necessary to heat sample 4 to detect the odor of gas and even with heat, the odor was slight. No odor was detected when samples 5 and 6 were heated." (See appendix C.)

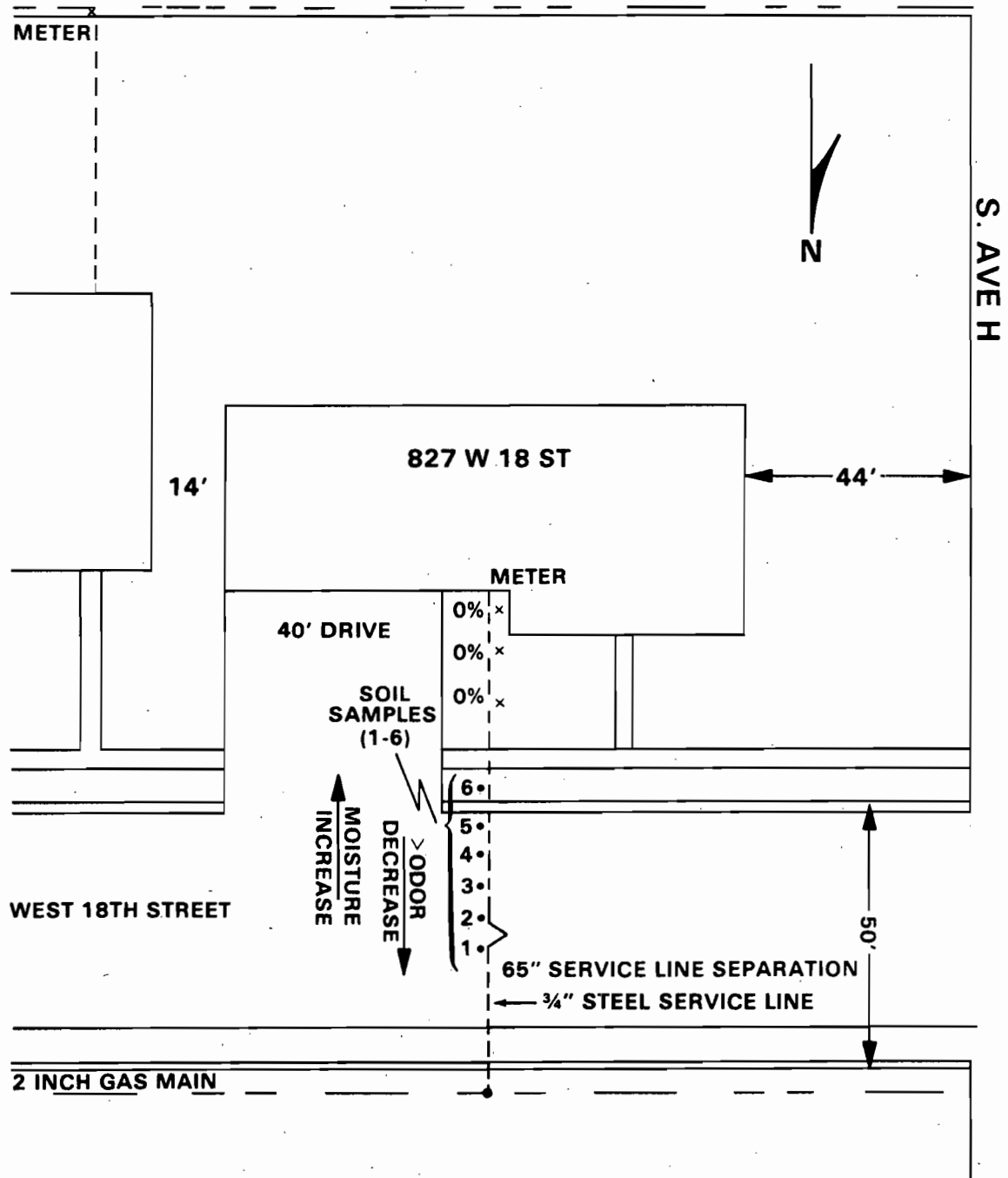


Figure 6.--Soil samples taken at accident site.

Other Information

Telephone Conduit Excavation. -- Mountain Bell hired an independent contractor to excavate and to place approximately 2,800 linear feet (11,918 duct feet) of 4-inch-diameter, plastic conduit along West 18th Street between State Highway 18 and South Avenue I. The contract also encompassed the excavation associated with placing four precast manholes and the restoration of all surfaces disturbed. The work was to be performed in accordance with Job Document N-2-0866 and Bell System Practices.

Sheet 2 of 6 of the "General Placing Detail" plan prepared by Mountain Bell shows the general conduit route along West 18th Street, but does not indicate the existence of any gas main. Sheet 6 of 6 shows the work to be performed in front of 827 West 18th Street and shows water, sewer, and gas lines to the west of 827, but no service line is shown in front of 827.

Applicable general conditions of the contract state that the contractor shall:

- 1.03 Notify all utility companies and others who may have underground plant in the vicinity of the work should the work performed by the contractor involve excavation or construction. All existing company plant shall be located, marked, and staked by company personnel, unless otherwise specified in the contractor documents.
 - 1.04 Carefully locate, expose and protect all underground or adjacent plant or structures belonging to the company or others prior to any trenching or other work operations and to assure responsibility for damages caused by reliance upon detail plans for exact location of such plant or structures.
 - 1.05 Dig test holes to determine the depth and location of all known subsurface utilities and structures.
- * * * * *
- 1.18 Immediately make temporary repairs of any damage caused to subsurface structural properties and at the same time report the damage to owner and the company. Contractor shall not make permanent repairs to such structures unless consent of the owner has first been obtained. The contractor shall be responsible for any damage caused to the property of the company or that, the company will be responsible for any damage to subsurface structures of others where damage occurs during a tunneling, boring or jacking operation when the presence of the structure is not indicated on the work order.

No formal preconstruction meetings were held which all the parties (company, contractor, electric company, gas company, city, water, and sewer departments, etc.) attended. However, during the initial project design and development stage, Mountain Bell contacted State highway personnel, the Portales Sewer and Water Departments, and the gas company to discuss the proposed route of the conduit and to determine where any line crossings might be involved. In particular, Mountain Bell discussed with the gas company the possibility of an interference with a 2-inch gas main at Avenue D, and

Mountain Bell relocated the conduit to avoid the main. Mountain Bell personnel stated that the gas company told them that there would be no additional interference with any gas lines on West 18th Street until after its intersection with South Avenue I.

The contractor's business, K and L Enterprises, Inc., was incorporated 2 years ago. However, for 4 years before, the contractor had performed similar work for Mountain Bell in southeastern New Mexico under the same name but without having his business incorporated. The contractor stated that he and one of his employees had visited the gas company to look at maps and to identify locations where the proposed conduit crossed the gas main. The contractor also stated that the gas company told him that he would not encounter any gas lines along West 18th Street until he began to excavate in South Avenue H, about 40 feet beyond (west of) the intersection of West 18th Street and South Avenue I. The contractor stated that gas company personnel and Mountain Bell personnel stopped by several times each day to talk and observe the work he was performing.

In the western part of New Mexico, there is a one-call system for excavation notification called the "Blue Stake," but there is no system in the eastern part of the state where Portales is located.

Applicable Gas Company Procedures. -- The gas company procedures state that service lines which have been disconnected or removed from service or disturbed such as to cause leakage should be pressure tested. A 90-psig test is prescribed for all lines operating between 1 and 100 psig. (See appendix D.)

The gas company's policy for maps and records states that the operating office shall be responsible for ensuring that its facility maps show the detailed location of such facilities so that facilities can be located without a record search for the information, and that all its maps are kept up to date. (See appendix E.)

The gas company emergency plan calls for quick response to any defined gas emergency and prescribes procedures to be followed during and after the incident. One such procedure to be followed is "(J) Investigating and analyzing all accidents and failures, where appropriate, to determine the causes of the failure and to minimize the possibility of recurrence." (See appendix F.)

Maps and Records. -- The maps for the gas mains in Portales are aerial photos of the city which show only the gas mains. The gas company does not enter its gas service lines on these aerial maps.

In its investigations of pipeline accidents in Greenwich, Connecticut, on May 25, 1977, in Williamsport, Pennsylvania, on January 25, 1977, and in Mansfield, Ohio, on May 17, 1978, the Safety Board found that the inaccuracy of, or the lack of, system maps caused or contributed to the accidents. On August 21, 1978, the Safety Board recommended that the Materials Transportation Bureau (MTB) of the Research and Special Programs Administration, U.S. Department of Transportation:

Revise 49 CFR 192 to require that gas company system maps and records be maintained accurately to identify the location, size, and operating pressure of all of their pipelines. (P-78-50)

In a letter to the Safety Board dated November 8, 1978, the MTB stated that,

MTB has completed its review of the NTSB report and has concluded that the implementation of these Recommendations would improve pipeline

safety. Because both require a revision of the Federal Regulations, we will consider these Recommendations in developing our regulatory schedule commencing in January 1979.

On November 29, 1979, the MTB issued an Advance Notice of Proposed Rulemaking (ANPRM), "Transportation of Natural Gas and Other Gas by Pipeline; Maps and Records," Docket PS-61, inviting comments "relative to the need to establish regulations which would require gas pipeline operators to have adequate maps and records of their pipeline systems."

Eighty-three comments were received; most respondents were opposed to a Federal requirement for maps and other records and stated that the proposed requirements already were being fulfilled. At the Technical Pipeline Safety Standards Committee Meeting of April 15, 1980, MTB orally stated its position that the proposed regulations were directed at companies that did not have adequate maps and records and needed the prodding of such a regulation. On February 29, 1980, the Safety Board commented in support of the ANPRM stating that,

Maps and records sufficient to identify and locate the major components of buried pipelines are essential for a gas pipeline operator to conduct safely the expansion, operation, and maintenance activities normal to this industry. Also, these records are required to provide early location information to persons proposing to excavate near gas facilities Safety Board reports of gas pipeline accidents have identified the clear need for such improved records. Operators of liquid pipelines subject to 49 CFR 195 are now required to maintain maps and other pipeline identification and location records and we urge the MTB to act expeditiously to require similar records for gas systems. (See appendix G.)

More than 2 years later, the MTB announced its intention to withdraw its rulemaking project concerning maps and other record requirements for natural gas pipelines (see 47 Federal Register 48666, October 28, 1982) because it had determined that a requirement for such documents would not be cost-effective. The Safety Board learned that the reason for the decision to withdraw the proposed rulemaking was the MTB's April 1981 report entitled, "Cost Benefit Analysis of Increased Natural Gas Pipeline Safety Regulations," issued in response to requirements contained in Section 110 of the Pipeline Safety Act of 1979 (Act). This section of the Act required the Secretary of Transportation to study the adequacy and cost-effectiveness of existing pipeline safety regulations and address, among other things, the issue of "whether natural gas pipeline safety could be significantly enhanced in a cost-effective manner by regulations requiring operators to prepare and maintain a general description of their natural gas pipeline facilities."

The MTB report assessed the effect of the existing regulations upon gas system safety and assessed the need for additional rulemaking action by analyzing data provided to the MTB by reporting gas companies on Individual Leak Reports and Annual Reports. The Safety Board, in its report, "Safety Effectiveness Evaluation of the Material Transportation Bureau's Pipeline Data System" (NTSB-SEE-80-4), showed these data to be incomplete, inaccurate, and unusable for meaningful safety analysis purposes.

In assessing the cost-effectiveness of a requirement that operators of gas systems prepare and maintain a general description of their natural gas pipeline facilities, the MTB report postulated a requirement for maps and records which encompassed:

- (1) the location of the pipeline and the pipeline facilities;
- (2) the type, age, manufacturer, and method of construction of such pipeline facilities;
- (3) the nature of the materials transported, the sequence in which they are transported, and the pressure at which they are transported;
- (4) the climatic, geologic, seismic, and other conditions (including soil characteristics) associated with the areas in which the pipeline facilities are located, and the existing and projected populations and demographic characteristics within such areas; and
- (5) specific types of detailed data such as the type of joining method used and material specification.

Notably however, the proposal which was evaluated did not include a requirement that the service lines be included in the pipeline facility description.

In reviewing the current practices of pipeline operators, the MTB report used responses to the ANPRM from the Interstate Natural Gas Association of America (INGAA) and the American Gas Association (AGA), which provided comments "on typical practices of pipeline operators as they relate to the data elements that might be required for the description of pipeline facilities." Cost estimates for preparing and maintaining a description of pipeline systems as described above were obtained from pipeline companies, and a cost for the gas industry to comply with a potential requirement to prepare and maintain a description of its pipeline systems as described above was projected.

No data were developed concerning the benefits which might be expected should the pipeline operators prepare and maintain the proposed description of their pipeline systems. A discussion about the possible use of the proposed data in relation to the prevention of excavation damages was included in the MTB report. The fact that accidents have occurred as a direct result of a pipeline operator not knowing the location of gas pipeline facilities was not emphasized in the report, and the resultant loss of life, injuries to persons, and property damage were not considered. The MTB report recognized that the operators of large pipeline systems now voluntarily incur the costs associated with preparing and maintaining maps and other records necessary for the location of their buried pipeline facilities, but the report did not address the reasons why they have elected to do so.

The MTB report concluded that, based on a 20-year life for such records, to require pipeline operators to develop and maintain a description of their pipeline facilities, as defined in the report, would not "warrant the costs of compliance." Consideration of requiring alternatives other than the MTB-defined "system description" or of individual elements or combinations of individual elements contained in the MTB-defined "system description" were not considered.

The MTB report indicated that the Southern Union Company (parent company of the Gas Company of New Mexico) was among the 29 gas companies which assisted in the study performed to develop the MTB's report. Neither the Southern Union Company's three-page response nor the company's response to the ANPRM provided specific information about the usefulness of maps and other records for identifying and locating gas pipeline facilities.

ANALYSIS

General

A combination of factors led to the occurrence of this accident. If the gas service line locations had been shown on the gas company maps, the locations might have been made known to the contractor, and the pullout might have been prevented. The gas company's failure to investigate the pullout by measuring the pulled out line and pressure testing the entire service line from gas main to gas meter allowed a 65-inch line separation under the street to go undetected. Absorption of the odorant in the escaping gas by the wet soil prevented the detection of the gas leak by smell before explosive accumulations migrated into the affected residence.

The Accident

When a gas service line is snagged and snapped or pulled out of a compression coupling, gas usually escapes from one of the open ends. At a typical pressure of 25 psig, the escaping gas is readily detectable by sound or odor or both. In this accident, both the contractor who snagged the line and later the gas company employee who cut off the mangled section and plugged the remaining service line in the ditch stated that they neither heard nor smelled gas escaping from the snagged section prior to cutting and plugging it. Later, when the gas company serviceman cut the line to plug it, gas was escaping and was readily detectable by both the contractor and the serviceman by its odor and the accompanying noise. The line was under 25-psig pressure at the time of the snag, even though gas was not escaping noticeably from the crimped ends. The 65-inch-long separation in the middle of the street probably dislodged some of the soil which had been packed around the service line for 17 years (the amount of time which had passed since the two compression couplings had been installed in the middle of West 18th Street). These soil particles, propelled by gas at 25 psig, probably were blown down the service line, lodged in one or both of the crimped sections, and effectively blocked the small openings and stopped the flow of gas. This would have explained the limited amount of gas noticed by the contractor and the gas serviceman at the point the line was snagged.

When a gas service line is snagged and pulled out of its connection, it usually is pulled out at only one location. In this accident, it had been pulled out in two locations--one where the end was snagged around the backhoe bucket teeth, which was readily seen at the juncture with one of the compression couplings, and the other buried under West 18th Street, which was unseen. The Safety Board considered the possibility that two pieces of line had been pulled out, the one which the gas company employee saw and replaced on May 24, and another possibly pulled out later as evidenced by the bent line and compression coupling over the newly installed telephone conduit, which showed signs of damage. Several factors invalidate that possibility. A second snagging of the service line would have required an additional 65 inches of service line (the amount of separation found later in the middle of West 18th Street) to be pulled up by the backhoe bucket, presumably when the contractor was pouring the concrete cap over the telephone conduit. If that had happened, the gas service line again would have been crimped and bent, and the contractor would have had to cut off 65 inches of the line, straighten out the rest of the exposed service line, and somehow reconnect the service line to 827 West 18th Street. Even if the contractor had accomplished this, gas service to 827 West 18th Street would have been interrupted long enough to extinguish the gas burner and/or the pilot lights at that residence. This most likely would have prompted the residents to call the gas company about the service interruption, but no such telephone call was received by the

gas company. Therefore, the Safety Board concludes that the service line had been pulled out only once, that the 65-inch gap was created on May 23, 1982, and that gas continued to migrate through the ground across the gap and continued to supply the house with gas service until the explosion 37 days later.

The critical element here is the missing piece of service line which could not be located. The contractor stated that he thought the missing piece was 10 to 12 feet long, but he did not measure it, and he later stated that he could not be sure of his estimate. The two gas company employees, one of whom cut and plugged the service line on the day of the pullout, estimated that the missing piece was 6 to 7 feet long, but they also stated that they were not sure of their estimate and that they had not measured or carefully examined the piece either. The gas company employee correctly identified the pullout as a Grade I leak requiring immediate repair because it represented a hazardous condition. However, he reacted only to the obvious fact that a service line had been damaged and he failed to investigate the conditions surrounding the pullout. His investigation should have included the examination and measurement of the snagged line. This omission was critical to this accident, because the information should have been available on the following day when the gas company foreman reconnected the gas service line to the customer service line at 827 West 18th Street. He used only 7 feet of new line; had the missing line been 12 feet long, and had the foreman known this, then when he saw that he needed only 7 feet of new line to reconnect the gas service line to the customer service line, he presumably would have realized that an additional 5 feet of line was missing somewhere on the service line. Undoubtedly, he would have taken steps to find the gap in the line by either digging up the line across West 18th Street or by excavating the line at the gas main and then pressure testing the entire service line to 90 psig. Another gas company omission was the failure of its personnel to retain the pulled out piece of line. Had they done so, the piece would have been available for the foreman's inspection and measurement the next day, and this might have prevented the accident. Both of these omissions--the failure to measure and inspect the damaged line and the failure to retain the cut-out portion--were contrary to the gas company policy of investigating failures to minimize the possibility of a recurrence.

Pressure Testing

Unfortunately, on the following day, there was a further failure to follow completely the company procedures which state that service lines which have been "disturbed" shall be tested as new service lines--at a pressure of 90 psig in this case. The foreman did not excavate the service line at its connection with the gas main, separate it from the gas main, and initiate a 90-psig test of the service line from the gas main to the house meter. Had he done so, the line would not have held pressure, and a search for the leak would have resulted in the discovery of the 65-inch separation.

Finally, if the gas company employee who cut and plugged the snagged service line on May 23 or if the crew which reconnected the service line on May 24, 1982, had checked available company records which showed that compression couplings had been installed in the middle of the street in 1966, they might have been alerted to consider the possibility of an additional pullout under the street, given the amount of line crimped around the backhoe, and additional inspection and pressure testing might have been performed and the line separation discovered and repaired.

Maps and Records

The gas company's Operating and Maintenance Plan, "Operations Mapping, 671.7," states that maps shall be kept in detail and up to date. Contrary to this specific

directive, however, maps were not available showing the location of the service line to 827 West 18th Street or any other service line in that area. If the 3/4-inch, steel gas service line to the house at 827 West 18th Street had been shown on the gas company maps, presumably it would have been pointed out to the contractor and marked along with the delineation and marking of the 2-inch gas main on May 20, 1982. This lack of mapping of service lines prevented the gas company personnel who discussed the conduit excavation project with the contractor and with the telephone company from identifying all of the gas company's facilities on West 18th Street and marking them. Because telephone company personnel and the contractor had met with gas company personnel before and during the project, and because these meetings had resulted in precautions taken at locations shown on gas company maps where the conduit crossed the gas main, the Safety Board believes that had the service line to 827 West 18th Street been made known to the contractor and marked at the site before excavation, it too would have been protected from damage, and this accident would not have happened.

Also, because gas service lines are not shown on the gas company maps, gas company employees relied upon their general knowledge and memory concerning line location. Consequently, the fact that other service lines in the area were connected to a main in the alley behind the 800 block of West 18th Street probably influenced gas company employees to tell the contractor that there were no more lines in his path. This fact probably further influenced gas company personnel on the night of the accident to search for the gas meter in the alley behind the house instead of in the front. While the delay in locating the gas meter in this emergency did not result in any additional loss of life or damage, it demonstrates the importance of having accurate maps or other immediately available records for locating gas facilities.

The gas company personnel should have told the contractor that the gas company's service lines were not shown on their maps and that the contractor should be alert to the possibility that additional gas lines were in his way. The gas company employees who discussed the conduit project with Mountain Bell representatives and with the contractor should have had the gas company meter reader at these discussions; he at least could have pointed out that the gas meter at 827 West 18th Street was in front of the house, and that might have suggested that the service line was in front of the house also.

The Safety Board is concerned that there continues to be no regulations requiring gas pipeline maps and records. The Safety Board believes that the MTB's April 1981 report on its study concerning the cost-effectiveness of pipeline system maps and records for improving gas pipeline safety is deficient because the study is based primarily upon data which the Safety Board has previously determined to be incomplete and erroneous. Moreover, the study considered only one of many possible combinations of data which could provide adequate information for the location of pipeline facilities. The data which the MTB considered were very detailed, and included superfluous information not essential for identifying and locating pipeline facilities. Thus, the Safety Board concludes that the results of the study do not justify the MTB's intended withdrawal of its ANPRM regarding the need to establish regulations which would require gas pipeline operators to have adequate maps and records of their pipeline systems. The Safety Board believes that its recommendation P-78-50 concerning maps and records is still valid, and the Safety Board further believes that the MTB should not withdraw its ANPRM.

Gas Migration and Odorization

A puzzling aspect of this accident was the 37-day period between the initial service line snag and pullout on May 23, 1982, and the explosion and fire on June 28, 1982. Usually when gas at 25 psig escapes from a service line under a pullout condition, the

migration is swift, and if an explosion or fire occurs, it takes place rapidly, sometimes within minutes or hours. In this accident, however, it was 37 days before gas was ignited by something in the house at 827 West 18th Street. This would have required the gas to build up a reservoir under the street and then to migrate along the 3/4-inch service line, along the 2-inch gas main on the north side of the street, along the newly completed conduit installation on the south side of the street and under the lawns and houses at 821, 825, and 827 West 18th Street -- an area of at least 150 by 300 feet. This migration is consistent with the data obtained during tests made after the accident.

Although the gas reservoir was capped by the road pavement, it was improbable for some of that gas not to have found an opening, pavement fissure, or other place to leak up through the soil between the curb and sidewalk or up in the front lawn. The leaking gas then presumably would have been detected by its odor, and reported. The gas samples taken after the accident had an adequate odorant level, but no one had detected and reported gas odors between May 24 and June 28.

Between May 1 and June 20, 1982, the Portales area had received 1.17 inches of rain. The Safety Board concludes that the odorant compounds added to the gas by the gas company were adsorbed by the surrounding soil when the gas leaked from the service line. Soil samples taken at the side of the gas service line from its pullout in the middle of West 18th Street in 6-foot intervals up to the curb showed that the gas odor in the samples went from strong at the pullout to nonexistent at the curb line and that the moisture content of the soil samples taken were dry at the pullout to wet at the curb line.

The Safety Board investigated a similar accident in Bowie, Maryland, on June 23, 1973, ^{3/} in which the gas leak may have existed for at least 5 months. In the Maryland accident, so much gas had accumulated in the residential area that the gas company, at the direction of the Maryland Public Service Commission, installed continuous gas detection and alarm devices within each residence in the residential gas area (about 12 homes) for 12 months after the explosion and fire. The Safety Board found this same circumstance of soil adsorption of the odorant in the Maryland accident.

As a result of the Maryland accident, the Safety Board recommended that the American Gas Association (AGA), "Give a high priority to the problem of soil adsorption of odorant compounds in its planned research to develop an improved odorant (P-74-43)." The AGA, through the Gas Research Institute (GRI), conducted a 3-year research program to identify new odorants, superior to existing odorants, for use in gas distribution systems. After examining 200 different odorants, none were found to be significantly superior to the current odorant used by the gas industry. The GRI report stated,

GRI therefore believes that it is futile to continue the research for a new odorant. . . . However, GRI plans to continue funding research in odorization, particularly in two areas:

1. The development of reliable cost-effective odor-measuring instruments.
2. Determination of what odorization levels are necessary to provide adequate warning to the public.

While present research has not yet developed such an odorant, the Safety Board encourages the AGA to continue its research efforts in the two referenced areas.

^{3/} Pipeline Accident Report--"Washington Gas Light Company, Bowie, Maryland, June 23, 1973" (NTSB-PAR-74-5).

Excavation Damage Prevention

Although there is no one-call excavation notification system in the Portales area and although there had been no formal, one-group preconstruction meeting before the excavation involved in this accident, all parties (the telephone company, the city of Portales, and the gas company) knew that a conduit was being installed and knew who was to do the work and when the work was to be done. Although the contractor had not worked before on Sundays, when gas company employees were normally off duty, and although the contractor did not tell the gas company that he planned to work on Sunday, both the contractor and the telephone company believed, based on their assertion that they had been told so by gas company employees, that after the contractor had crossed the gas main at Golden Acres Avenue, he would not encounter any more gas lines until west of South Avenue I. The contractor stated that gas company employees told him that all of the houses in the 800 block of West 18th Street (between Avenues J and H) were supplied by gas service lines from the alley behind the houses. Although the gas company asserts that its employees deny giving such information, the Safety Board concludes that gas company employees probably did do so, because when they arrived at the burning house the night of the accident, they spent 5 to 10 minutes looking for the gas meter in the alley behind the house. The Safety Board thus believes that the gas company did not give the contractor accurate information as to the location of the gas lines involved in the accident.

Training Program

The gas company's training program appears adequate, in that the frequency of training courses received by the employees in recent years, as well as the scope of the courses, was appropriate. Nevertheless, the employee who plugged the service line on the day of the pullout and the crew which reconnected the service line on the following day failed to follow gas company procedures. Moreover, the employees' experience with gas operations should have alerted them to the possibility of a second pullout as a result of the forces produced when a service line is snagged and pulled out by a backhoe. In this case, neither the company training nor the experience of these employees sufficed to alert them to the potential danger posed by the pulled out service line; apparently, the training in maintenance and repair and emergency procedures did not make a lasting impression.

CONCLUSIONS

Findings

1. The gas company maps do not include the location of service lines in Portales, New Mexico. Since the gas company did not explain this fact to the contractor and to the telephone company, they both assumed that no gas lines were in the path of the planned construction in the 800 block of West 18th Street. This assumption was reinforced by statements made by gas company employees.
2. The contractor's backhoe struck a gas service line and pulled one end of the line out of the ground, where it could be seen, and also pulled the service line apart by 65 inches at a coupling under the road, where it could not be seen.
3. The gas company employees did not follow company procedures and did not measure or inspect carefully the pulled out service line, did not retain possession of the severed service line, did not pressure test the reconnected line, and thus failed to become aware of the possibility of a second separation.

4. None of the gas company employees involved with repairing the service line were aware that two compression couplings had been installed in the portion of the service line beneath the road. Had they known and associated this fact with the pullout, the employees might have excavated, bar hole tested, or pressure tested the entire service line to check for additional breaks.
5. Gas escaping at 25 psig from the 65-inch service line separation beneath the road accumulated and migrated underground through the wet soil where its odorant was adsorbed by the soil, causing the leakage to go undetected.
6. Gas also migrated through the ground across the gap between the pulled-out section, and continued to supply the house with gas service.
7. The Materials Transportation Bureau's April 1981 report on the cost-benefit analysis of increasing gas pipeline safety regulations does not contain sufficient justification for its announced intention to withdraw its proposed rulemaking action to require maps and records showing the location of all pipeline facilities.

Probable Cause

The National Transportation Safety Board determines that the probable cause of the accident was the failure of the gas company to carefully inspect a damaged service line and to apply a pressure test from the gas main to the meter once the line was reconnected. Contributing to the accident was the failure of the gas company to provide complete information to the contractor regarding the location of service lines due to incomplete and dated information on its maps and records of its distribution facilities.

RECOMMENDATIONS

As a result of its investigation of this accident, the National Transportation Safety Board made the following recommendations:

--to the Research and Special Programs Administration of the U.S Department of Transportation:

Discontinue its planned withdrawal of rulemaking in Docket PS-61 and expedite rulemaking to require pipeline operators to maintain maps and records necessary for the safe operation of their systems. (Class II, Priority Action) (P-83-1)

--to the Gas Company of New Mexico:

Include accurate information on its system maps to identify the existence and location of all service lines. (Class II, Priority Action) (P-83-2)

Revise its construction, maintenance, and emergency procedures and its training program, and develop explicit instructions for its employees to follow when repairing damaged gas facilities. Particular emphasis should be placed on investigating and testing for unseen pipe separation. (Class II, Priority Action) (P-83-3)

--to the American Gas Association, the National L.P. Gas Association, and the American Public Gas Association:

Notify its member companies of the circumstances of the accident in Portales, New Mexico, on June 28, 1982, and urge them to include accurate information on their system maps sufficient to identify the existence and location of all their pipeline facilities, and to emphasize to their employees the importance of checking for unseen damage where their facilities have been damaged by excavation operations. (Class II, Priority Action) (P-83-4)

--to the American Public Works Association:

Notify its members of the circumstances of the accident in Portales, New Mexico, on June 28, 1982, and urge them to cooperate with the pipeline operator in determining the extent of damage when pipeline facilities have been damaged. (Class II, Priority Action) (P-83-5)

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

/s/ JIM BURNETT
Chairman

/s/ FRANCIS H. McADAMS
Member

/s/ G. H. PATRICK BURSLEY
Member

/s/ DONALD D. ENGEN
Member

PATRICIA A. GOLDMAN, Vice Chairman, did not participate.

January 13, 1982

APPENDIXES

APPENDIX A

INVESTIGATION

The National Transportation Safety Board was notified of the accident at 7:45 a.m., e.d.t., on June 28, 1982, by the Materials Transportation Bureau. At that time, the initial information indicated that the accident resulted from a malfunctioning gas hot water heater which had been repaired recently. This information was later found to be inaccurate, and an accident investigator was dispatched from the Safety Board's Fort Worth, Texas, Field Office.

APPENDIX B

PRECIPITATION RECORD FOR PORTALES, NEW MEXICO
(RECORDED BY THE EASTERN NEW MEXICO UNIVERSITY)

May 1	-	.02 inch
May 2	-	.01 inch
May 5	-	trace
May 6	-	.01 inch
May 18	-	.16 inch
May 22	-	.20 inch
May 23	-	.02 inch
May 25	-	.06 inch
May 26	-	.01 inches
May 27	-	.14 inches
Total 10 days		.63 inches

June 8	-	trace
June 11	-	.30 inch
June 16	-	.24 inch
June 18	-	trace
June 20	-	trace
Total 5 days	-	.54 inch

Total rain May 1 through June 20
= 1.17 inches

APPENDIX C

SOIL TESTS

RESULTS OF TESTS OF SIX SAMPLES OF SOIL COLLECTED ALONG THE LENGTH OF THE SERVICE LINE ON JUNE 28, 1982 AT 827 WEST 18th STREET, PORTALES, NM

Figure 6 in the text of this report shows the approximate locations from which samples of soil were collected on June 28, 1982. These samples were collected at the side of or just below the exposed service line (3/4-inch pipe) at approximately 6-foot intervals over a total distance of 30 feet. The six samples (approximately 200 to 300 cc of soil per sample) were sealed in 1-quart Mason jars and taken to Albuquerque for testing.

Qualitative tests were carried out on portions (approximately 3 to 5 cc) of each of the samples by heating these subsamples and sniffing the volatile materials evolved to determine the relative intensities of odor-producing contaminants in the natural gas that was assumed to be present. Tests were conducted in two randomized blocks, and in each block of tests, two different detectors (two individuals) were used.

Samples 1 through 3 contained little or no moisture. It was not necessary to heat portions of these samples in order to detect the contaminants; the "signature" of the natural gas was immediately noted when the jars containing these samples were opened. Samples 4 through 6 contained moisture in relative amounts that increased with increased distance from the gap (see figure 6). It was necessary to heat portions of sample 4 to detect only a slight odor of the contaminants. No odor was detected when portions of samples 5 and 6 were heated.

Samples will be retained, pending a requirement to perform additional tests.

APPENDIX D

GAS COMPANY OF NEW MEXICO OPERATING PROCEDURES

658.01 General: All facilities used in the transportation of natural gas must be pressure tested before being placed in service, in accordance with the following schedule:

* * * * *

- (c) Services or any portion thereof which are disconnected from the gas supply shall be tested as new work.

* * * * *

- (e) Any existing pipeline which is removed from service and moved or otherwise disturbed in a manner which might create leaks therein shall be tested as new facility. (Emphasis added.)

* * * * *

658.07 Test Procedure - Steel System Operating At/Or Below 100 PSI: All facilities operating in this pressure range must be tested according to these standards:

* * * * *

- (b) Minimum Test Pressure: Mains operating at less than one PSI must be tested to at least 10 PSI. Mains operating at or above one PSI must be tested to at least 90 PSI. (Emphasis added.)

* * * * *

658.10 Test Procedure - Services: Each service must be tested before being placed in service. If possible, the entire line including connection should be tested. If not, the connection shall be soap tested at the operating pressure when placed in service. All services operating at pressure of 100 psig or less shall be tested in accordance with the requirements of Policy 658.07 (plastic services in accordance with Policy 658.09) except that minimum test pressures shall be that specified in Policy 658.04 or that pressure indicated below, whichever is greater.

<u>Maximum Operating Pressure Range</u>	<u>Test Pressure</u>
Less than 1 psig	10 psig
1 psig to 100 psig	90 psig

* * * * *

658.11 Test Duration: The times indicated in the paragraphs above are to be considered absolute minimums to comply with the law. The length of time the facility is under test must be sufficient to assure that the

facility is free of leaks. It is recommended that the test be maintained for one hour for each sixty cubic feet of volume with a maximum of 48 hours. Time shall begin when the pressure in the facility has stabilized. Times may be modified when a Dragnet indicator is used for the test.

APPENDIX E

GAS COMPANY OF NEW MEXICO MAPS AND RECORDS

671.1 Types of Maps: A regular mapping system is part of the Company's record keeping program. Maps may be prepared and maintained in a local office or in the Division Engineering Department. Regardless of the place the actual mapping is done, responsibility for the maps rests with the operating location. The following information shall be kept available in each local office in a graphic manner (does not require a research of filed records to obtain): (Emphasis added.)

- (a) Detailed location of all gas facilities; (Emphasis added.)
- (b) The location class of all areas in which the Company has facilities;
- (c) The leak repair record of the gas system;
- (d) Data required for emergency planning including cut-off the restoration of service; and
- (e) The status of the Company's corrosion control program.

671.2 Facility Maps: Maps shall be kept which show the Company's gas facilities in detail. (Emphasis added.) All maps of new areas of service (including extensions to existing systems) prepared after January 1, 1971, shall contain the following information:

- (a) All major geographical features of the area such as streets, alleys, railroads, and streams (1 and contour features such as hills are expected);
- (b) All major land boundaries such as section corners and quarter corners (Blocks in Texas), where available, and special survey and land grant limits;
- (c) All political subdivision lines such as city limits, state, and county lines;
- (d) All gas facilities required for operation and maintenance of the system such as ells, valves, lines stoppers, etc., with sufficient dimensions to permit them to be located without the aid of a pipe locator. (Emphasis added.)

It is suggested that when existing maps are redrawn, provision shall be made to include the above information. All maps must be kept up-to-date. A pencil notation should be made until regular mapping can be done and the particular sheet reprinted. All facilities should be mapped permanently within three months after installation. Special action may be needed in the case of large projects which are put in service a section at a time or when there is a delay in preparing the Completion Report.

671.3 Class Location: Each location shall have a map which indicates the class location of all areas served and the boundaries thereof. This may be a separate map or included on the facility or system map(s).

* * * * *

APPENDIX F

GAS COMPANY OF NEW MEXICO EMERGENCY PLANS

675.1 General: Gas system operations can be affected by the unusual conditions which develop from time to time. The total effect of these conditions on the operations depends to a large extent on the planning the operating location has done before they occur. The operating location should react quickly to unusual situations in order to limit the effect of the incident. They should also repair and restore conditions to normal as soon as practical.

675.2 Emergencies:

675.21 Definitions: The term emergency should be used in its ordinary sense to define a hazardous situation within a system. Each operating location shall prepare a written emergency plan to establish procedures to minimize these hazards. The plan shall be considered as a part of the overall "Operating and Maintenance Plan." It shall include, but not be limited to, the following emergencies:

- (a) Impending known hazard
- (b) Gas detected inside or near a building
- (c) Hazardous leak
- (d) Damage to facilities
- (e) Fire located near or directly involving a pipeline facility
- (g) Uncontrolled flow of gas
- (h) Abnormal weather
- (i) Outage (an unplanned loss of service)
- (j) Disaster (natural disasters, enemy attacks, senior civil disorder, etc.).

* * * * *

675.22 Emergency Procedures

* * * * *

- (e) Taking direct action toward protecting people first and then property.
- (f) Providing emergency shutdown and pressure reduction in any section of the pipeline system necessary to minimize hazards to life or property.
- (g) Making safe any actual or potential hazard to life or property.
- (h) Notifying appropriate fire, police and other public officials of gas pipeline emergencies and coordinating with them both planned responses and actual responses during an emergency.

- (i) Safely restoring any service outage.
- (j) Investigating and analyzing all accidents and failures, where appropriate, to determine the causes of the failure and to minimize the possibility of a recurrence. (Emphasis added.)

APPENDIX G

NATIONAL TRANSPORTATION SAFETY BOARD LETTER
TO MATERIALS TRANSPORTATION BUREAU

FEB 29 1980

Dockets Branch
Materials Transportation Bureau
Department of Transportation
Nassif Building, Room 8426
Washington, D.C. 20590

Dear Sir:

The National Transportation Safety Board has reviewed your Advance Notice of Proposed Rulemaking (ANPRM), Docket No. PS-61, Notice No. 1, which was published November 29, 1979 at 44 FR 68493.

As noted in your ANPRM, investigations of gas pipeline accidents by the Safety Board have identified the need for improvements in gas distribution facility maps and records. We are pleased that in its response to Safety Board Recommendations Nos. P-77-6 through -8, P-77-24, P-77-25, P-77-40, and P-78-50, the Materials Transportation Bureau (MTB) has chosen to evaluate all gas facility location and identification needs in preparation for the development of comprehensive requirements. Maps and records sufficient to identify and locate the major components of buried pipelines are essential for a gas pipeline operator to conduct safely the expansion, operation, and maintenance activities normal to this industry. Also, these records are required to provide early location information to persons proposing to excavate near gas facilities.

The Safety Board recognizes that there are many reasons for the lack of accurate maps and records. However, even where natural disasters or fires have destroyed the system identification and location records, many operators have established programmed actions to reconstruct these records because of their safety, economic, and engineering importance.

Transmission and distribution systems differ in many characteristics; therefore, their identification and location needs may differ substantially. Additionally, distribution systems vary considerably in size, operating pressure level, and degree of complexity. For these reasons, the Safety Board believes that the requirements for transmission and distribution systems should be separate and that the MTB should establish, to the extent practicable, criteria to identify each required item specifically.

In response to the MTB's request for comment on several specified issues, the Safety Board offers the following:

1. All gas system operators should be required to have and maintain current system maps and records sufficient to identify and locate their facilities. Requirements for transmission and distribution facilities should be established independently, but these requirements must be included in Subpart L of 49 CFR 192 to make the requirements applicable to existing systems. Other than to provide a sufficient grace period to bring existing systems into compliance, there should be no differentiation in the requirements between existing and new systems.
2. The Safety Board does not believe that the MTB should establish a mapping scale. Rather, we believe that a minimum scale, such as 1:100, should be established, as well as a requirement that the scale be sufficient to legibly show the location and identity of essential system components. This will allow each operator to use the mapping scale(s) suited to the unique needs of his system.
3. Criteria should be established against which the need for specific items to be included on maps and in associated records can be determined by each operator.

We do not believe that all items of safety importance for each system can be identified in a specification-type requirement without being overly burdensome to a majority of the operators. Also, we believe that the use of general criteria would better educate operators regarding the safety reasons for establishing comprehensive identification and location records. For example, a requirement could specify that all valves which can be used to promptly isolate portions of a system must be shown on system maps. The criteria for evaluation by operators is (1) that a specific valve, when operated in combination with others, could isolate a portion of the system; and (2) that the valve must be capable of being operated without delay. This type of requirement would eliminate the need to document information about valves which were installed to facilitate system expansion and for which ready access is no longer available. Other items that should be included on maps or in related records and for which criteria should be developed include:

a. For all pipeline systems:

1. Pressure control and limiting components,
2. Casings,
3. Stopple fittings,
4. Abandoned pipe,

5. By-passes,
6. Crossing or parallel lengths of pipelines whose operating pressures would pose a hazard if the pipelines were interconnected,
7. Details of all pipes, valves, and control lines for pressure-limiting and pressure-control equipment,
8. Valves and other buried control facilities whose specific control purpose is not otherwise identified in a positive manner, and
9. Locations where pipe or appurtenances make changes in the normal elevation or protrude from the pipe such that the potential for damage during excavation activities is significantly increased.

b. For transmission systems:

1. Safety controls for compressors,
2. Emergency shutdown actuation points at compressor stations,
3. Pipeline specifications sufficient to calculate the maximum allowable operating pressure,
4. Pipeline crossings at roads, railroads, and natural barriers such as waterways, and
5. Class locations and date established.

c. For distribution systems:

1. Service line connection points including abandoned taps,
2. Pipe specifications sufficient for calculating the maximum allowable operating pressure for pipelines operating at 100 p.s.i.g. or more,
3. Pipe material and pipe diameter,
4. The maximum allowable operating pressure of each separately controlled portion of the system,
5. Construction methods used, e.g., plastic pipe joined with compression couplings, and
6. The approximate location of underground service lines that serve more than one customer.

While the ANPRM is necessarily somewhat tentative in suggesting that the proposed system identification and location records are necessary for the safe operation of gas pipeline systems, Safety Board reports of gas pipeline accidents have identified the clear need for such improved records. Operators of liquid pipelines subject to 49 CFR 195 are now required to maintain maps and other pipeline identification and location records and we urge the MTB to act expeditiously to require similar records for gas systems.

Should you have questions about our comments, our staff will be available to assist in any way possible.

Sincerely yours,

ORIGINAL SIGNED BY/ JAMES B. KING

James B. King
Chairman