



**The Commonwealth of Massachusetts**  
**DEPARTMENT OF PUBLIC UTILITIES**

**PIPELINE ENGINEERING AND SAFETY DIVISION**

**INCIDENT REPORT**

**44 Willowdale Road, Groton, Massachusetts**  
**December 11, 2007**

**PIPELINE ENGINEERING AND SAFETY DIVISION**

**Accident File**

**Location: 44 Willowdale Road, Groton, Massachusetts**

**Date of Accident: December 11, 2007**

**Gas Company: Boston Gas Company d/b/a National Grid**

**Estimated Property Damage: Over \$260,000 \***

**Injuries: None**

**Report Issued – September 1, 2009**

**\* Estimated by Boston Gas Company d/b/a National Grid**

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**I. INTRODUCTION**

**A. Scope of the Investigation**

The Massachusetts Department of Public Utilities (“Department”), Pipeline Engineering and Safety Division (“Division”), pursuant to G.L. c. 164, § 105A and a Federal Certification Agreement as provided for in 49 U.S.C. § 60105, has investigated a natural gas (“gas”) release at 44 Willowdale Road, Groton, on December 11, 2007 (“Incident”).<sup>1</sup> The release of gas contributed to an explosion, fire and over \$260,000 in property damage to the dwelling, as estimated by the operator of the natural gas facilities, Boston Gas Company d/b/a National Grid (“National Grid” or “Operator”) (Exh. 1).<sup>2</sup>

As part of the Department’s annual certification process by the United States Department of Transportation (“U.S. DOT”), the Department must report to the U.S. DOT

each accident or incident . . . involving a fatality, personal injury requiring hospitalization, or property damage or loss of more than an amount the Secretary establishes... and any other accident the [Department] considers significant, and a summary of the investigation by the [Department] of the cause and circumstances surrounding the accident or incident. 49 U.S.C. § 60105(c).

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<sup>1</sup> Incident means any of the following events:

1. An event that involves a release of gas from a pipeline or liquefied natural gas or gas from an LNG facility and,
  - a. A death, or personal injury necessitating in-patient hospitalization; or
  - b. Estimated property damage, including cost of gas lost, of the operator or others, or both, of \$50,000 or more.
2. An event that results in an emergency shutdown of an LNG facility.
3. An event that is significant in the judgment of the operator, even though it did not meet the criteria of paragraphs (1) or (2). 49 C.F.R. Part 191, § 191.3.

<sup>2</sup> As a result of a merger completed in 2007, Boston Gas is part of the National Grid utility system. Prior to this, the company was Boston Gas Company d/b/a KeySpan Energy, New England.

The purpose of this report is to inform the U.S. DOT as to the cause and circumstances surrounding the Incident.

The Department has established procedures for determining the nature and extent of violations of codes and regulations pertaining to safety of pipeline facilities and the transportation of gas, including but not limited to, 220 C.M.R. §§ 101.00 through 113.00. See 220 C.M.R. § 69.00 et seq. The Division also enforces the U.S. DOT safety standards for gas pipeline systems as set forth in 49 C.F.R. Part 192 ("Part 192"). G.L. c. 164, § 105A.

[e]ach accident or incident . . . involving a fatality, personal injury requiring hospitalization, or property damage or loss more than an amount the Secretary establishes, any other accident the [Department] considers significant, and a summary of the investigation by the authority of the cause and circumstances surrounding the accident or incident.

National Grid investigated the Incident, and submitted an Incident Analysis Report (Exh. 1). Part 192, § 192.617

**B. Overview of Incident**

At approximately 2:28 p.m. on December 11, 2007, the Department received notice from National Grid of a release of gas at 44 Willowdale Road, Groton. The caller reported that a National Grid leak survey technician from Surveys & Analysis Inc. ("Leak Survey Technician") had hit a gas service line<sup>3</sup> while investigating a grade 3<sup>4</sup> leak on Willowdale Road, Groton (Exh. 2).

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<sup>3</sup> *A service line:* A distribution line that transports gas from a common source of supply to an individual customer, to two adjacent or adjoining residential or small commercial customers, or to multiple residential or small commercial customers served through a meter header or manifold. A service line ends at the outlet of the meter or at the connection to a customer's piping, whichever is further downstream, or at the connection to customer piping if there is not a meter. 49 C.F.R. §192.3.

The Department dispatched two investigators to the scene. The damaged portion of the gas service line was constructed of  $\frac{3}{4}$ -inch plastic pipe, operating at high pressure (Exh. 1, at ii).<sup>5</sup> The plastic service line transitioned to one-inch steel piping at the service valve, and continued onto the gas main.

The Leak Survey Technician acquired gas readings in front of the house, and continued the leak investigation by checking at the gas service riser, approximately one foot away from the house (Exh. 3, at 4-5). As he investigated the leak, the Leak Survey Technician utilized a probe bar to create a test hole (id.). When doing so, he punctured the plastic service adjacent to the house (id.). The puncture was located upstream of the service valve. The escaping gas apparently entered the basement of the building through the fieldstone foundation (Exh. 7).

At 12:48 p.m., the Leak Survey Technician knew that he had punctured the gas service, called the National Grid "Call Center" to report the gas leak, and waited for the arrival of a National Grid leak responder (Exh. 2). At 12:57 p.m., a National Grid leak responder was dispatched to investigate the leak ("Leak Responder") (id.). He arrived onsite at 1:14 p.m., and reviewed the situation with the Leak Survey Technician. The Leak Responder attempted to locate the valve box with a shovel. After a couple of shovelfuls, he hit a rock and stopped (Exh. 3, at 1).

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<sup>4</sup> National Grid classifies a Grade 3 leak as a non-hazardous leak at the time of detection, and can be reasonably expected to remain non-hazardous.

<sup>5</sup> A high pressure system is a system in which the pressure in the main is higher than the pressure provided to the customer. Part 192, §192.3.

The Leak Responder knocked on the door of 44 Willowdale Road, and got no answer. The Leak Responder checked at the front door with his Combustible Gas Indicator ("CGI")<sup>6</sup> machine, and acquired a gas reading of 3.5 percent. He again knocked on the door and "confirmed that it was locked (id.)."

As the Leak Responder walked back to his vehicle to request assistance, he heard an explosion, and was knocked to the ground. He was shaken but uninjured (id.). At 1:30 p.m., he notified National Grid dispatch personnel, and told them that an "explosion" had occurred at the site (Exh. 2).

The house was unoccupied at the time (Exh. 3, at 1). As a result of the explosion, the Leak Responder was taken to the hospital (id.). Personnel present during the Incident were sent for Post Incident Drug and Alcohol Testing (Exh. 4).

## II. THE DEPARTMENT'S INVESTIGATION

### A. Description of the Site

Willowdale Road is located in a residential area of Groton. The area is comprised of single-family residences. The structure at 44 Willowdale Road was a two-story house, with a basement and a fieldstone foundation. The house had a gas-fired water heater and a central furnace. A two-inch steel gas main<sup>7</sup>, sections of which were installed in 1930 and 1955,

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<sup>6</sup> A CGI machine is utilized to detect natural gas concentrations. An air sample is drawn across an element at a controlled rate and a direct reading of combustible gas content of the sample is then obtained.

<sup>7</sup> "Main" means a distribution line that serves as a common source of supply for more than one service line

underlies Willowdale Road (Exh. 5). The operating pressure of the gas main at the time of the Incident was between 54 and 57 p.s.i.g (id.). The installation date of the gas service to 44 Willowdale Road is “unknown (Exh. 6).” The outside service riser had a manual shut off valve. The service regulator and gas meter were mounted downstream of this valve.

**B. Description of the Scene**

On December 11, 2007, at approximately 3:40 p.m., Division investigators arrived at 44 Willowdale Road. Representatives from National Grid, Groton Fire and Police Departments, State Police, and the State Fire Marshal’s Office were at the scene.

The house had been completely destroyed by the explosion and ensuing fire. It collapsed into the foundation. Debris had been blown onto the Road, into adjoining properties and across the Road into a wooded area (Exh. 7). The service riser assembly, gas meter and service regulator were intact, and located in close proximity to the original installation location. The service had been bent over by the debris as it was displaced from the house during the explosion. The meter had been burned as a result of the fire (id.).

National Grid could not immediately isolate the gas service to 44 Willowdale Road as the curb valve could not be located (Exh. 3). National Grid shut off the gas main on Willowdale Road at a main valve at the corner of Willowdale Road and Hollis Road. Fourteen accounts, including an elderly complex, had gas service disruption (id.). National Grid eventually located the curb valve and disconnected the service. National Grid re-energized the gas main and restored gas service to the affected accounts (id.).

National Grid conducted a pressure test of the portion of the steel service line that extended from the gas main to the service valve. The service was first pressurized to

56 p.s.i.g. The test held pressure for a period of 16 minutes. The pressure was raised to 91 p.s.i.g. and tested an additional 10 minutes. Both tests were successful (id.).

After completion of the test, National Grid exposed the remaining portion of the service upstream of the service valve. The puncture on the exposed plastic service was clearly visible (Exh. 7).

The service pipe was sectioned and cut into two pieces to help in its transportation. After the investigation was completed at the scene, the State Fire Marshal's Office transferred custody of the pipe to the Division's investigators.

### C. National Grid

#### 1. Leak Survey Technician

National Grid contracts with Surveys & Analysis Inc., to perform leak surveys on its facilities. On December 11, 2007, a Surveys & Analysis Inc. Leak Survey Technician was in the process of rechecking an existing grade 3 leak reported at 43 Willowdale Road (Exh. 3, at 4).

The Leak Survey Technician stated that he had been leak surveying on his own for approximately eight months (Exh. 9). In the process of rechecking the leak, he obtained readings with his Flame Ionization Unit ("FIU")<sup>8</sup> at the edge of the road and front lawn of 44 Willowdale Road (Exh. 3, at 4). As he began to perform his leak investigation, another Surveys & Analysis employee arrived onsite to obtain leak survey forms (id.). The Leak

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<sup>8</sup> An FIU detects the presence of a hydrocarbon by drawing an air sample across a flame. The FIU does not provide percent of gas readings and any acquired readings must be verified with a Combustible Gas Indicator.

Survey Technician stopped the investigation and exchanged forms with the other Surveys & Analysis employee who placed the paperwork in his vehicle and stayed onsite (id.).

To further investigate the leak, the Leak Survey Technician acquired a CGI machine and a probe bar from his vehicle (id.). He explained that he “banged a bar hole approximately six feet from the house and got trace gas, less than 1 percent bleed-out not sustained (id.).” He continued his investigation and bar holed approximately one foot away from the house over the gas service, as he removed the bar, he stated that, “he saw blowing dirt and smelled gas and knew that he had damaged the gas service (id.).”

The other Surveys & Analysis employee stated that “he saw the Leak Survey Technician removing the probe bar and CGI machine from his car” and that when he caught up with him, the Leak Survey Technician had begun to bar hole at the house (Exh. 8). It was at this time that he drove the probe bar through the gas service. He further explained that they both knew the gas service had been hit as “they could see it blowing and dirt and dust was flying around (id.).”

At 12:48 p.m., the Leak Survey Technician called the National Grid “leak line” to report that he had probed through the gas service. As he stood in front of the house, he stated that he “didn’t knock on the door as he could see that no lights were on and that there were no cars in the driveway, so he assumed that no one was home (Exh. 3).”

The State Fire Marshal’s Investigators and Division Inspectors interviewed both of the Surveys & Analysis employees. The Leak Survey Technician, when asked if knew the depth that gas services are installed, replied that “services are usually two (2) feet deep and that he has a mark on his pogo stick so that he knows where two feet is, so that he doesn’t go deeper

(Exhs. 7,9 ).” When he was informed that gas services in private property are installed at a depth of 12” and 18” in sidewalks or public areas, he responded that he did not know those facts (Exh. 9).

The other Surveys & Analysis employee was asked what they had done after the gas service had been damaged. He responded that “they both backed up their cars and that the Leak Survey Technician called dispatch to report the leak (Exh. 8).” He said that he was told to go to his truck by the Leak Survey Technician as he wasn’t actually working there (id.). When asked what they did next, he said that “they both sat in their cars and waited for National Grid to arrive” and “that they had not knocked on the door to see if anyone was home (id.).”

## 2. Operator Qualification and Training

National Grid did not train the Surveys & Analysis employees (Exh. 10). Surveys and Analysis provided no training documents or procedures to the Division with respect to the curriculum covered for the required covered tasks relative to this Incident (Exh. 11). Surveys and Analysis stated that, “training [of Survey’s and Analysis employees] is performed via an apprenticeship structure and on the job training (id.).” Surveys and Analysis reported that the only formal documentation for competency from training [of the Leak Survey Technician] is the passing of nationally recognized Operator Qualification (“OQ”) testing (id.). Surveys and Analysis verified that the Leak Survey Technician was administered and passed the Industrial Training Services OQ Program and the Northeast Gas Association (“NGA”) OQ

Program (Exh. 11).<sup>9</sup>

Surveys and Analysis stated that the Leak Survey Technician was monitored numerous times during his apprenticeship by a National Grid supervisor prior to being authorized to independently perform surveys for National Grid (id.).

NGA qualified the Leak Survey Technician on May 21, 2007, to perform Operator Qualified covered tasks, among these were:

- NGA-018 Conducting Gas Leakage Surveys
- NGA-019 Patrolling and inspecting Pipelines
- NGA-020 Investigating Leak/Odor Complaints
- NGA-070 Abnormal Conditions

(id.).

The Leak Survey Technician stated that he had been leak surveying for approximately 10 months, and received one month of training when he worked in Maine with another surveyor and had received another month's training, so he believed that he had been surveying on his own for eight months (Exh. 9).

When asked what materials had been provided to him during his training, the Leak Survey Technician made available Operator Qualification and Corrosion Training Materials that were specific to Operators from Kentucky, Baltimore and other State utilities (id.).

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<sup>9</sup> NGA is a regional trade association that focuses on education and training, technology research and development, operations, planning, and increasing the public awareness of natural gas in the Northeast U.S. All of the Commonwealth's natural gas utilities are members of NGA.

National Grid provided NGA Operator Qualification records for the National Grid Leak Responder (Exh. 12). NGA qualified him on December 5, 2005 to perform 16 covered tasks, among these were:

- NGA-018 Conducting Gas Leakage Surveys
- NGA-019 Patrolling and inspecting Pipelines
- NGA-020 Investigating Leak/Odor Complaints
- NGA-070 Abnormal Conditions

(id.).

National Grid provided training materials and tests administered to its Leak Responder that covered the following tasks:

- Knowledge Test for Emergency Response - 3/22/2007
- Emergency Response Unit School - Performance Test - 3/23/2006
- Review 70 Abnormal Operating Conditions/Properties of Natural Gas
- Review 18, 19 Leak Investigation
- Review 20B
- LEAK-5010: First Response and Leak Investigation
- LEAK-5030: Leak receipt and Classification
- Module 7 - Emergency Response Unit Guidelines
- Module 3 - Using the Flame Ionization Unit and Other Tools for Investigation of Road Leaks
- Module 14 - Leak Investigation and Repair

(Exh. 13)

### III. FINDINGS AND CONCLUSIONS

#### A. Findings

1. On December 11, 2007, the operating pressure of the National Grid two-inch steel gas main underlying Willowdale Road was between 54 and 57 p.s.i.g.
2. The three-quarter inch plastic service to 44 Willowdale Road operated at high pressure had an outside service riser, and manual shut off valve.
3. The service regulator and gas meter were mounted downstream of this valve.
4. On December 11, 2007, National Grid dispatched a leak survey technician employed by National Grid Contractor, Surveys and Analysis, Inc., to investigate a grade 3 leak on Willowdale Road in Groton.
5. The Leak Survey Technician utilized a Flame Ionization Unit and began to detect gas at the edge of the lawn at 44 Willowdale Road.
6. After detecting gas at 44 Willowdale Road, the Leak Survey Technician retrieved his Combustible Gas Indicator and probe bar.
7. The Leak Survey Technician advanced his first bar hole approximately six feet from the building.
8. The Leak Survey Technician moved approximately one foot away from the building, advanced a second bar hole and punctured the service line to 44 Willowdale Road.
9. At 12:29 p.m., December 11, 2007, the Leak Survey Technician reported to National Grid that he had punctured the service line and waited for National Grid personnel to arrive.
10. After puncturing the service line, there is no evidence to demonstrate that the Leak Survey Technician fully performed an outside leak investigation, performed building checks, and attempted to evacuate and ventilate buildings as necessary.
11. A National Grid Leak Responder arrived on the scene at 1:14 p.m.
12. National Grid could not immediately isolate the gas service to 44 Willowdale Road as the curb valve could not be located.

13. The Leak Responder detected 3.5 percent gas at the door of 44 Willowdale Road.
14. As the Leak Responder walked back to his vehicle to request assistance, the house exploded.
15. National Grid shut off the gas main on Willowdale Road at a main valve at the corner of Willowdale Road and Hollis Road.
16. National Grid eventually located the curb valve and disconnected the service.
17. The gas released from the service line most likely moved into the house through the voids in the fieldstone foundation.
18. The possible sources of ignition of the gas are the gas-fired water heater and central furnace.
19. The Leak Survey Technician was tested for drugs, but there is no evidence that he was tested for alcohol.
20. The Leak Survey Technician did not have appropriate parts of the National Grid O&M manual of written procedures at the time of the incident.
21. The Leak Survey Technician did not participate in National Grid's training program.
22. On May 21, 2007, the Northeast Gas Association qualified the Leak Survey Technician to perform the covered tasks he was required to perform the day of the Incident.

**B. Conclusions**

1. The acts of the Leak Survey Technician contributed to the incident.
2. The Leak Survey Technician's training was inconsistent with National Grid's training and qualification of its own employees.
3. National Grid's method of qualification of the Leak Survey Technician may have been deficient.
4. The conclusions in the National Grid Incident Analysis report are reasonable, and supported by substantial and specific evidence.

5. National Grid's proposal to review and periodically audit training performed by National Grid leak survey contractors addresses the apparent differences in training between contractors and Operator employees, and is likely to prevent, or reduce in severity a similar occurrence from occurring in the future.

#### IV. NATIONAL GRID RESPONSE

On June 18, 2009, pursuant to G.L. c. 164, § 105A and 220 C.M.R. §§ 69.00 et seq., the Department concluded an enforcement action with National Grid. National Grid, D.P.U. 07-PL-13. National Grid agreed to: (1) verify that the recommendations presented in National Grid's Incident Analysis Report have been completed; (2) evaluate the Leak Survey Technician that caused the Incident to determine whether the technician is qualified to continue to perform the covered task; (3) review the effectiveness of National Grid's qualification methods, procedures, processes, and training with respect to those National Grid employees and contractors performing covered tasks NGA 020, Investigating Leak/Odor Complaints, and NGA 070, Abnormal Conditions; and (4) file a report with the Department concerning this review.

# EXHIBIT 1

Operator Incident Analysis Report

**INCIDENT ANALYSIS REPORT  
44 WILLOWDALE AVENUE  
GROTON, MASSACHUSETTS  
DECEMBER 11, 2007 SERVICE RUPTURE AND EXPLOSION**

**Prepared by the National Grid Incident Analysis Team**

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**Philip Quan, Manager of Hub Operations**

**July 16, 2008**

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## Executive Summary

At approximately 12:46 p.m. on December 11, 2007, while attempting to check gas readings on property located at 44 Willowdale Road, Groton, Massachusetts, Survey and Analysis Inc., an independent contractor, struck and ruptured an underground, three-quarter inch diameter plastic, 60 PSI gas service pipeline, thereby precipitating a Grade 1 gas leak. Approximately 43 minutes later, while a National Grid Emergency Response Unit technician was taking preliminary precautions and assessing the situation, an explosion occurred. As a result, one residential structure was destroyed and two others damaged. There were no reported physical injuries to persons on site at the time of the explosion. National Grid claims adjuster provided initial estimate of property losses at \$262,000.

The root cause of the rupture was a lack of clear understanding of the risks associated with advancing a bar hole in the vicinity of a buried service. Existing National Grid O&M procedures do not address the method for advancing a pogo or bar hole in the immediate vicinity of a buried service line. Further, while leak investigation and classification training is provided by Technical Training to all National Grid personnel, leak survey contractors are not required to obtain training offered by National Grid, and thus were not trained to the same standards National Grid requires of its own employees. In addition to the root cause cited above, current procedures and poor communication reduced the incident response time.

The Incident Analysis Team determined that within two minutes of striking the gas line, the Surveys & Analysis technician, following National Grid procedures, contacted Emergency Dispatch to report the incident. However, the technician did not continue to follow Procedure LEAK-5010 in its entirety. Per Section 2.c, the technician should have proceeded with the outside leak investigation, including performing building checks, evacuation and ventilation of buildings. The employee contacted The Call Centre per the procedure, but did not continue with the leak investigation and instead waited for the ERU to arrive at the scene approximately 28 minutes later.

The Incident Analysis Team recommends that National Grid Leak Survey modify its procedures to include specific direction on bar holing in the vicinity of a service, and the addition of a provision for risk assessment not only by leak classification personnel but by Emergency Dispatch, including a means for personnel to contact emergency services by calling 911 directly. Furthermore, the team recommends that all leak survey and Emergency Response Unit

personnel be provided with the appropriate tools, materials, personal protective equipment and training to act as a first responder, taking appropriate actions to repair damages and make safe.

## Background

About 12:46 p.m. on December 11, 2007, while attempting to check gas readings on property located at 44 Willowdale Road, Groton, Massachusetts, a National Grid contractor struck and ruptured an underground, three-quarter inch diameter plastic, 60 PSI gas service, thereby precipitating a Grade 1 gas leak. Approximately 43 minutes later, while a National Grid Emergency Response Unit technician was taking preliminary precautions and assessing the situation, an explosion occurred. See Figure 1 for a general time line of events described in the following sections.

## Events Preceding the Rupture of the Service

On the day of the incident, Philip Watson, a leak survey technician employed by National Grid contractor Surveys & Analysis, Inc., was performing Grade 3 leak rechecks. Around 12:40 p.m., Mr. Watson arrived at 43 Willowdale Road to begin the task of rechecking leaks at house numbers 43.

Once on site, Mr. Watson noticed that the reported location of the Grade 3 leak at 43 Willowdale Road was beneath a puddle and surrounded by snow cover (Figure 2). After his Flame Ionization Unit (FI) did not detect gas in the area of the leak noted on the leak investigation report, Mr. Watson walked toward number 43 and the FI continued to register no detection of gas. Mr. Watson then began to walk in a southerly direction into Willowdale Road where his FI began to detect gas at the edge of the lawn at 44 Willowdale Road. Once he was approximately six feet away from the building at 44 Willowdale and still detecting gas with his FI unit, he decided to return to his vehicle to get his Combustible Gas Indicator (CGI) and bang (a/k/a pogo) bar.

At approximately 12:41 p.m., Mr. James Collette, an off duty Surveys & Analysis employee arrived at Willowdale Road to meet with Mr. Watson to pick up his next day's work assignment. At the time of Mr. Collette's arrival, he observed Mr. Watson taking his CGI machine out of his vehicle and proceeded to observe Mr. Watson from a distance of about ten to fifteen feet away.

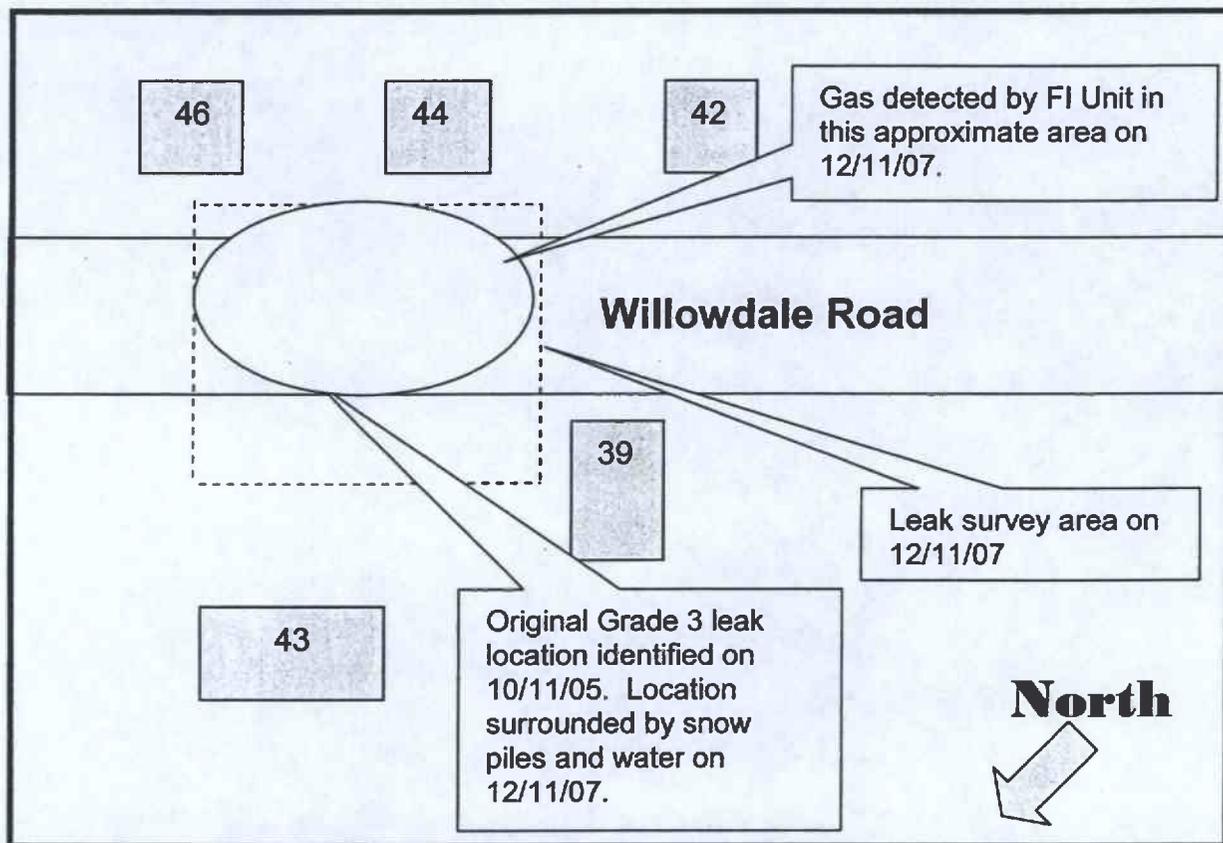
**FIGURE 1: Incident Time Line**

12:46 pm	12:48	1:04	1:06	1:14	1:15	1:25	1:27	1:29	1:30	1:32
<b>SERVICE RUPTURED</b>	Call Center contacted by Contractor	Maintain Crew #1 dispatched by Supervisor from Acton*	ERU dispatched	ERU arrives	Maintain Crew #2* contacted by Crew #1	ERU contacts Dispatch to request fire department assistance	Dispatch contacts Groton Fire Department	<b>EXPLOSION OCCURS</b>	Maintain Crews 1 & 2 arrive	Groton Fire Department arrives

**0 minutes** 2 min. 16 min. 20 min. 28 min. 29 min. 39 min. 41 min. 43 min. 44 min. 46 min.  
(elapsed time)

\* Maintain Crew #1 working approximately 12 miles from the scene; Supervisor unable to contact Crew #2 working less than 1 mile from scene at time of incident.

FIGURE 2: Site Schematic



Returning to his last location six feet away from the building, based on his interviews Mr. Watson advanced his first hole with the pogo bar approximately twelve inches deep and received less than 1% of sustainable gas readings. Mr. Watson subsequently moved closer, to approximately one foot away from the building, where he advanced his second hole approximately twelve inches deep. At that time, Mr. Watson felt and heard a noise sounding like a bang. Upon hearing the noise, Mr. Watson pulled the pogo bar out of the ground and witnessed blowing dirt, coupled with a strong smell of gas. At the time Mr. Watson made the second hole, Mr. Collette indicated that he heard a "hiss" and saw dust blowing. After smelling a strong odor, Mr. Collette assumed it was the gas service.

## Contractor and ERU Response After Rupture

Upon hearing the noise and smelling gas, Mr. Watson stepped away from the area and notified National Grid's 1-800-233-5325 "Leak Line." The call was answered by Ms. Skinnion from the National Grid call center. During their two-minute conversation, Mr. Watson identified himself as a contractor from Surveys & Analysis working for National Grid performing a leak survey and was calling in a Grade 1 leak. Ms. Skinnion asked Mr. Watson where the location of the leak was and he replied, "right in front of the service...I was putting a hole on it and actually punctured the service right at a foot in front of the house." Mr. Watson went on to say that the CGI readings in and around the leak had reached 100%. Subsequent to the phone call, both Mr. Watson and Mr. Collette returned to their vehicles, moved them down the street away from 44 Willowdale, and waited for the National Grid Emergency Response Unit (ERU) to arrive at the scene.

At approximately 12:50 p.m., while Mr. Watson stood by waiting for a first responder, a National Grid Maintenance crew was dispatched from Central Street in Acton (approximately 12 miles away), in response to the leak at 44 Willowdale. Crew members Mike Canto and Brett Doehler (Crew #1) had just completed a patch repair when Supervisor Jeff Johnson called and instructed the crew to respond and to confirm the details of the leak with dispatch. A second maintain crew, Charlie Backus and Kevin Cusick (Crew #2), were completing a grade one leak /service relay at 177 Hollis Street in Groton, less than one mile from Willowdale Road but were unreachable when Johnson attempted to make contact on the nextel. Canto, aware of the second crew's location relative to the leak, also attempted unsuccessfully to contact Backus several times on the Nextel radio.

At approximately 1:06 p.m., Service Representative Terrance Dye was dispatched to investigate a Grade 1 leak at 44 Willowdale Road. At approximately 1:14 pm Mr. Dye arrived at 44 Willowdale Road. Upon his arrival, he saw "two survey people," and was greeted by Mr. Watson who explained how he, Mr. Watson, had pogoed over the service resulting in the gas leak. As Mr. Dye approached the house he could hear the sound of blowing gas and immediately called emergency dispatch for a maintenance crew.

Mr. Dye then asked Mr. Watson if anyone was home at 44 Willowdale, but neither technician knew for sure. After the brief conversation, Mr. Dye went to his vehicle to retrieve a

shovel and attempted to locate the curb valve. While digging around the escaping gas, Mr. Dye claimed that he had hit a rock or other obstruction and immediately stopped. He then went to the front door of 44 Willowdale Road and knocked but he received no reply. Mr. Dye proceeded to his vehicle to secure his CGI. Returning to the front door, Mr. Dye placed the probe of the CGI under the door and received an instantaneous alarm with a reading of 3.5% gas in the atmosphere. Mr. Dye "banged" on the door and checked to see if the door was unlocked. It was not.

During this time, Mr. Dye was also updating Maintenance crew member Doehler (Crew #1), who was enroute to the site. At approximately 1:15 p.m., crew member Canto (Crew #1) was able to contact Backus of Crew #2, informing him of the Grade 1 blowing service. At 1:25 p.m., Mr. Dye contacted Emergency Dispatch to report that he detected 3.5% atmospheric readings and requested assistance from the Groton Fire Department. Dispatcher Coleman Flaherty received the call from Dye and at 1:27 p.m. notified the Groton Fire Department.

At approximately 1:29 p.m. Mr. Dye started to return to his vehicle, which was parked in front of 42 Willowdale, about 45 feet away from 44 Willowdale. With his back to the building, Mr. Dye heard an explosion and fell to the ground. Although shaken up, Mr. Dye was not physically injured. Mr. Collette was organizing his equipment in his vehicle at the time of the explosion. As Mr. Dye picked himself up off the ground, he and Mr Collette looked toward each other and acknowledged that both were unharmed. At 1:30 p.m., Mr. Dye contacted Emergency Dispatch to report that the incident had occurred. Mr. Collette gathered his remaining equipment, placed it in his vehicle, and left the site<sup>1</sup>.

While leaving 177 Hollis Street, Backus (Crew #2) heard the explosion and proceeded to 44 Willowdale immediately. Both Maintenance crews arrived at 44 Willowdale at the same time and were on the scene prior to the Groton Fire Department, with the building fully engulfed with flames.

## **Emergency Response after the Explosion**

Both Canto and Backus attempted to reach the service valve but were unsuccessful. Utilizing his Field Data Capture (FDC) unit in his vehicle, Canto attempted to review scanned

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<sup>1</sup> At approximately 1:20 p.m., Mr. Watson left the site.

records of 44 Willowdale and found none were available. Later review of archived records would indicate that recent records of 44 Willowdale did not exist. Canto, familiar with the area, was aware of a valve at the intersection of Hollis and Willowdale. Canto and Doehler proceeded up to the intersection and located the valve. After contacting Gas Control about the valve Canto was given permission to close the valve which affected 13 customers on Willowdale Road. The valve at the intersection of Hollis and Willowdale was closed and the action communicated to the Groton Fire Department between 1:35pm and 1:50pm. Following the shut down of the gas system both crews proceeded to shut off all effected services at each individual riser. Supervisor Jeff Johnson arrived at the site at approximately 1:55 p.m.

Once National Grid was allowed back on site by the fire department, crews were assigned separate tasks. Backus was assigned to establish a purge point at the end of the main and was instructed to stand by the closed valve at the intersection of Hollis and Willowdale.

Canto began digging at the service riser working his way back toward the main. While digging, Canto was able to pin point the exact location where Mr. Watson had punctured the service. The crew continued to hand dig until they found the gate valve. After finding the gate valve, the crew was instructed by the Department of Public Utilities (DPU) to shut off the valve. Brett Doehler was then instructed to cut out the plastic service pipe 6" from the valve, along with the connected pipe to the riser and meter. All pipe, fittings, and meter where given to DPU Inspector J. Santi, but were later returned to National Grid for storage.

After the DPU had secured the fittings and pipe, the crew was instructed to excavate a hole at the main and abandon the service to 44 Willowdale Road. The service was abandoned at the main and two pressure tests were successfully performed. Following the tests, company welder Chris Dennehy strapped a ¾" compression end cap on the welded tee. In doing so, the service abandonment was completed and the 2 inch diameter main was ready to be reactivated. Gas Control was notified that the main was ready to be placed back into service. The two crews working together opened the valve at Hollis and Willowdale and began to purge the main back into service. The purging was completed and the main was fully activated at 8:00.

## **Injuries**

No Injuries Reported

## Property Damage

As a result of the explosion, the house at 44 Willowdale Road was destroyed (see photographs, Appendix A) The blast also damaged 42 and 46 Willowdale Road and an automobile parked near the blast. According to National Grid's claims adjusters initial findings assessed damage to the vehicle and all three buildings are estimated at \$262,000.

## Incident Analysis

The incident triggering the sequence of events leading to the explosion was the puncturing of the gas service on the 44 Willowdale Road property with a pogo bar by a Surveys & Analysis technician during the performance of a leak recheck. After the rupture of the service one foot away from the foundation, natural gas from the damaged pipeline apparently migrated underground through the permeable stone foundation and accumulated in the home. Approximately 43 minutes elapsed from the time the service was ruptured to the time the explosion occurred. The following sections analyze the causes of the incident.

## Leak Investigation Procedure

Post-incident interviews affirmed that the technician had justifiable reason to be conducting a leak investigation on the property where no leak had been previously documented, and appeared to be following National Grid leak survey procedure (LEAK-5010) until the point the service was penetrated by his pogo bar. However, procedures LEAK-5010 (First Response and Leak Investigation), or LSUR-5020 (Walking Surveys), do not address the method for advancing a pogo bar in the immediate vicinity of a buried service line. The IA Team recommends:

- establishing an exclusion zone around the line within which no bar holes should be advanced to eliminate the potential for line ruptures, or
- indicate that surveyors should not advance pogo bars directly over a gas service.

Upon further inquiry, the IA team understands that leak investigation and classification training is provided by Technical Training to all National Grid personnel. This training covers leak survey and migration of natural gas including where an underground service line is located in relation to a meter. Survey & Analysis, is required by their contract agreement with National Grid to ensure their employees be knowledgeable of gas mains and service installations based on experience and training. The Contractor shall also be responsible for training and assuring proficiency for all its personnel.

## Post-Incident Response Actions

### Failure to Follow Procedures

Within two minutes of striking the gas line, the Surveys & Analysis technician, following National Grid procedures, contacted Emergency Dispatch to report the incident. However, the technician did not continue to follow Procedure LEAK-5010 in its entirety. Per Section 2.c, the technician should have proceeded with the outside leak investigation, including performing building checks, evacuation and ventilation of buildings. The employee contacted Emergency Dispatch per the procedure, but did not continue with the leak investigation and instead waited for the ERU to arrive at the scene approximately 28 minutes later.

When he arrived, the ERU did not fully utilize the procedure LEAK-5010 in response to a live uncontrolled gas leak. Rather than checking the building for occupants, surveying atmospheric conditions or ventilating the home, the ERU began to shovel dirt from around the blowing gas line in an effort to locate a service valve, an activity for which the ERU was not adequately equipped with personal protective equipment to perform in a live gas situation. In addition, the responder failed to close the valve at the gas riser.

### Ability to Assess Risk

Following the detection of the Grade 1 leak, per LEAK-5010, the contractor was required to contact National Grid's Call Center, who in turn forwarded the order to Emergency Dispatch who has the responsibility to subsequently contact the police and/or fire departments. Currently, there is no provision in LEAK-5010 for personnel classifying a Grade 1 leak to contact emergency services directly by dialling 911. Currently, there is no methodology in LEAK-5010 by which leak investigation personnel or Call Center personnel can assess the risk posed by a Grade 1 leak and determine if emergency services personnel or emergency response actions are required prior to the arrival of a National Grid Emergency Response Unit. Approximately 39 minutes elapsed between the first phone call placed by the contractor to Emergency Dispatch and the time the fire department was contacted. The fire department arrived at the scene in approximately 5 minutes. If the first call was made to the fire department the response time could have been shortened by approximately 40 minutes.

## **Ability of Contractor/ERU to Act as First Responder**

Approximately twenty-five minutes elapsed from the time the service line was ruptured until a National Grid Emergency Response unit arrived (fifteen minutes prior to the explosion). National Grid repair crews arrived on site one minute after the explosion and 44 minutes after the damage occurred. Neither the Surveys & Analysis technician nor the National Grid ERU were equipped with appropriate tools or personal protective equipment to take initial steps to eliminate the leak (such as squeezing off the service) in a live gas situation.

## **Communication**

Supervisor Johnson was unable to contact the closest National Grid Maintenance Crew who was working approximately one mile away from the incident. This was due to: 1) one member of the Maintenance crew having misplaced his Nextel phone and was awaiting a replacement, and 2) the second crew member did not have his phone on his person, thus did not hear the Supervisor's attempts to contact. As a result, the Supervisor Johnson contacted the next closest crew (located approximately 12 miles from the incident) who arrived approximately 40 minutes after the initial call, and after the explosion occurred.

## **Non-contributory Factors**

Items that were examined and determined not to be a factor in the incident were:

The one foot depth of cover and location of the gas line was consistent with gas company standards.

Documentation received from Survey & Analysis indicates that both Mr. Watson and Mr. Colette met the training standards for performing leak survey activities. Both have successfully completed the Surveys & Analysis' training program, which is conducted via an apprenticeship and on the job training. The formal competency documentation is passing of nationally

recognized Operator Qualifications (OQ) testing. Surveys & Analysis provided documentation that both Mr. Watson and Mr. Colette passed the OQ testing on these respective dates: Phil Watson: 02/12/07 to 04/13/07; James Colette: 10/20/05 to 11/07/05. Further, Mr. Watson was monitored during his apprenticeship by a National Grid representative prior to being authorized to independently perform leak surveys and investigations.

Survey & Analysis employees Philip Watson and James Collette and National Grid employee Terrance Dye were immediately tested for alcohol and drug exposure. Specimens collected from Mr. Dye and Mr. Collette tested negative for drugs or alcohol. Mr. Watson's specimen tested negative for the presence of drugs. There is no documentation to support that Philip Watson was tested for the presence of alcohol.

## Action Plan

The IA Team recommends the following action plan as a result of the 44 Willowdale Road Incident:

Recommendation	Agreed Management Action	Person Responsible	Due Date
<b>LEAK SURVEY PROCEDURES</b>			
1) Modify procedure LEAK-5010 for all geographic regions to describe the procedure for bar holing in the vicinity of a buried gas service relative to known/visible landmarks (e.g., gas meter), and specify an exclusion zone around the service within which bar holes are prohibited.		Tom Picciott (Designee, E. Grasso)	Mass. 7/1/08 Subsequent areas 9/1/08
2) Modify LEAK-5010 to include a procedure for individuals identifying a Grade 1 leak to perform a risk assessment and determine if Emergency Dispatch or 911 should be contacted directly instead of the Call Center.		Tom Picciott (Designee, E. Grasso)	December 2008
3) A periodic process audit should be performed to ensure all leak survey contractors are adequately trained and/or performance in compliance with National Grid work methods and procedures.		Kevin Mahoney	July/August 2008
<b>EMERGENCY DISPATCH</b>			
4) Perform review and risk assessment to determine when public safety agencies should be contacted (and by who) to ensure the greatest level of public safety.		Kass Geraghty (Designee, K Wisely)	August 2008
<b>TECHNICAL TRAINING</b>			
5) Update training procedure to incorporate modifications to LEAK-5010 described in Recommendation 1.		Brian Varga (Designee, R. Ellis)	Subsequent to item #1

Recommendation	Agreed Management Action	Person Responsible	Due Date
6) Require all leak survey contractors to attend a mandatory National Grid or equivalent introductory training course covering the basic properties of natural gas, leak survey, barholing techniques and emergency procedures.		Lisa Gentile (Designee, K. Caddell)	Prior to 2009 Leak Survey Program
7) Training performed by National Grid Leak Survey contractors must be reviewed and accepted by National Grid. All procedures associated with the leak survey process, hazards associated with the activity, and how to respond to abnormal operating conditions must be included in the contractor training curriculum. Periodic audit of said training should be conducted by National Grid to verify materials covered meets National Grids standards and procedures.		Brian Varga (Designee, R. Ellis)	July 2008
<b>COMMUNICATION</b>			
8) Consideration should be given to identifying potential alternatives and prepare cost benefits analysis on enhancing, supplementing, or changing, the current communication system. (i.e. Nextel's and pagers)		Kass Geraghty (Designee, S Bell)	August 2008

These recommendations are made on (insert date) by the Incident Analysis Team:

- Kevin Mahoney, Team Leader
- Steve Bell, Manager Dispatch
- Leo Cody, Principle Engineer & Regulatory Compliance
- Ernest Grasso, Manager Policy
- William Haggerty, Manager Customer Meter Services
- Dave Kearney, Principle Engineer & Regulatory Compliance
- Saadat Khan, Manager Support Services NY Downstate & Upstate

Robert Naper, Senior Supervisor  
Philip Quan, Manager Leak Survey





Figure A-3. Surveys & Analysis Pogo Bar.

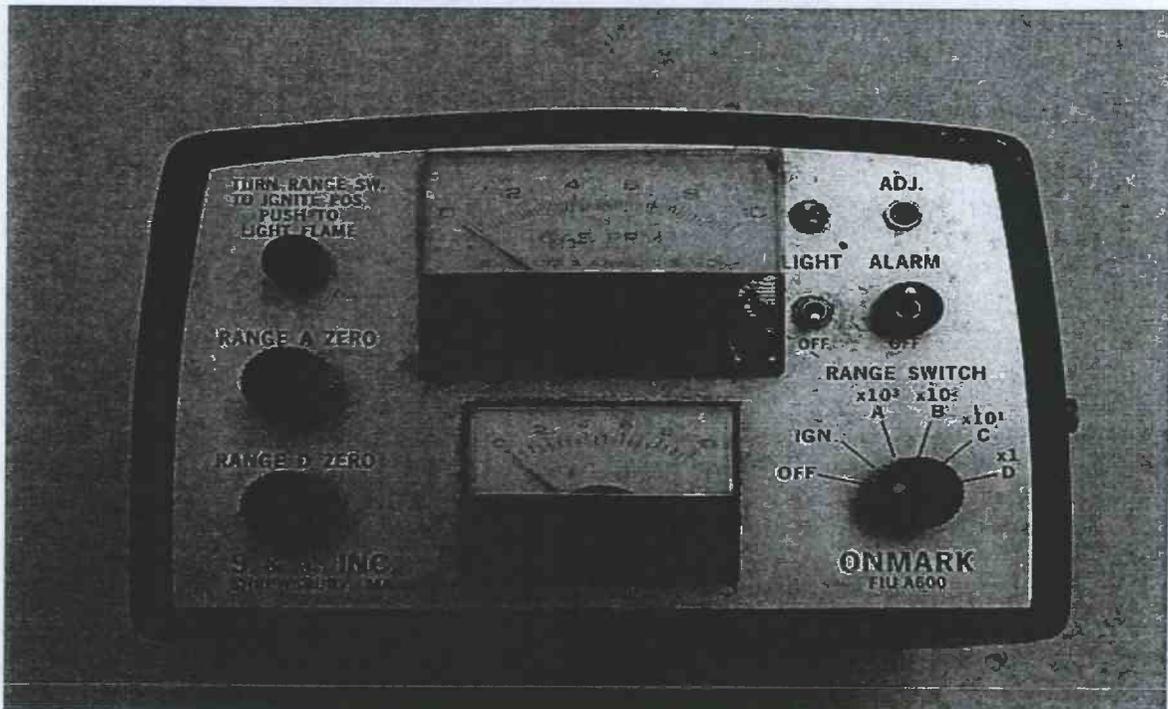


Figure A-4. Surveys & Analysis Flame Ionization (FI) Unit.



Figure A-5. Surveys & Analysis FI Unit. Note calibration date of 12/8/07.

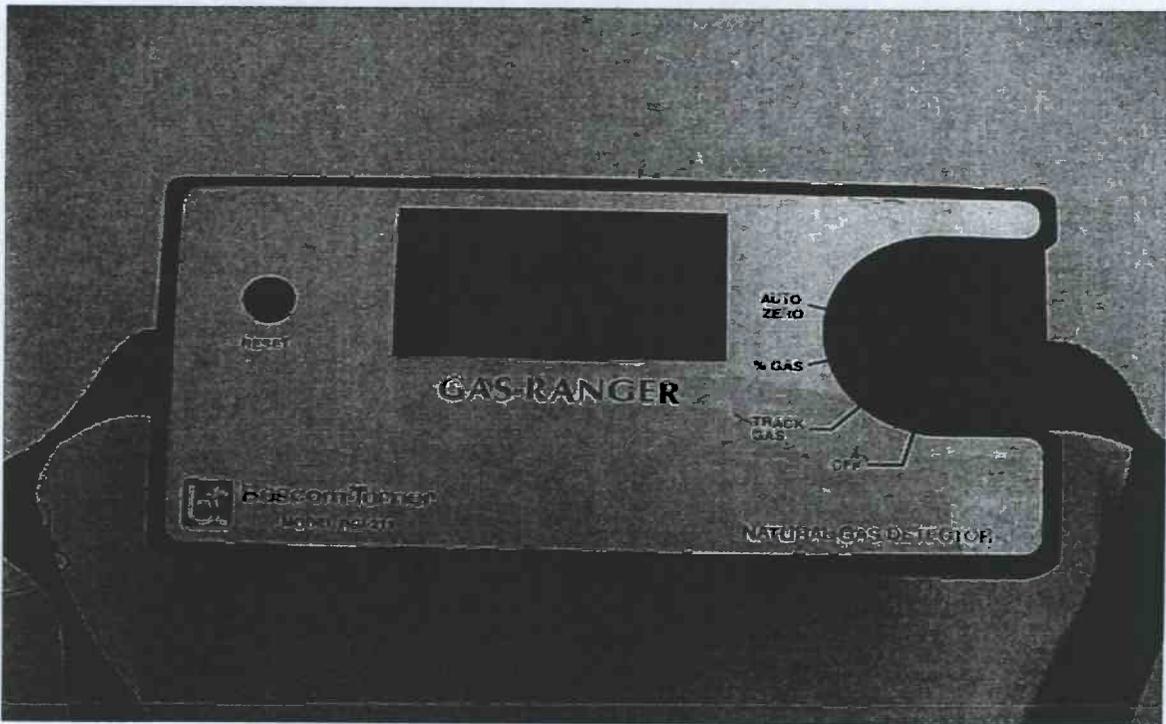


Figure A-6. Surveys & Analysis Combustion Gas Indicator (CGI).

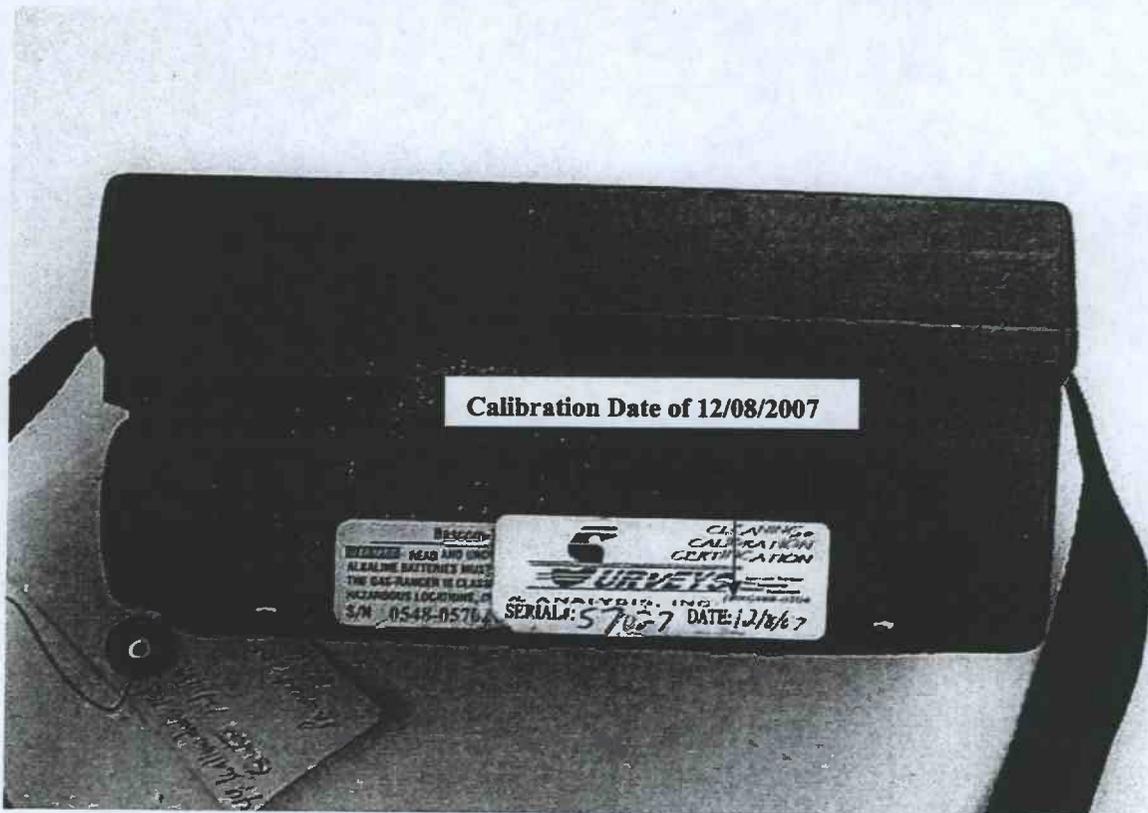
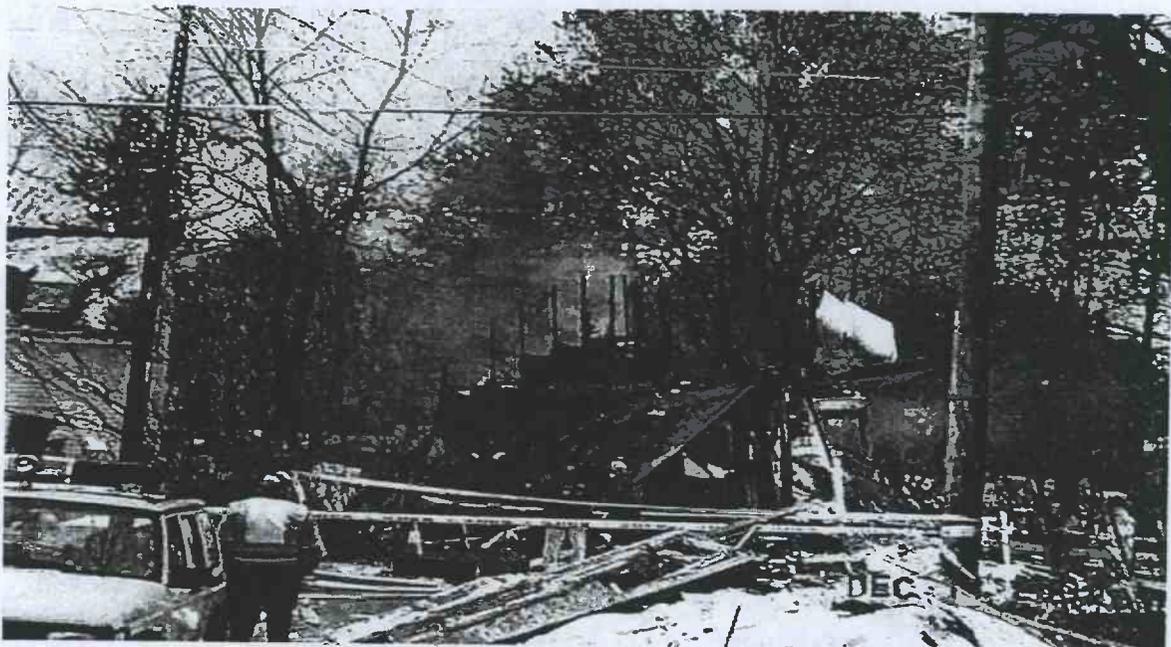


Figure A-7. Survey & Analysis CGI. Note calibration date of 12/08/07.



FigureA-8. Emergency response at 44 Willowdale Road.



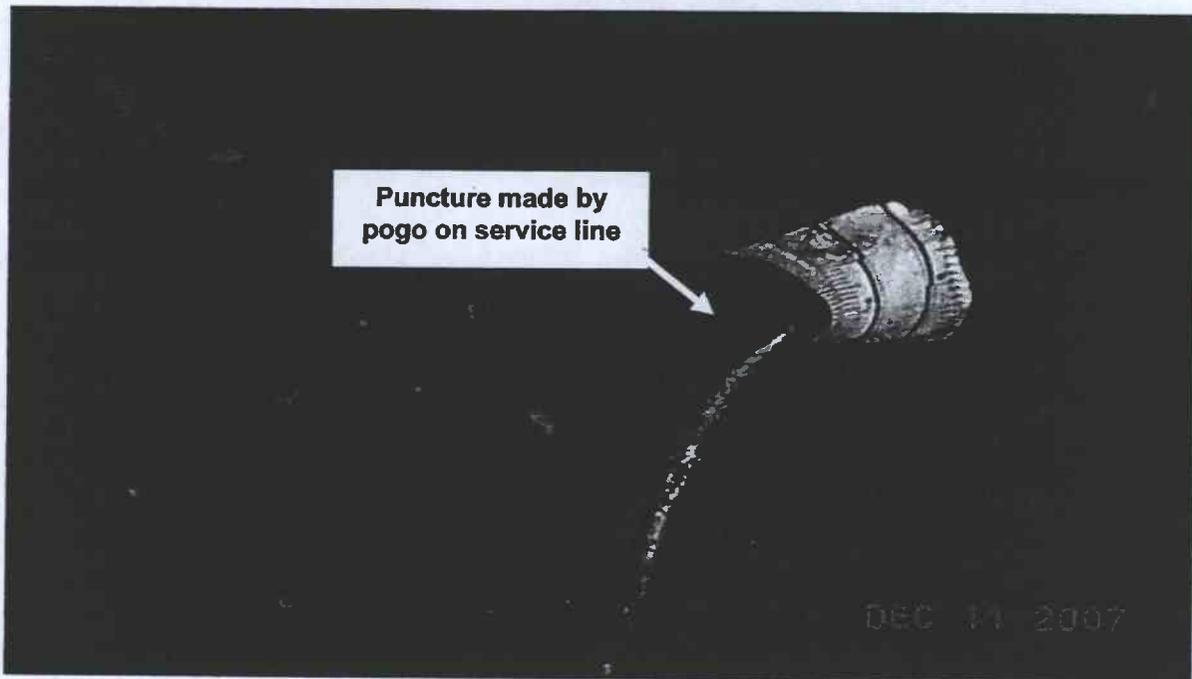
**Figure A-9. Damage to 42 Willowdale Road.**



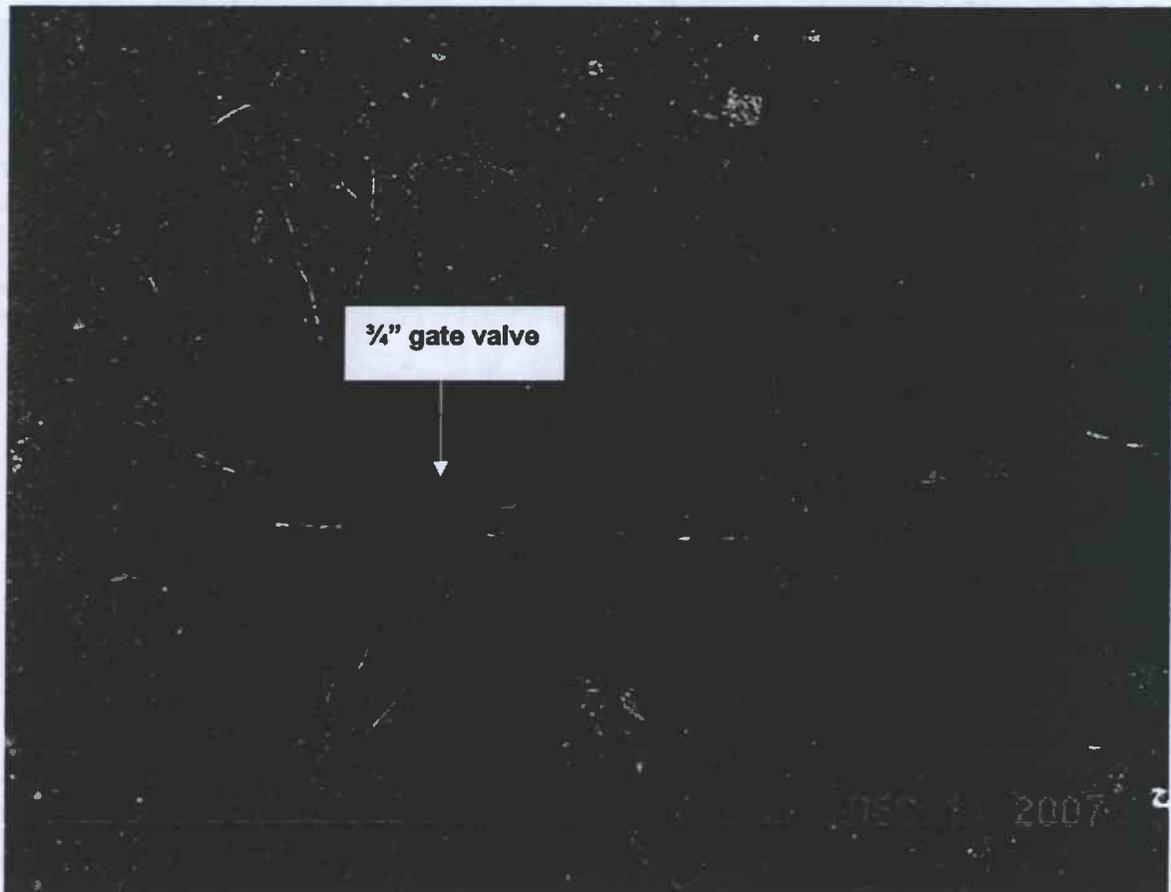
**Figure A-10. Damage to 46 Willowdale Road.**



**Figure A-11. 3/4 inch diameter plastic service line located after the incident.**



**Figure A-12. Damage to service line.**



**Figure A-13. 3/4 inch gate valve for 44 Willowdale service.**



**Figure A-14. National Grid technician cutting the 3/4" service off at the main.**



**Figure A-15. Pressure test on the remaining stub portion of service.**

**APPENDIX B NATIONAL GRID PERSONNEL ON-SCENE**

**National Grid Employees with approximate arrival times on site at 44 Willowdale Road,  
December 11, 2007**

<b>Name</b>	<b>Approximate Arrival Time</b>	<b>Task/Department</b>
T.J. Dye	1:14 PM	Emergency Response Unit
Mike Canto	1:30 PM	Maintain Crew Leader
Brett Doehler	1:30 PM	Maintain
Charles Backus	1:30 PM	Maintain Crew Leader
Kevin Cusick	1:30 PM	Maintain
Jeff Johnson	1:55 PM	Supervisor
Walter McCusker	2:15 PM	CMS
Tom Kubilis	2:35 PM	Supervisor
Bill Haggerty	2:40 PM	Manager
Dave Graves	2:45 PM	National Grid Media Relations
Dan McNamara	3:00 PM	Director
Mike Bruno	3:00 PM	Community Relations
John Gatherum	3:10 PM	Risk Management
Paul Bradley	3:15 PM	Construction Supervisor
Rick Enright	3:20 PM	CMS Director
Gary Bennett	3:20 PM	CMS Director
Tom Flaherty	3:30 PM	QAQC Inspector
Pam Johnston	3:40 PM	CMS

## APPENDIX C: Operational History, 44 Willowdale Road

The original installation of a three quarter inch diameter gas service and gate valve serving 44 Willowdale Road was performed on November 12, 1930. The existing steel main was then relayed with 2 inch diameter coated steel and the service supply at 44 Willowdale had been abandoned on June 27, 1955. The coated steel main and associated services were installed for the use of high-pressure (approximately 60 lbs.). No other records pertaining to 44 Willowdale Road were found.

An active service card for 44 Willowdale could not be located. However, there are two distinct active service cards for 46 Willowdale Road, thus it is likely that one of these may have been mistakenly identified as 46, rather than 44, Willowdale. According to National Grid archived records, all available service cards for Willowdale Road had been scanned and saved as PDF files. Active scanned service cards exist for 28, 36, 38,40,42,43,46,49,55, and 85 Willowdale. An active service card record exists in Spipe for 54 Willowdale, but a matching service card was not found. Abandoned Spipe records were not included in the listing of active service cards.

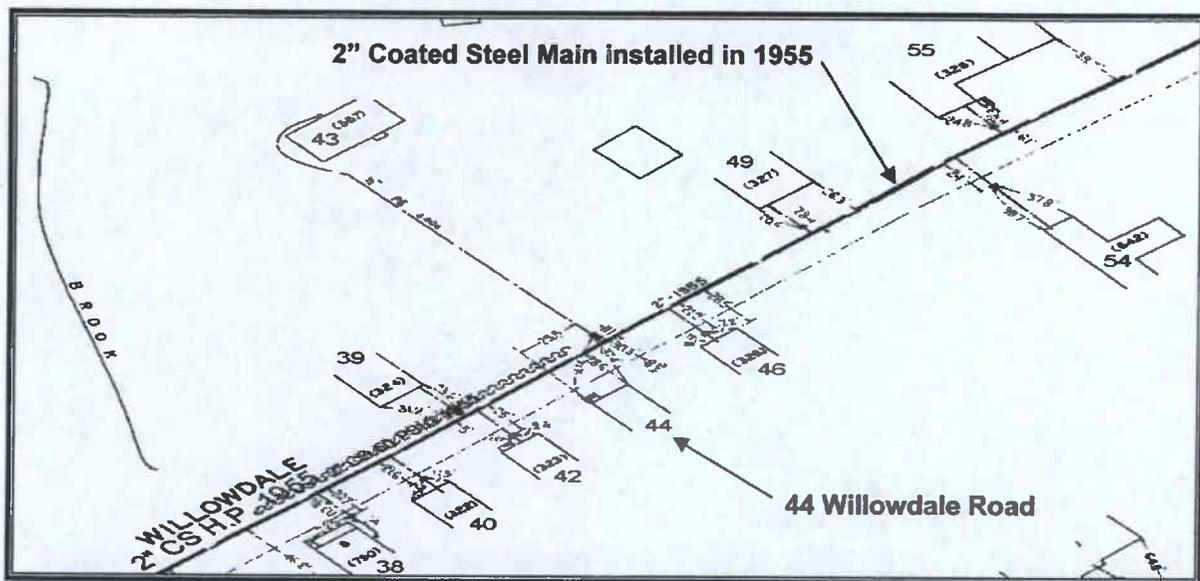


Figure C-1. National Grid integrity overview map of Willowdale Road

## APPENDIX D: Surveys & Analysis Procurement Information

KeySpan issued a Request for Proposal (RFP) to contractors for Leak Survey Services, for KeySpan's New England gas distribution territory, on January 18, 2005. Having passed KeySpan's technical review (Surveys and Analysis, Inc. had already been performing Leak Survey Services for KeySpan) and having been evaluated as the low bidder for all New England bid areas, KeySpan chose to award a contract for Leak Survey Services to Surveys and Analysis, Inc., for all of KeySpan Energy Delivery New England's service territory.

On April 4, 2005, Surveys and Analysis, Inc., was contracted by KeySpan Energy Delivery to perform Leak Survey Services defined as the detection of gas leaks, using Flame Ionization (FI) and Combustible Gas Indicator (CGI) technology, as appropriate, throughout KeySpan's New England gas distribution territory, including the following categories of survey:

- Walking Survey
- Inside Meter Survey (*New Hampshire only*)
- Mobile Survey
- Winter Patrol (*for areas with cast iron pipe*)
- Monitoring Survey (*rechecks of existing leaks*)
- Business District Survey
- Required Building Survey
- Transmission Survey
- Ad Hoc Surveys (*Pre-paving Survey, Master Meter Survey, Uprating Survey, Cast Iron Encroachment, Blasting Survey, Special Investigations, or other surveys as needed*)

The contract (blanket purchase order 302852) is valid through March 31, 2008; with an estimated annual spend of \$910,000.00.

## **EXHIBIT 2**

**Operator Sequence of Events**

**COMMONWEALTH OF MASSACHUSETTS DEPARTMENT OF PUBLIC  
UTILITIES PIPELINE ENGINEERING AND SAFETY DIVISION**

**FIRST SET OF INFORMATION REQUESTS FROM THE PIPELINE  
ENGINEERING AND SAFETY DIVISION OF THE DEPARTMENT OF PUBLIC  
UTILITIES TO KEYSpan ENERGY DELIVERY**

RE: 44 Willowdale Street, Groton (December 11, 2007)

Respondent: Kathleen Geraghty

**PL 1-2**

Provide a sequence of events and a description of the incident. Include the time KeySpan was notified of the incident, when Dispatch notified the leak responder and crew to report to Groton, and their arrival time.

Response:

*12:48* – KeySpan Call Center receives call from Leak Survey Technician Phillip Watson (Survey's & Analysis) reporting a damaged gas service to 44 Willowdale Road, Groton. The Technician reported that during a recheck of an existing gas leak he had pogoed through a plastic service line, causing an escape of gas.

*12:51* – Call ends. Leak is entered into CAD system and is transmitted to Dispatch.

*12:57* – Leak order is dispatched to Service Technician Terrance Dye.

*13:04* – Dispatch notifies Service Supervisor Jeff Johnson.

*13:06* – Service Technician Dye goes en route to location.

*13:10* – Dispatch calls Dig Safe to request an emergency dig safe for 44 Willowdale Road, Groton.

*13:14* – Service Technician Dye arrives on site.

*13:20* – Dispatch notifies Damage Prevention Supervisor Tom Kubilis.

*13:25* – Terrance Dye reports gas readings at front door and requests assistance from Groton Fire Department to gain entrance into 44 Willowdale Road.

*13:27* – Dispatch calls Groton Fire Department requesting assistance.

*13:30* – Dispatch receives report from Service Technician Dye of a disturbance at 44

Willowdale Road.

*13:45* – Dispatch sends out internal electronic notification to Company personnel per the Gas Emergency Plan and Procedures.

*14:06* – Dispatch verbally notifies Massachusetts Department of Public Utilities (Chris Bourne) and follows up with electronic notification.

*15:00* – Dispatch files verbal notification with Department of Transportation - Kevin Williams (File # 856918).

## **EXHIBIT 3**

**Statements of Operator Employees**

**COMMONWEALTH OF MASSACHUSETTS DEPARTMENT OF PUBLIC  
UTILITIES PIPELINE ENGINEERING AND SAFETY DIVISION**

**FIRST SET OF INFORMATION REQUESTS FROM THE PIPELINE  
ENGINEERING AND SAFETY DIVISION OF THE DEPARTMENT OF PUBLIC  
UTILITIES TO KEYSpan ENERGY DELIVERY**

RE: 44 Willowdale Street, Groton (December 11, 2007)

Respondent: Kevin Mahoney/Counsel

**PL 1-3**

Provide statements from KeySpan Energy Delivery personnel who responded to the emergency.

Response: Please see attached summaries relative to interviews of KeySpan personnel who responded to the emergency.

**Terrance Dye:**

Mr. Dye believes that he arrived at 44 Willowdale Road at around 1:15 PM on December 11, 2007. After parking his truck across the street from that address, he met two Survey & Analysis employees, Phillip Watson and a second individual who he did not know. Mr. Dye heard blowing gas, and he called KeySpan Dispatch for a crew. Mr. Watson informed him of what had happened. He also stated that he always pogos on top of gas lines, and that this had never happened before. Mr. Watson said that he had been at this location checking a leak when he pogoed through the service line. Mr. Watson asked Mr. Dye if he was all set and Mr. Watson gave him the leak ticket for a Grade 1 leak.

After his conversation with Mr. Watson, Mr. Dye in an attempt to locate a gate box grabbed a shovel and removed a couple of shovel fulls, but hit rock and stopped.

Mr. Watson did not know if anyone was home at the location. Consequently, Dye knocked on the door, but got no answer. Mr. Dye indicated that he did not ring the door bell. Mr. Dye then got his CGI machine and put the probe of his CGI machine under the front door. He got a reading of 3.5% gas. He once again banged on the front door and confirmed that the door was locked. He then called KeySpan Dispatch and requested assistance from a KeySpan crew and from the Fire Department.

As Mr. Dye was walking back to his truck, he heard the explosion and fell to the ground. Mr. Dye called Dispatch back and told them that the house had exploded. Mr. Dye indicated that he was shaken up, but not hurt.

Mr. Dye believes that he was on site for five to ten minutes before the incident occurred. He stated that a KeySpan crew and the Fire Department arrived within two to three minutes.

### **William Haggerty:**

On December 11, 2007, at approximately 1:36 PM Mr. Haggerty received a call notifying him of the incident at 44 Willowdale Road in Groton. At approximately 2:40 PM, Mr. Haggerty arrived at the scene. Upon arrival, he met with Supervisor Jeff Johnson and was told that Terrance Dye had been investigating a leak when the incident occurred. He was also told that a survey contractor had been on site and pogoed through a service line. Mr. Haggerty confirmed that both Mr. Dye and the Survey contractor were all right.

Mr. Haggerty then made contact with the Groton Fire Chief, a State Fire Marshal's Office investigator, and Detective Ed Sheridan. The detective and the investigator requested an opportunity to speak to Mr. Dye. Shortly thereafter, they interviewed Mr. Dye. Both Mr. Haggerty and Mr. Johnson were not allowed to attend the interview.

Mr. Johnson confirmed for Mr. Haggerty that an area check was performed. Later, Detective Sheridan requested a copy of the Leak Sheet, which was provided to him.

Eventually, Mr. Dye received treatment from EMTs at the site and was transported to Nashoba Valley Hospital.

Mr. Haggerty continued to work with the crew to locate the service valve and to secure the line prior to re-gassing the street. After the service valve was located, Mr. Haggerty proceeded to the hospital to interview Mr. Dye. He spoke to Mr. Dye at the hospital and made arrangements for Mr. Dye to be drug and alcohol tested.

Mr. Haggerty then returned to the scene where the crews were in the process of performing customer relights. The houses on either side of 44 Willowdale had damaged windows. Thus, gas service was left off to those two houses, until they could be secured. A KeySpan crew investigated the existing grade-3 leak on the service to 43 Willowdale Road and was beginning to dig when Mr. Haggerty left the scene at approximately 12:00AM.

### **Mike Canto, Brett Doehler, Charlie Backus, and Kevin Cusick**

Charlie Backus and Kevin Cusick were working at 177 Hollis Street, Groton, MA and were getting ready to leave their jobsite when the incident occurred. Mr. Backus indicated that he heard the incident and that he and Mr. Cusick immediately proceeded to 44 Willowdale Road.

At approximately 12:50 PM, Mike Canto and Brett Doehler started en route to a blowing gas call at 44 Willowdale Road, in Groton. They had just completed a patch repair on Central Street, Acton. Mr. Doehler had talked on the Nextel to Mr. Dye at approximately 1:20 PM.

Both trucks arrived at the scene at the same time, and were on the scene before the Fire Department arrived. At this time, the house was fully involved. Backus and Cusick made an unsuccessful attempt to locate the service valve. There were no scanned records available. They then went to a valve at the intersection of Hollis and Willowdale and contacted Gas Control. With permission from Gas Control, the valve was closed and this was communicated to the Fire Department. At this time, both crews went to shut off

the affected risers.

After Supervisor Jeff Johnson arrived, Backus and Cusick compiled a list of the buildings affected by the outage. Canto and Doehler were instructed to pogo the 100-foot perimeter and then to proceed to pogo the entire street, with the exception of the area that had been taped off by the fire department.

When the scene was released to the gas company, Backus established a purge point at the end of the main and stood by the closed valve at Willowdale and Hollis. Canto hand dug at the riser and followed the pipe back in search of the problem. When the gate valve was found the DPU instructed them to turn it off. Doehler was instructed to cut the plastic pipe six inches from the valve, and the connected pipe with the riser and meter was given to the DPU (Gorge Santi).

At this point, Canto and Doehler were instructed to excavate a hole at the main so that the service to 44 Willowdale Road could be abandoned. The service was abandoned at the main, and two pressure tests were performed. The first test was at 56 pounds for 16 minutes (7:14 to 7:30). The second test was at 91 pounds for 10 minutes (7:40 to 7:50). Both tests were successful.

Chris Dennehy, Company welder, strapped a  $\frac{3}{4}$  inch compression end cap on the welded tee so that the main could be gotten up and running. Gas Control was notified that the main was going to be put back in service. Canto proceeded to the purge point and the main was purged back into service at approximately 8:00 PM. Mr. Cantos was assigned to the repair of an existing grade 3 leak at 43 Willowdale.

#### **Tom Kubilis:**

At approximately 1:15 p.m. on December 11, 2007, Mr. Kubilis received a call from Emergency Dispatch informing him that a survey technician a put a pogo through a gas service at 44 Willowdale Road, Groton, Massachusetts. Mr. Kubilis proceeded to the location and while on route received another call from Dispatch at approximately 1:35 p.m. informing him that the house at the location had exploded. Mr. Kubilis arrived at the scene at approximately 2:30 p.m. When he arrived, he met with Supervisor, Jeff Johnson, who informed him that the gas was off and that the homes in the area were being checked for gas readings. He spoke briefly with Michael Canto, who informed him that his crew was right around the corner when the house exploded. He also spoke with Terrence Dye, who was the ERU responder on site when the house exploded. Mr. Dye informed him that he had gotten reads of 3.5 % gas from the probe he put under the front door and that while he was going back to his truck the house exploded. Mr. Kubilis noted that Mr. Haggerty arrived at approximately 3:00 p.m. and that Dan McNamara arrived shortly thereafter. Mr. Kubilis stated that using the computer in Mr. Canto's truck he looked up the scanned records for 44 Willowdale Road and found none. He also looked up the SPIPE records for the address and the records existed but only the available information was that the meter location was outside. At approximately 4:30 p.m., Mr. Kubilis was told to go to the hospital to be with Mr. Dye and arrived there approximately 15 minutes later. He stayed with Mr. Dye until the doctor released him at approximately 6:00 p.m. Mr. Kubilis contacted Mr. Haggerty to inform him that Mr. Dye was being released. He was told that that he and Mr. Dye should stay at the hospital as Mr. Haggerty was on the way to the hospital to interview Mr. Dye. At approximately

7:00 p.m., Mr. Haggerty interviewed Mr. Dye. Also, in attendance was the local union representative, Jake Thompson and Mr. Kubilis. Following the interview, Mr. Kubilis accompanied Mr. Dye to the drug/alcohol testing facility in Woburn, where Mr. Dye was given drug and alcohol screening. After the test, Mr. Kubilis was told that everything was fine.

### **Philip Watson:**

On December 11, 2007, Mr. Watson was doing rechecks in Waltham when his Supervisor, Neil Dulmaine, assigned him to do Grade 3 rechecks in Groton. He arrived in Groton at around 9:00 AM. His equipment included an On Mark FI, a Bascom Turner Ranger CGI machine, and a Heath bang bar. He believes that Neil Dulmaine had calibrated the CGI and FI on the previous Friday. On the morning of December 11, Mr. Watson used test gas on the FI. He also indicated that the CGI machine self-calibrates at each start up. Mr. Watson started up the FI two times. He started it in Waltham and tested it with the test gas. In Groton, it ran out of bottled gas, so he filled the gas bottle and restarted the machine. He tested after the second start up.

When Watson arrived at the area he received work from Dane Barrett. Watson took the Groton leaks, while Barrett stayed in Ayer. After completing a number of rechecks, Mr. Watson went to lunch for about a half-hour. He then went to 43 Willowdale Road. He had the old leak investigation form with the sketch on it. He had the Groton leaks and the monitoring sheets.

During the recheck at 43 Willowdale Road, he went to the area where the existing leak was, at the side of the house in a snow puddle near the woods. He got no reads with the FI. He walked the FI in the area and it started going off from the edge of the lawn to approximately 6 feet from the building at 44 Willowdale Road. The lawn was approximately 20 feet from the edge of the road to the house. He did not remember smelling gas on the property prior to the incident. Once he got to six feet from the house, he went and got his CGI and bang bar.

Watson next banged a hole at about six feet from the house and got trace gas, less than 1% bleed-out not sustained. He then bar holed approximately a foot away from the house and approximately one foot deep. He felt something, wiggled it around and thought it was rock. He banged again, removed the bar and saw blowing dirt and smelled gas. He put down a total of two pogos—one at about six feet from the house and one at about one foot from the house. The second one hit the service.

At the building, he had seen a gas meter right in front of where he pogoed. The gas meter was outside and on the left hand side of the front corner of the building. He bar holed in front of the meter. He always pogos right in front of the meter, not on top of the service. He is cautious of possibly hitting the line from training, and he has never hit a line before. He only pogoed about one foot before hitting the line.

Mr. Watson removed the bang bar as he had heard about in training. He stepped back from the area, off the lawn, and called KeySpan Leak Line. There was nobody present at the location. There were no cars in the driveway and the lights were off.

The KeySpan service people first arrived no more than one hour after he made the call. He indicated to the emergency responder where the service was that he had hit. The responder checked it out and walked back to his van. He tried to call someone on the

way back to the van but could not get through. He got a shovel from the van, and came back to the damage. He started to dig. Mr. Watson gave him the paperwork and was told that the emergency responder was all set. Mr. Watson left the scene and went to his next job on Hollis and Cross Streets. He heard an explosion, but didn't react until Neil called him to tell him that the incident had occurred. Mark Cohn also called him regarding a urine test.

At a second interview, Mr. Watson confirmed that when he was putting away his FI and getting his CGI and bang bar Mr. James Collette arrived at the scene. Mr. Watson gave him some paperwork. Mr. Watson was not sure where Collette was while he was banging the holes.

### **James Collette:**

On December 11, 2007, Mr. Collette had the day off. He went to Willowdale Road to pick up the next day's work from Phil Watson. He arrived there at approximately noon, around lunch time. He observed Watson investigating the leak. He was putting an FIU in his vehicle. Watson gave him the paperwork. Then Watson was getting his bang bar and CGI out of his vehicle. Collette returned to his vehicle. When he looked back, Watson was walking the property. Collette followed him. He was about eight to ten feet behind Watson.

Watson banged one hole, then he banged a second hole. Collette saw dirt and snow blowing. He heard hissing and smelled gas.

Watson immediately stepped back, pulled out his phone, and called KeySpan. Then, Watson and Collette moved their vehicles down the street. Mr. Collette pulled out and fired up his FIU and CGI. He was testing the equipment by sweeping the area in front of the Jeep.

He had not smelled gas prior, but smelled gas after Watson pogoed. The gas service was on the front of the house on the left side.

After about one-half hour after the call was made, the emergency responder arrived on the scene. The responder spoke to Watson, and then dug down three or four shovels full with his shovel. Watson left the scene, and Collette was putting his equipment back in his truck when the incident occurred.

## **EXHIBIT 4**

**Drug and Alcohol Test Results**

**COMMONWEALTH OF MASSACHUSETTS DEPARTMENT OF PUBLIC  
UTILITIES PIPELINE ENGINEERING AND SAFETY DIVISION**

**FIRST SET OF INFORMATION REQUESTS FROM THE PIPELINE  
ENGINEERING AND SAFETY DIVISION OF THE DEPARTMENT OF PUBLIC  
UTILITIES TO KEYSpan ENERGY DELIVERY**

RE: 44 Willowdale Street, Groton (December 11, 2007)

Respondent: Linda Lamkin

**INFORMATION REQUEST NO. PL 1-21**

Provide the results of the post incident drug and alcohol test results for the three Employees listed in IR PL 1-4.

Response:

The drug and alcohol testing on Terrance Dye was negative. KeySpan is awaiting complete drug and alcohol testing results Philip Watson and James Collette and it will supplement this response when that information is received.

TEAMWORK  
SYSTEMS

Phone 1-800-200-4994  
770-477-1053 or 770-477-1149

6906 Tara Blvd., Suite 7  
Jonesboro, GA 30236

Fax 770-477-1323  
web: www.teamworksystems.net

**ATTENTION:**

Attn: Mr Paul Gerabedian  
Surveys & Analysis Inc  
538 Hartford Turnpike  
Shrewsbury, MA 01545

Home Base: Surveys and Analysis Inc (100)  
Participant: James D Collette  
Participant ID: 253  
SSN: 022-58-3087

**Results of DOT Controlled Substance Test**

Record Status: **Negative**  
Test Type: Post-accident Test  
Collection Date/Time: 12/11/2007 4:45 PM  
Batch ID: 20071213  
Specimen ID: 0056383147  
Date COC Received: 12/12/2007  
Medical Review Officer: George Capo, DO CMRO  
Sample Type: Urine

Laboratory: Clinical Reference Laboratory  
8433 Quivira Rd  
Lenexa, KS 66215  
Collection Site: Fallon Occupational Health  
630 Plantation St  
Worcester, MA 01605  
Verification Date: 12/13/2007  
Specimen Collector: Sandra Kosmoder

<u>Substance Tested</u>	<u>Result</u>	<u>Substance Tested</u>	<u>Result</u>
Cocaine	Negative	Amphetamines	Negative
Marijuana	Negative	Opiates	Negative
Phencyclidine	Negative		

This is a DOT test.

 /B.W.

George Capo, DO CMRO

12/13/2007

Date

ON-SITE DRUG/ALCOHOL TEST DEVICES - LABORATORY TESTING SERVICES - MRO SERVICES  
RANDOM SELECTIONS - EDUCATIONAL SERVICES - PAPER & PENCIL TESTS

**TEAMWORK  
SYSTEMS**

Phone 1-800-200-4994  
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**ATTENTION:**

Attn: Mr Paul Gerabedian  
Surveys & Analysis Inc  
538 Hartford Turnpike  
Shrewsbury, MA 01545

Home Base: Surveys and Analysis Inc (100)  
Participant: James D Collette  
Participant ID: 253  
SSN: 022-58-3087

**Results of DOT Alcohol Test**

Record Status: Negative  
Test Type: Post-accident Test  
Collection Date/Time: 12/11/2007 5:01 PM  
Batch ID: 20071218  
Specimen ID: 1329  
Date COC Received: 12/18/2007  
Sample Type: Breath

Collection Site: Fallon Occupational Health  
630 Plantation St  
Worcester, MA 01605  
Specimen Collector: Sandra Kosmider

<u>Substance Tested</u>	<u>Result</u>
Alcohol	Negative

**This Is A DOT Test**

ON-SITE DRUG/ALCOHOL TEST DEVICES - LABORATORY TESTING SERVICES - MRO SERVICES  
RANDOM SELECTIONS - EDUCATIONAL SERVICES - PAPER & PENCIL TESTS



**Drug Testing System**  
**Lab Results Report:**  
**DRUGTEST**

12/17/2007

<b>Employee:</b>	WATSON, PHILIP
<b>Employee Number:</b>	021605630
<b>Employer:</b>	NATIONAL GRID (FORMERLY KEYSpan)
<b>Employer Number:</b>	24631
<b>Location:</b>	NATIONAL GRID - KEYSpan NE- PHMSA
<b>Location Code:</b>	KEY016
<b>Ordering Account Number:</b>	984247KEY016
<b>COC Number:</b>	0967505980
<b>Specimen ID:</b>	0967505980-1207
<b>Reason:</b>	POST ACCIDENT
<b>Modality:</b>	RSPA
<b>Date Collected:</b>	12/11/2007
<b>Lab Received:</b>	12/13/2007
<b>Lab Reported:</b>	12/13/2007
<b>Date COC Rec:</b>	12/14/2007
<b>MRO Verified:</b>	12/14/2007
<b>Date Reported:</b>	12/14/2007
<b>MRO Operator:</b>	IMAGENOWFILEMOVER
<b>Result:</b>	<b>NEGATIVE</b>
<b>Drug Class:</b>	<b>Result:</b>
AMPHETAMINES	NEGATIVE
COCAINE	NEGATIVE
MARIJUANA	NEGATIVE
OPIATES	NEGATIVE
PHENCYCLIDINE	NEGATIVE

**NOTE: All positive drug test results have been verified through GC/MS confirmation tests.**

**Laboratory:** LABCORP

*John G. Cametas M.D.*

John G. Cametas, Medical Review Officer  
 Pembroke Occ Health  
 2301 N. Parham Rd.  
 Richmond, VA 23229  
 Phone: 8043461010 Fax: 8043465050

## **EXHIBIT 5**

**Records of Gas Main on Willowdale Road**

**COMMONWEALTH OF MASSACHUSETTS DEPARTMENT OF PUBLIC  
UTILITIES PIPELINE ENGINEERING AND SAFETY DIVISION**

**FIRST SET OF INFORMATION REQUESTS FROM THE PIPELINE  
ENGINEERING AND SAFETY DIVISION OF THE DEPARTMENT OF PUBLIC  
UTILITIES TO KEYSpan ENERGY DELIVERY**

RE: 44 Willowdale Street, Groton (December 11, 2007)

Respondent: David Iseler, James Hughes

**INFORMATION REQUEST NO. PL 1-7**

Provide records for the main on Willowdale Street, including but not limited to, installation date, MAOP, leak history (over the last 2 years) and operating pressure at the time of the incident. Include in your response a description of any maintenance or replacement work performed on the main within the last 2 years.

Response:

Main footage and installation date is listed in the table below.

**KeySpan Energy Delivery** 12/13/2007 10:44:49AM

**Mains Details by Operation Area, Town and Street**

<u>Main Object ID</u>	<u>Material</u>	<u>Pressure</u>	<u>Diameter</u>	<u>Install Date</u>	<u>Length</u>	<u>Street Object ID</u>	<u>L F Add</u>	<u>L T Add</u>	<u>R F Add</u>	<u>R T Add</u>
<u>State: MA</u>				<u>Master Town Code: GRO</u>		<u>Town Code: GRO</u>				
<b>WILLOWDALE RD</b>										
384169	CS	H	2.000	1/1/1955	1,211.70	1059622	1	87	2	86
384149	CS	H	2.000	1/1/1930	22.10	1059622	1	87	2	86
384172	CS	H	2.000	1/1/1930	110.70	1059622	1	87	2	86
<b>Total Length for Street: WILLOWDALE RD:</b>										<b>1,344.50</b>
<b>Total Length for Selected Streets in Town: GRO:</b>										<b>1,344.50</b>
<b>Total Length for Selected Streets in Op. Area: MSFLEO:</b>										<b>1,344.50</b>

The MAOP of the main is 60 psig. Gas Control does not have any telemetry (i.e., pressure reading capability) in the town of Groton. Therefore, an estimated pressure reading at the time of the incident on Willowdale St was calculated based on using our SynerGEE distribution system model and prevailing conditions that day. Gas Control was able to provide the outlet pressure (i.e., 57 psig) at the time of the incident of one of the closest district regulators supplying the 60 psig system in Groton (i.e., East Main @ Ayer Circle, Ayer). The weather conditions on December 11th, the date of the incident, was a 28 Effective Degree Day (EDD). On a 28 EDD and with the supplying district regulators set at 57 psig, the SynerGEE model predicts a peak-hour pressure on

Willowdale St of 54 psig. However, the incident occurred off peak (approx. 2 p.m.). Therefore, it is estimated that the pressure on Willowdale St would have been somewhere in the 54 to 57 psig range.

Main Leak History prior 2 years:  
No main leaks

Main Replacement or Maintenance Work prior 2 years:  
Street Box Work Only

## **EXHIBIT 6**

**Records of Gas Service at 44 Willowdale Road**

**COMMONWEALTH OF MASSACHUSETTS DEPARTMENT OF PUBLIC  
UTILITIES PIPELINE ENGINEERING AND SAFETY DIVISION**

**FIRST SET OF INFORMATION REQUESTS FROM THE PIPELINE  
ENGINEERING AND SAFETY DIVISION OF THE DEPARTMENT OF PUBLIC  
UTILITIES TO KEYSpan ENERGY DELIVERY**

RE: 44 Willowdale Street, Groton (December 11, 2007)

Respondent: Kelly Roberts

**INFORMATION REQUEST NO. PL 1-8**

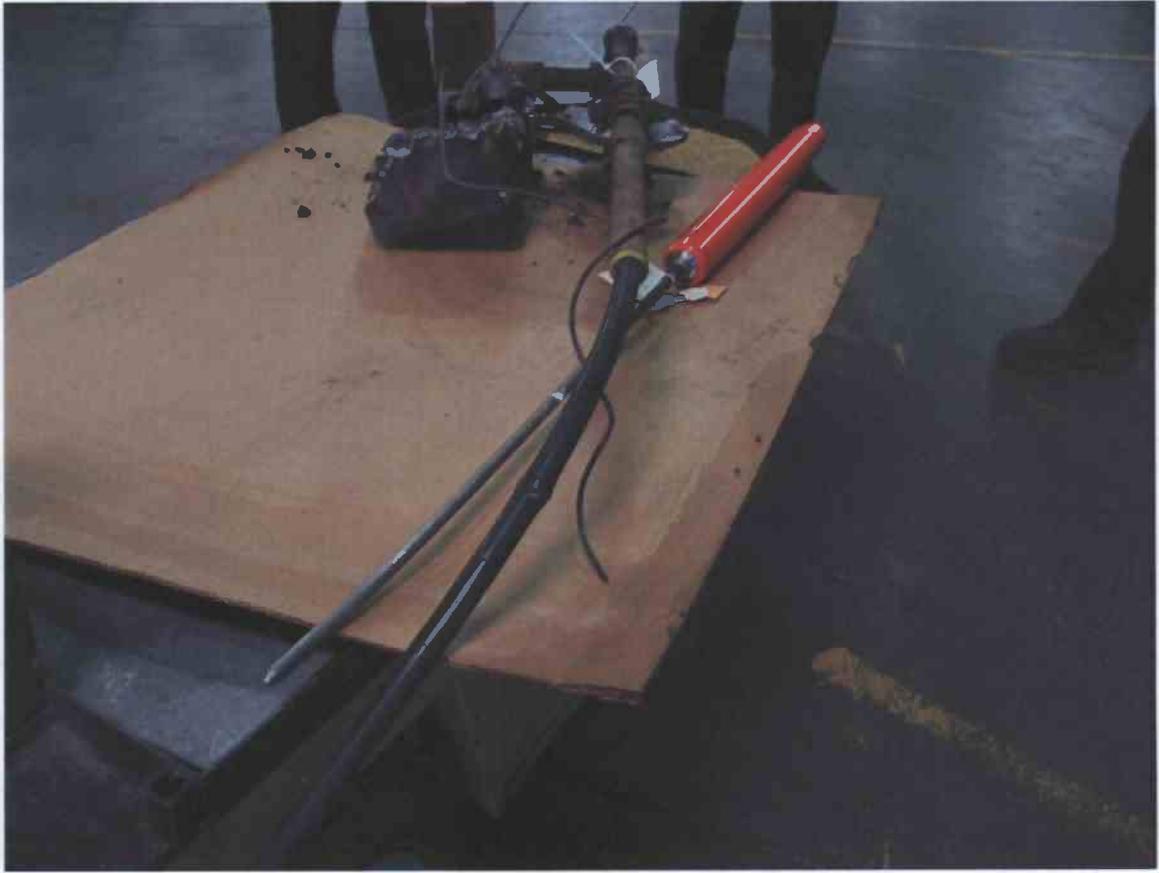
Provide records for the service line to 44 Willowdale Street, including but not limited to: installation date, line size and material, number of meters, leak history and maintenance. Include in your response a description of any leak history or maintenance performed on customer owned piping or appliances. Please list known appliances at that address.

Response:

KeySpan's records indicate that there is one outside meter at the premises. Otherwise, KeySpan has no service card information for 44 Willowdale Road. With respect to leak history, KeySpan has no record of any leak on the service line prior to the date of the incident. KeySpan's records indicate that this was a heating account, but they do not specify which appliances were at this address.

## **EXHIBIT 7**

**Photographs of the Operator's Damaged Facilities and the Incident Scene**







DEC 11 2007



## **EXHIBIT 8**

**DPU Interview of James Collette**

## MEMO

To: File

From: Jorge Santi

Date: December 19, 2007

Re: 44 Willowdale St. Groton, Mass.  
Survey & Analysis Employee Interview

### Interview of Survey & Analysis Employee James Collette

On December 19, 2007 an interview of James Collette was conducted by Groton Police Department Detective Edward Sheridan in attendance was DPU Utility Engineer Jorge Santi.

Detective Sheridan began the interview by asking Mr. Collette who he is employed by and how long he had been working there. Mr. Collette responded that he works for Surveys & Analysis part time during the winter surveying leaks as he is a carpenter and that he has worked for them for a year and a half (1½ yrs.).

He was asked what he had been doing during the morning of the incident and why he was at Willowdale Street, his response was that he was not working that day but had been told to report to the office to get a company vehicle and drive out to meet Phil Watson (Surveys & Analysis employee) so that he could get some leak survey sheets from Mr. Watson and these leaks would become his future work.

Mr. Collette said that he didn't know Mr. Watson and that this was the first time meeting him, he believes that he arrived at Willowdale Street sometime around noon. He said that when he arrived he saw Mr. Watson investigating the leak with an FI machine and asked for the leak survey sheets and when they were given to him he placed them in his vehicle.

He saw Mr. Watson removing the probe bar (pogo) and CGI machine from his car and when he caught up with Mr. Watson he had begun to bar at the house and that it was at this time that he drove the pogo bar through the gas service. They both knew that the gas service had been hit as "they could see it blowing and dirt and dust was flying around".

Detective Sheridan asked what they did next and Mr. Collette stated that they both backed up their cars and that Mr. Watson called dispatch to report the leak. When asked how long he had been there before the gas service was damaged Mr. Collette thought that he had been there approximately 5/10 minutes but wasn't exactly sure.

He said that he was told to go to his truck by Mr. Watson as he wasn't actually working there, when asked what they did next he said that they "both sat in their cars and waited for KeySpan to arrive" and that they did not knock on the door to see if anyone was home. He told us that while they were waiting that he could see Mr. Watson using his cell phone as he had parked directly behind him.

He was asked by Detective Sheridan where they were parked in proximity to 44 Willowdale and he said that originally they were parked near this house but had moved back to the next house.

He was asked if he recalled how long it had taken for KeySpan to arrive and he believes that it took approximately 20/25 minutes and said that when the KeySpan employee arrived the person took out a shovel and began to dig near the foundation wall. During this time he said that he had been approximately 20/30 feet away waiting at the front of his vehicle and did not know what conversations Mr. Watson and the KeySpan employee had.

Mr. Collette was asked what he had done while he was waiting and he said that he had taken out his FI and CGI Machine and had warmed up the equipment in case it was needed. He saw Mr. Watson and the KeySpan employee discussing the leak and after a short while Mr. Watson walked over to him and told him that they could leave as KeySpan was now responsible for the leak.

He said that Mr. Watson left before he did and as he was securing and placing the equipment back in his truck he heard the KeySpan employee say "there is gas in the house" and recalls that the serviceman checked at the mail slot and around both the front and rear doors.

He recalled that Mr. Watson had been gone from the site approximately 5/10 minutes and that he was standing on the driver's side of his truck storing the equipment and that the KeySpan employee was at the back of his van. At this time he heard a loud explosion and felt hot temperatures on his face and ringing in his ears. He said that he and the KeySpan employee looked at each other and were surprised by what had occurred.

When asked how long the KeySpan employee had been on site prior to the explosion he said that it had been approximately 15 minutes. He recalled a Police Officer yelling at him and the KeySpan employee to move their trucks out of the way as the Fire Department equipment was on the way. He said that he knew that the KeySpan employee was alright so he left the jobsite.

The detective asked what he did next and Mr. Collette said that he drove to a nearby gas station and called the office and told them about the explosion but was told that they already knew about it and they hung up. He called his relatives to let them know that he was okay after what had occurred and that he waited there approximately one hour to settle down.

He then drove back to the Surveys & Analysis office in Shrewsbury to return the vehicle and when he arrived he told the secretary that he had been onsite at Willowdale Street during the explosion. He said that they were surprised as they did not know that he had been there during that time and was told that he had to go for a Drug and Alcohol test since he had been on site. He was told to report to the Fallon Community Center in Worcester and arrived there at 1635 hrs. and was drug and alcohol tested.

He was asked by Detective Sheridan if he had left any equipment at the site and Mr. Collette said that he had not left anything behind and had been told by Mr. Watson that a CGI Machine with "James" written on it had been found, he said that it was not his and that all of the equipment issued to him was in his truck. He said that the equipment had recently been tested on the same day and the test date stickers that were on the machines in his truck had matching dates.

Detective Sheridan asked him if he had any other items that he wanted to discuss and Mr. Collette said "I probably shouldn't be telling you this" but when the KeySpan employee dug with his shovel near the service he could see the dirt and snow go "poof". He was asked how far away he was when this took place and he said that he was about 15/20 feet away.

I asked Mr. Collette if he knew the depth that gas services are installed at and he said "services are four (4) feet deep" I asked if he knew the depth of gas mains and he said "that he believes mains are also four (4) feet deep" and that he had never been asked these questions before.

When asked if he pogo's over the gas services when he investigates leaks he said that he usually pogo's one (1) foot over on either side of the gas service. When asked how deep he drives the pogo into the ground he said that usually he goes two (2) feet deep to be sure he gets good readings.

He was asked about the training that he has received and he said that he has reviewed booklets, watched videos, taken written tests and had two weeks of field training. He was then asked how he has been trained to handle situations such as the one that occurred at Willowdale Street and he said that he didn't recall how to handle them. Mr. Collette later said that he recalled being trained to handle situations like this and taught to control and secure the location, knock on doors and clear the house if required.

Mr. Collette was asked what he had been doing since the incident occurred and he said that he has not worked since the incident occurred and that the leak survey sheets that he obtained from Mr. Watson were left at the office. He also said that last week he was interviewed by KeySpan regarding what had occurred.

The meeting adjourned.

## **EXHIBIT 9**

**DPU Interview of Philip Watson**

## MEMO

To: File

From: Glenn LaChance, Jorge Santi

Date: December 13, 2007

Re: 44 Willowdale St. Groton, Mass.  
Survey & Analysis Employee Interview

### Interview of Survey & Analysis Employee Philip Watson

On December 11, 2007 an interview of Philip Watson was conducted by Groton Police Department Detective Edward Sheridan. In attendance were State Trooper Craig Boudreau, Groton Fire Chief Joseph L. Bosselait, DPU Utility Engineers Glenn LaChance and Jorge Santi.

Detective Sheridan asked Mr. Watson to describe what had occurred during his work day beginning with the activities leading up to the incident. Mr. Watson stated that he had started performing leak survey activities in the Waltham area but was told by his supervisor at some point during the morning to report to the Groton area and begin monitoring existing Grade 3 leaks.

He said that he arrived at 46 Willowdale St. before 1250 hrs. and had been at the job site for approximately ten minutes when he began to survey the grade 3 leak located across the street from the house with his FUI machine and detected readings so he proceeded to investigate further in the direction of the house utilizing his CGI machine and pogo bar.

He said that he placed a bar hole at the curb line and that he had attained gas readings so he proceeded closer to the property and placed another bar hole at the outside service location to further check the migration area. He stated that when he barred at the service location he knew that he had damaged the service line as he could hear the gas blowing and dust and dirt was flying around.

Detective Sheridan asked if he checked the house for occupants and Mr. Watson responded that he had been standing in the street looking at the house and could see that no lights were on so he didn't think that anyone was home and that he had been trained not to knock on doors.

Detective Sheridan asked Mr. Watson what other actions he had taken and he said that he called the KeySpan leak line to report the leak and that he had informed them that he had pogo'd through the service. He was asked if he knew what time he had called at but he could not remember the exact time, so he reviewed his cell phone use and the call to KeySpan was logged

in at 1250 hrs.

Detective Sheridan asked him if he knew how long it had taken the KeySpan employee to respond and Mr. Watson thought that it had taken 45 minutes to 1 hour this was further discussed and the Groton Fire Chief explained that they had been dispatched at 1329 hrs. to an explosion at Willowdale Rd.

Mr. Watson explained that when the KeySpan employee arrived he gave him the paperwork for the leak and showed the KeySpan employee the leak location and after 5 to 10 minutes he left the jobsite and proceed down the street to another grade 3 location. While surveying at the new location he heard a loud noise but did not know that it was an explosion until he started receiving numerous phone calls on his cell phone from his supervisor and KeySpan managers and was told that an explosion had occurred. He was directed by his supervisor and KeySpan supervisor Mark Cohn to report to KeySpan headquarters at 52 Second Ave. Waltham for drug and alcohol testing.

Mr. Watson was asked if anyone else had been present at the incident and Mr. Watson stated that another Survey & Analysis employee whom he did not know as he was a newer employee had been sent to meet him so that he could provide him with some of the monitoring sheets that he had.

He said that he did not know this other person other then his first name being "James" and he stated that he was not training him. Mr. Watson was asked if the CGI machine that had been found at the incident location belonged to "James" and Mr. Watson said that he did not know but when "James" was onsite receiving the paperwork he had taken out his cigarettes and CGI machine. Mr. Watson was asked if "James" had done any work while at the jobsite and he stated that no work had been performed by "James" but he did not know why his CGI machine had been left behind.

Mr. Watson said that as soon as he had exchanged information with the KeySpan employee he left as he had been trained to leave the jobsite as soon as KeySpan employees arrived. He was asked if he knew when "James" left the jobsite and Mr. Watson said that he was walking up the street towards his vehicle to leave when "James" also walked with him and said that he was going to move his truck so that he didn't get blocked in but he did not see "James" leave the jobsite.

Mr. Watson was asked how long he had been surveying and he stated that he had been surveying for 10 months, he was asked how long he was trained for and he said that he had worked in Maine with another surveyor for approximately one month and that he had more training after that so he had probably been surveying on his own for 8 months.

He was asked if he saw the service riser at the foundation wall and he responded "yes, I saw it" when asked why he barred over the gas service he explained that based on previous leak investigations he has found that if he bars on the side of the service the readings sometimes are not present and he was concerned about not finding the leak.

The DPU representatives asked if he knew what depth the services are installed at and he said that services are usually two (2) feet deep and that he has a mark on his pogo stick so that he knows where two feet is so that he doesn't go deeper. Mr. Watson was told that services in private property are installed 12" deep and 18" in sidewalks or public areas. He said that he didn't know that.

Detective Sheridan asked him what type of training he had received and Mr. Watson explained that he had some books in his car that he had received, the detective asked him to bring them in after the interview.

The books that Mr. Watson provided referenced OQ and Corrosion training and were labeled with Kentucky, Baltimore and other utilities that were not located in New England. The books are in the possession of the Detective.

Mr. Watson was asked if he still had the pogo bar, documents and equipment with him but he explained that when he arrived at Second Ave. in Waltham his boss and Mark Cohn had taken these items from his vehicle.

He was asked for his supervisors name and contact information so that Detective Sheridan could contact him to schedule an interview with "James". Mr. Watson was asked if he had anything else to state and he said that he didn't and that he had been told by his supervisor to stay home until further notice.

The interview adjourned.

After Mr. Watson left the interview the Detective and Fire Chief asked Glenn LaChance and I for our thoughts and we explained that personnel are not trained to pogo directly over the gas services and that he should know what depth requirements have been established for gas facilities and how to properly investigate a leak.

The activities of the other survey person "James" were discussed and the length of the time that he was onsite had not been known until the interview and his activities while at the jobsite created additional questions that Detective Sheridan would address as he was going to schedule an interview and call Glenn LaChance when scheduled.

## **EXHIBIT 10**

**Operator's Records of Survey and Analysis Operator Qualification Training**

**COMMONWEALTH OF MASSACHUSETTS DEPARTMENT OF PUBLIC  
UTILITIES PIPELINE ENGINEERING AND SAFETY DIVISION**

**FIRST SET OF INFORMATION REQUESTS FROM THE PIPELINE  
ENGINEERING AND SAFETY DIVISION OF THE DEPARTMENT OF PUBLIC  
UTILITIES TO KEYSpan ENERGY DELIVERY**

RE: 44 Willowdale Street, Groton (December 11, 2007)

Respondent: Chris Frasier, William Haggerty, Phil Quan

**INFORMATION REQUEST NO. PL 1-5**

Refer to IR-PL-1-4 above. Provide training materials utilized to qualify these Employees.

Response:

With respect to the employees of Survey & Analysis, KeySpan did not train these individuals, but it has made a request of Survey & Analysis for any such training materials and will supplement this response. For training material relative to Mr. Dye, please see Attachment PL 1-5.

## **EXHIBIT 11**

**Surveys and Analysis Records of Operator Qualification Training**



538 Hartford Turnpike  
Shrewsbury, MA 01545  
www.surveysandanalysis.com

1-800-899-0704  
(508) 842-4011  
FAX (508) 842-2703

TO: Lisa Gentile  
Director of Support Services  
Keyspan Energy

FROM: William Kildare  
VP of Operations

DATE: February 11, 2008

RE: Request for information

---

The following is in response to the request for information on the 10 items in your letter dated December 18, 2007.

1. Training Dates:  
Phil Watson 02/12/07 – 04/13/07  
James Colette 10/20/08 – 11/07/05
2. Training Documents:  
Training is performed via an apprenticeship structure/on the job training (OJT). The only formal documentation for competency from training is the passing of nationally recognized Operator Qualifications (OQ) testing. Both of these employees have passed both the Industrial Training Services (ITS) OQ program and the Northeast Gas Association (NGA) OQ programs as documented in response to question 3 below. In the case of Mr. Watson, he was monitored numerous times during his apprenticeship by the Keyspan supervisor (Mr. Cohn) prior to being authorized to independently perform surveys for Keyspan.
3. OQ Certifications:  
Attachment 1 is the OQ training records for both Mr. Watson and Mr. Collette under both the ITS program and the NGA program.
4. Dates of Employment:  
Phil Watson 02/12/07  
James Collette 10/20/05
5. Location/Time of drug test for James Collette  
See Attachment 2

6. Location/Time of alcohol test for James Collette  
See Attachment 2
7. Results of drug test for James Collette  
See Attachment 2
8. Results of alcohol test for James Collette  
See Attachment 2
9. Calibration records for Phil Watson's FI equipment  
The calibration record for the equipment is attached to the machine which is in National Grid's possession at this time. The machine is field calibrated and then the updated calibration record is attached to the instrument. The instrument calibration date was 12/08/07.
10. Calibration records for Phil Watson's CGI equipment  
This is a similar process as the FI equipment. It is field calibrated and the calibration record is attached to the instrument. This instrument is also in National Grid's possession. The instrument calibration date was 12/08/07.

If we can be of any further assistance, please let us know.

# EMPLOYEE QUALIFICATIONS

06/22/07 **Surveys and Analysis, Inc.**

Employee ID: Survey-049

First Name: Philip

Last: Watson

Title:

Phone:

Company: Surveys and Analysis, Inc.

State:

## QUALIFICATIONS

<u>Task ID</u>	<u>Name</u>	<u>Revision</u>	<u>Date</u>	<u>Next Date</u>
NGA-006B	Inspecting for atmospheric corrosion	1	05/21/07	05/20/12
NGA-008B	Visually inspecting for internal corrosion	1	05/21/07	05/20/12
NGA-018	Conducting gas leakage surveys	1	05/21/07	05/20/12
NGA-019	Patrolling and inspecting pipeline	1	05/21/07	05/20/12
NGA-020A	Investigating leak/odor complaints	1	05/21/07	05/20/10
NGA-070	Abnormal Operating Conditions /Properties of Natural Gas	1	05/21/07	05/20/10

**PHILIP L WATSON  
SURVEYS AND ANALYSIS  
538 HARTFORD PIKE  
SHREWSBURY, MA 01545**

**Co. Code: 13104  
Instructor: Dulmaine, Neil  
Proctor: Dulmaine, Neil**

**Test Results For:**

**OQ M-1 Performing Leakage Surveys of Gas Facilities**

Test Date: 02/16/2007

Pass/Fail: Pass

Test Key #: 1007

Test Number: 6005

Test Group No: 1466

**Questions Missed:**

4,19,27,35,46,47

**Overall Result for This Group**

<b>Mean:</b>	<b>Median:</b>	<b>S.D:</b>	<b># Above Mastery:</b>	<b># In Group:</b>
87.23	87.23	0.00	1	1



*Managed Training Provider*

310 C. C. Lowry Drive Murray, KY 42071 • Phone 270/753-2150 • Fax 270/753-9807

**PHILIP L WATSON  
SURVEYS AND ANALYSIS  
538 HARTFORD PIKE  
SHREWSBURY, MA 01545**

**Co. Code: 13104  
Instructor: Dulmaine, Neil  
Proctor: Dulmaine, Neil**

**Test Results For:**

**OQ M-7 Preventing Accidental Ignition/Damage Prevention/Responding to  
Abnormal Operating Conditions**

**Test Date: 02/16/2007**

**Pass/Fail: Pass**

**Test Key #: 839**

**Test Number: 6015**

**Test Group No: 1467**

**Questions Missed:**

15,24,32,

**Overall Result for This Group**

<b>Mean:</b>	<b>Median:</b>	<b>S.D:</b>	<b># Above Mastery:</b>	<b># In Group:</b>
90.91	90.91	.000	1	1



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**PHILIP L WATSON**  
**SURVEYS AND ANALYSIS**  
**538 HARTFORD PIKE**  
**SHREWSBURY, MA 01545**

**Co. Code: 13104**  
**Instructor: Dulmaine, Neil**  
**Proctor: Dulmaine, Neil**

**Test Results For:**

OQ Task I-1(b) Monitoring Corrosion Control Methods/ Patrolling and Surveillance

Test Date: 02/16/2007

Pass/Fail: Pass

Test Key #: 779

Test Number: 6000

Test Group No: 1465

**Questions Missed:**

7,

**Overall Result for This Group**

<b>Mean:</b>	<b>Median:</b>	<b>S.D:</b>	<b># Above Mastery:</b>	<b># In Group:</b>
94.12	94.12	0.00	1	1

**EMPLOYEE QUALIFICATIONS**

09/11/2006 NEGA Contractor Pool

Employee ID: Survey-013

First Name: James

Last: Collette

Title:

Phone:

Company: NEGA Contractor Pool

Company Name: Survey Analysis

State:

**QUALIFICATIONS**

<u>Task ID</u>	<u>Name</u>	<u>Revision</u>	<u>Date</u>	<u>Next Date</u>
NGA-006B	Inspecting for atmospheric corrosion	1	12/05/2005	12/05/2010
NGA-008B	Visually inspecting for internal corrosion	1	12/05/2005	12/05/2010
NGA-018	Conducting gas leakage surveys	1	12/05/2005	12/05/2010
NGA-019	Patrolling and inspecting pipeline	1	12/05/2005	12/05/2010
NGA-020A	Investigating leak/odor complaints	1	12/05/2005	12/04/2008
NGA-070	Abnormal Operating Conditions /Properties of Natural Gas	1	12/05/2005	12/04/2008



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**JAMES D COLLETTE  
SURVEYS AND ANALYSIS  
538 HARTFORD PIKE  
SHREWSBURY, MA 01545**

**Co. Code: 13104  
Instructor: Dulmaine, Neil  
Proctor: Dulmaine, Neil**

**Test Results For:**

**GDS 1.11 OQ M-7 Prevent Accidental Ignition**

Test Date: 04/16/2005

Pass/Fail: Pass

Test Key #: 541

Test Number: 8196

Test Group No: 2572

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**Questions Missed:**

25,

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**Overall Result for This Group**

<b>Mean:</b>	<b>Median:</b>	<b>S.D:</b>	<b># Above Mastery:</b>	<b># In Group:</b>
97.06	97.06		1	1



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JAMES D COLLETTE  
SURVEYS AND ANALYSIS  
538 HARTFORD PIKE  
SHREWBURY, MA 01545

Co. Code: 13104  
Instructor: Dulmaine, Neil

**Test Results For:**

GDS 2.5 OQ Task M-1 Performing Patrol & Leakage Surveys on Gas Pipeline Facilities

Test Date: 03/26/2005

Pass/Fail: Pass

Test Key #: 784

Test Number: 4452

Test Group No: 2326

**Questions Missed:**

2,22,

**Overall Result for This Group**

Mean:	Median:	S.D:	# Above Mastery:	# In Group:
94.29	94.29	0.00	1	1



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**JAMES D COLLETTE  
SURVEYS AND ANALYSIS  
538 HARTFORD PIKE  
SHREWBURY, MA 01545**

**Co. Code: 13104  
Instructor: Dulmaine, Neil**

**Test Results For:**

OQS I-1.1, 1.4 and I-1.12 Monitoring Corrosion Control Methods Used on Buried Metal Pipelines

Test Date: 03/26/2005

Pass/Fail: Pass

Test Key #: 553

Test Number: 4436

Test Group No: 2325

**Questions Missed:**

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**Overall Result for This Group**

<b>Mean:</b>	<b>Median:</b>	<b>S.D:</b>	<b># Above Mastery:</b>	<b># In Group:</b>
100.00	100.00	0.00	1	1

## **EXHIBIT 12**

**Operator Qualification Records for Employees Present at Incident**

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## EMPLOYEE QUALIFICATIONS

12/18/2007 **Keyspan Energy Delivery New England**

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**Employee ID:** 13347                      **First Name:** Terrance                      **Last:** Dye  
**Title:** App Tech      Apprentice Technician                      **Phone:**  
**Company:**      Keyspan Energy Delivery New England  
**Company:**      BGC                      **State:** MA  
**Location:**      COMMERCIAL POINT  
**Department:**      PFR  
**Union Code:**      Union

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### QUALIFICATIONS

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<u>Task ID</u>	<u>Name</u>	<u>Revision</u>	<u>Date</u>	<u>Next Date</u>
NGA-006	Inspecting for atmospheric corrosion	1	10/01/2007	09/30/2012
NGA-008	Visually inspecting for internal corrosion	1	10/01/2007	09/30/2012
NGA-011	Applying pipe coating in the field	1	10/01/2007	09/30/2012
NGA-012	Cleaning and either coating or jacketing pipe for atmospheric	1	10/01/2007	09/30/2012
NGA-017	Repair coating on steel pipelines	1	10/01/2007	09/30/2012
NGA-018	Conducting gas leakage surveys	1	10/01/2007	09/30/2012
NGA-019	Patrolling and inspecting pipeline	1	10/01/2007	09/30/2012
NGA-020	Investigating leak/odor complaints	1	10/01/2007	09/30/2010
NGA-022	Inspection of 3rd party excavations for damage prevention	1	10/01/2007	09/30/2012
NGA-023	Inspecting the condition of exposed pipe or pipe coating	1	10/01/2007	09/30/2012
NGA-024	Inspect pipe for damage	1	10/01/2007	09/30/2012
NGA-041	Inspect valves	1	10/01/2007	09/30/2012
NGA-042	Repair and maintain distribution line valves	1	10/01/2007	09/30/2012
NGA-043	Lubricate distribution line valves	1	10/01/2007	09/30/2012
NGA-045	Restore service	1	10/01/2007	09/30/2012
NGA-046 (Deleted)	Deleted Rev C June 9, 2005	1	10/01/2007	09/30/2012
NGA-070	Abnormal Operating Conditions /Properties of Natural Gas	1	10/01/2007	09/30/2010

**EMPLOYEE QUALIFICATIONS**06/22/07 **Surveys and Analysis, Inc.**

Employee ID: Survey-049      First Name: Philip      Last: Watson  
Title:      Phone:  
Company: Surveys and Analysis, Inc.      State:

**QUALIFICATIONS**

<u>Task ID</u>	<u>Name</u>	<u>Revision</u>	<u>Date</u>	<u>Next Date</u>
NGA-006B	Inspecting for atmospheric corrosion	1	05/21/07	05/20/12
NGA-008B	Visually inspecting for internal corrosion	1	05/21/07	05/20/12
NGA-018	Conducting gas leakage surveys	1	05/21/07	05/20/12
NGA-019	Patrolling and inspecting pipeline	1	05/21/07	05/20/12
NGA-020A	Investigating leak/odor complaints	1	05/21/07	05/20/10
NGA-070	Abnormal Operating Conditions /Properties of Natural Gas	1	05/21/07	05/20/10

**EMPLOYEE QUALIFICATIONS**

09/11/2006 NEGA Contractor Pool

Employee ID: Survey-013

First Name: James

Last: Colletta

Title:

Phone:

Company: NEGA Contractor Pool

Company Name: Survey Analysis

State:

**QUALIFICATIONS**

Task ID	Name	Revision	Date	Next Date
NGA-008B	Inspecting for atmospheric corrosion	1	12/05/2005	12/05/2010
NGA-008B	Visually inspecting for internal corrosion	1	12/05/2005	12/05/2010
NGA-018	Conducting gas leakage surveys	1	12/05/2005	12/05/2010
NGA-019	Patrolling and inspecting pipeline	1	12/05/2005	12/05/2010
NGA-020A	Investigating leak/odor complaints	1	12/05/2005	12/04/2008
NGA-070	Abnormal Operating Conditions /Properties of Natural Gas	1	12/05/2005	12/04/2008

## **EXHIBIT 13**

**Operator's Operator Qualification Training Materials**

## LEAK-5010: First Response and Leak Investigation

<b>Date:</b>	10/25/2005	<b>Filed:</b>	Yes	<b>Application:</b>	MA
		<b>Review:</b>	Annual	<b>Lead Org:</b>	Field Ops
<b>Revision: Revision to A.2.c, B.1.a, B.5.b referencing removal of sources of ignition.</b>					

### DESCRIPTION

This document describes the procedure for emergency response to odor complaints and gas leaks.

### PROCEDURE

#### A. General

##### 1. GAS LEAK INVESTIGATION PROCEDURES

- a. Any report of gas leakage shall be considered an emergency, and personnel should assume that the worst possible conditions exist, until the investigation proves otherwise. Prompt and careful evaluation of an emergency shall be considered essential to the safety of the employee, the customer, and the public.
- b. Implementation of the Gas Leak Investigation Procedures can vary according to the situation. The safe resolution of each gas leak depends on the proper assessment and appropriate actions of trained employees at the leak location.
- c. Gas Leak Investigations fall into two general categories; namely, investigating outside leaks and inside leaks. Generally, outside leaks originate from the Company's distribution system or from one of the Company's facilities, and inside leaks originate from the distribution system, or a customer's piping or gas-burning equipment.
- d. The procedures for investigation of gas leakage is outlined below, including procedures for outside and inside leak investigation, leak standby and leak monitoring, and the investigation of damaged service lines and mains.
- e. A gas leak shall be classified as Grade 1, 2, 2A or 3 as described in the Massachusetts Emergency Plan, Appendix A. A sketch depicting the Leak Classification Criteria is attached to this document.
- f. Leak investigation personnel shall purge their Combustible Gas Indicator (CGI) in fresh air before taking readings during an investigation.

##### 2. EMERGENCY RESPONSE PERSONNEL

- a. An Emergency Response Unit (ERU) is a specially equipped vehicle that is used by a PFR Representative to investigate whether an inside or outside gas leak exists at a location, and to classify the leak as a Grade 1, 2, 2A, or 3 if a leak is found at that location. Each ERU has a combustible gas indicator (CGI) and a hydrogen flame ionization unit (FI unit).

- b. An ERU, or other Company or contractor personnel trained and qualified to perform a leak investigation and classify a leak ("leak investigation personnel"), should be dispatched by Emergency Dispatch after receiving a report of an odor or an alleged leak. If an ERU cannot be dispatched, a PFR Representative shall be dispatched.
- c. When the ERU or other leak investigation personnel classifies a leak as a Grade 1, personnel shall:
  - Notify Emergency Dispatch.
  - If possible, potential sources of ignition should be removed from any hazardous area.**
  - Concentrate the leak investigation on buildings in the immediate gas migration area.
  - When a gas reading is detected in a manhole, take appropriate action to protect the general public, such as venting the manhole. Check all manholes in the area for gas, beginning with those that belong to the same utility (e.g., telephone, electric, sewer) in which the initial reading was obtained. Check the manholes for gas in all directions until a zero reading is found.
  - Proceed with the outside leak investigation, if found necessary.
  - Complete the Leak Investigation Report, Form No. 2236.
  - Emergency Dispatch shall notify the Field Operations Supervisor or the on-call Field Operations Supervisor of the location of each Grade 1 leak discovered by an ERU or other Leak Investigation Personnel.
- d. The Field Operations Supervisor shall inform Emergency Dispatch as to which MSF crew should be assigned to the location. A Grade 1 leak shall be repaired immediately or other remedial action taken that allows the leak to be downgraded; that is, it is no longer a Grade 1 leak.
- e. Emergency Dispatch shall dispatch the designated MSF crew to the location of the Grade 1 leak.
- f. After authorization by Emergency Dispatch or a Field Operations Supervisor, the Leak Investigation Personnel or ERU may leave the location of an unabated Grade 1 leak under the following conditions:
  - After marking the location of the leak and conveying the location information to Emergency Dispatch; or
  - After arrival of, and communication and agreement with, the Field Operations Supervisor, or on-call Field Operations Supervisor or MSF crew; or
  - After arrival of, and communication with, a standby PFR Representative that is sent by Emergency Dispatch. In this instance, the departure of the Leak Investigation Personnel or ERU may occur before the arrival of the Field Operations Supervisor or on-call Field Operations Supervisor or MSF crew.
- g. In the event that an ERU or leak investigation personnel cannot be dispatched in response to an emergency, Emergency Dispatch shall send a PFR Representative or other personnel qualified (i.e., MSF crew) to investigate, but not classify, the leak at the location for leak investigation.
- h. The personnel dispatched shall notify Emergency Dispatch of the results of the leak investigation.

- i. If a leak is found, Emergency Dispatch shall notify the Divisional Field Operations Supervisor, or on-call Field Operations Supervisor of the information received.
- j. The Field Operations Supervisor, or on-call Field Operations Supervisor shall determine the classification of the leak by one or more of the following options:
  - Personally conducting an on-site leak investigation. The information received from Emergency Dispatch and the PFR Representative may be used in the determination.
  - Dispatching a MSF crew to the location to classify the leak.
  - Dispatching a leak survey consultant to the location to classify the leak.
  - Dispatching the Emergency Truck to classify the leak.
  - Dispatching an ERU or other leak investigation personnel, as soon as they are available.
- k. The personnel who classify the leak shall notify Emergency Dispatch of the leak classification (i.e., Grade 1, 2, 2A or 3), and the action taken to mitigate the leak if it is a Grade 1.
- l. Emergency Dispatch shall:
  - Identify the leak classification (i.e., Grade 1, 2, 2A or 3) and record gas readings on the leak ticket.
  - Note the location of the leak if it is different from the reported address.
  - Immediately notify the appropriate Field Operations Supervisor of any reported Grade 2 or 2A leak with extraordinary circumstances determined by the leak investigation personnel.

## B. OUTSIDE LEAK INVESTIGATION

### 1. MARKING

- a. Company personnel shall conduct an investigation of the reported leak location to determine whether gas is leaking and, if it is, determine if it poses a potential hazard to the public or property at the time of detection. **If possible, potential sources of ignition should be removed from any hazardous area.** Accordingly, appropriate action shall be taken. PFR personnel or leak survey consultants shall mark the location where gas readings are found outside with a yellow crayon by circling the letters "PFR" or with a yellow flag.

### 2. BUILDING CHECK

- a. When the initial investigation determines that the leak is hazardous, the PFR Representative shall check all buildings within 200 feet on both sides of the street(s) in all street directions beyond the last place where gas is detected. In addition to checking the buildings, the PFR Representative shall check any available openings in the street in an attempt to determine the extent of the leak migration.
- b. The PFR Representative shall enter all buildings within the leak investigation area unless directed otherwise by a Field Operations Supervisor or Field

Authority, or after checking at the foundation and any available openings to the inside, a determination can be made that gas is not entering the building.

- c. When normal access to a building cannot be attained and positive readings are obtained at the foundation wall or at any available openings to the inside of the building, forced entry may be required. The Police and/or Fire Departments should be requested to assist in the forced entry, unless the situation dictates that immediate action should be taken by the PFR Representative.
- d. The building checks shall continue until the extent of the leak migration has been determined, the area is not expanding, and the leak has been brought under control, or unless directed otherwise by a Field Operations Supervisor or Field Authority.

### 3. EVACUATION OF BUILDINGS

- a. When a concentration of gas is detected in the atmosphere inside a building, evacuation of the building shall be considered. People shall be evacuated and restricted from buildings when the concentration of gas inside, outside in the ground, or in the air indicates ignition of the escaping gas is a possibility. People within the building should be warned against operating electric switches and devices or smoking during the evacuation. The location shall be considered a hazardous area.
- b. Emergency Dispatch shall promptly request the Fire Department to provide assistance whenever there is an evacuation of a building, unless the Company representative has informed Emergency Dispatch that the Fire Department is on-site. If the Fire Department is on-site before the arrival of a Company representative, the Company representative shall communicate with the Fire Department and determine the actions that the Fire Department has taken or plans to take.
- c. The evacuation of other buildings in close proximity to a hazardous area shall be evaluated.
- d. When required, assistance of the Police Department shall be requested to keep people and traffic at a safe distance from a hazardous area.
- e. The PFR Representative shall inform Emergency Dispatch of the evacuation and, as soon as practicable, Emergency Dispatch shall be informed of the number of people that were evacuated and the approximate time when the evacuation took place.
- f. Ventilation of a building may preclude the necessity for evacuation.

### 4. VENTILATION OF BUILDINGS

- a. Whenever gas has accumulated within a building, including the cellar or any floor in a building, the windows and doors shall be opened or broken, if necessary, to establish proper ventilation on all affected floors. Consideration should be given to ventilating floors above the affected floors.
- b. If, in the judgment of the PFR Representative, ventilation cannot be performed safely from within the building, it shall be accomplished from outside of the building.
- c. The amount of ventilation provided should be consistent with that necessary to maintain CGI readings below ignition levels and as low as possible in the

atmosphere within the building. If additional ventilation is required, ventilating fans, which are available at various Company locations, should be requested.

- d. Emergency Dispatch shall be informed as soon as practicable when conditions require ventilation to be accomplished from outside of the building, or when gas readings within a ventilated building are increasing.
- e. The Fire Department should be notified of any building that has been ventilated in conjunction with an evacuation.

#### 5. SOURCES OF IGNITION WITHIN A BUILDING

- a. When entering a building to investigate a reported leak, the door bell or any electric switch in the building shall not be activated because electrical devices may provide a source of ignition for accumulated gas.
- b. **Whenever** possible, potential sources of ignition should be removed from any hazardous area.
- c. Areas where coal or wood burning equipment are located, and are being used, should be isolated and ventilated.
- d. After thoroughly testing the atmosphere with a CGI and if conditions warrant, potential ignition sources, such as gas pilots and oil burners, should be eliminated.
- e. Emergency Dispatch shall be notified to request the telephone company and appropriate electric utility for an emergency shutoff when it is unsafe for Company personnel to do so (e.g., at the building's switch box).

#### 6. CONCENTRATION OF GAS

- a. It should be determined with a CGI whether escaping gas is entering a confined space in a sufficient concentration to make ignition in that space a possibility. Consideration should be given to confined spaces in or under structures, and to underground gas migration or migration caused by air movement.
- b. If a gas concentration cannot be readily determined, judgment shall be used by Company personnel to determine whether the area should be evacuated.

#### 7. COMMUNICATION WITH PERSONNEL

- a. The leak investigation shall be discussed with the MSF personnel and/or Leak Survey personnel when they are on the scene. If the leak is classified as a Grade 1, the 200 foot leak investigation shall be carried out.

### C. NONHAZARDOUS LEAK: GRADE 2, 2A OR 3

1. When it is determined through the investigation that the leak is not hazardous, or it is classified by ERU, MSF or Leak Survey personnel as a Grade 2, 2A or 3, including any gas detected in a manhole, the PFR Representative shall investigate two buildings beyond each side of the gas migration area, or all buildings within 200 feet of the gas migration, whichever is less. In either case, the buildings that are opposite one another on both sides of the street(s) in all street directions shall be investigated.

2. If the investigation determines that there is no gas escaping into any building, and that there is no immediate potential for gas migration into any building, the PFR Representative shall consider the investigation complete.
3. Before leaving the leak location, the leak investigation personnel shall notify Emergency Dispatch of the leak classification.

#### **D. REPORT TO EMERGENCY DISPATCH**

1. Initial information regarding the conditions at the location shall be reported to Emergency Dispatch, as soon as practicable.
2. At least hourly, Emergency Dispatch shall be informed of the buildings checked and CGI'd (Can't Get In) as listed on the Premise Condition Report.
3. For Standby and Monitor Check reporting requirements by PFR and MSF personnel to Emergency Dispatch.

#### **E. RE-CHECK OF AREA**

1. After escaping gas has been brought under control and before removing any area restrictions or allowing people to return to an evacuated building(s), the restricted area shall be re-checked with a CGI to ensure that there is no hazard to people or property.
2. The need for a Standby should be based upon the determination that gas is entering, or could imminently enter, a building. The determination shall be made using a CGI. A Standby can be initiated after the leak migration area has been determined, the area is not expanding, and the leak has been brought under control. To determine the leak migration area, more than one 200 foot check may be necessary. Standby may also be initiated if none of the preceding conditions existed. (Refer to the Leak Standby Procedure, Section H of this document, for individual responsibilities).

#### **F. RECORDS - OUTSIDE LEAK INVESTIGATION**

1. The PFR Representative shall complete the Mobile Data Terminal ("MDT") Leak Completion Screen for the building initially checked during the Leak Investigation.
2. A Premise Condition Report, Form 1701, shall also be required on all Leak Investigations, except as provided. All buildings checked in the Leak Investigation, including buildings CGI'd (Can't Get In) and those with zero gas readings, shall be listed on the Premise Condition Report. Whenever the Leak Survey Consultant or Field Operations Supervisor has classified the leak, it shall be noted on the Premise Condition Report under "Comments."
3. Additional entries to the MDT Leak Completion Screen shall not be required for subsequent visits during the Leak Investigation.

4. Personnel conducting an inside leak investigation shall complete a Premise Investigation Summary on the reverse side of the Leak Investigation Report, Form 2236 , for all streets on which buildings were investigated. Those buildings with a zero gas reading shall also be recorded.
5. When forced entry is required, a Forced Entry Form, Form 2261, shall be left in the customer's premises.
6. Communications
  - a. Leak Investigation Personnel shall discuss the investigation, including the Premise Condition Report, with the Leak Survey Consultant, and the Field Operations Supervisor or MSF Crew Leader if they are present at the location.
  - b. Classification of the leak by the Leak Survey Consultant or Field Operations Supervisor shall be noted on the Premise Condition Report. The Field Operations Supervisor or MSF Crew Leader's name and/or employee number shall be entered on the Premise Condition Report.
  - c. As often as information or conditions warrant, but at least hourly while on site, the MSF Crew and the PFR Representative shall exchange updated information regarding the status of the leak.

## **G. PIPELINE DAMAGED BY OUTSIDE SOURCES**

### **1. NOTIFICATION AND RESPONSE**

- a. Emergency Dispatch, on notification of a damaged service line or main, shall dispatch a Company representative to the reported leak location as soon as possible. The dispatched representative shall respond to the reported leak location immediately.
- b. Emergency Dispatch shall notify the appropriate Field Operations Supervisor who instructs Emergency Dispatch as to which MSF crew shall be dispatched to the location.

### **2. INVESTIGATION OF BUILDINGS**

- a. Upon arrival at the location, the Company representative shall investigate the building supplied by the damaged service line or main.
- b. Other buildings in the immediate vicinity of the location shall be investigated, except:
- c. When directed otherwise by a Field Operations Supervisor or other Field Authority.
- d. When determination can be made by the Company representative that gas is not entering another building(s). The determination shall be made only after checking the outside perimeter of the foundation and any available openings to the inside of the other building(s). A positive reading may require entry.
- e. If the situation warrants, the building(s) shall be ventilated and the occupants evacuated.
- f. The PFR Representative's investigation should include checking the adjacent properties for outages.

3. SHUT OFF OR CONTROL OF GAS

- a. Company personnel shall attempt to shut off or control the flow of gas from the damaged service line or main, provided they are properly trained, they have the proper equipment, and their personal safety is not at risk. Such personnel shall not crimp, put a dowel in the plastic pipe, or otherwise stop the flow of gas at the source of the leak, unless the plastic pipe is grounded with anti-static equipment to prevent ignition of escaping gas.
- b. If accessible, a curb cock should be used to stop the flow of gas from service lines.

4. STREET LEAK INVESTIGATION

- a. The Company representative shall take readings in the street to determine if any part of the buried service line has been damaged. When CGI readings indicate underground damage, the Company representative shall expand the leak investigation area to include checking buildings within 200 feet on both sides of the street(s) in all street directions beyond the last place where gas is detected.
- b. In addition to checking the buildings, the Company representative shall continually check the street to determine the extent of the leak migration.
- c. When the investigation determines that a damaged service line is leaking only where it has been pulled up in an excavation, the Company representative shall investigate two (2) buildings, or buildings within 200 feet, whichever is less, on both sides of the street(s) in all street directions.

5. DAMAGED SERVICE LINE THAT IS NOT LEAKING

- a. When a service line has been damaged but is not leaking outside the building, the Company representative shall investigate the building supplied by the damaged service line for leakage, extent of damage, or stress to the inside portion of the service line or the customer's piping.

6. NOTIFICATION OF DISPATCH

- a. Emergency Dispatch shall be notified of the conditions at the leak location as soon as practicable.

7. PFR/MSF COMMUNICATIONS

- a. The PFR Representative shall exchange information regarding the status of the leak investigation with the MSF personnel responding to the leak location, provided the PFR Representative is still on-site.
- b. The PFR Representative shall verify with MSF personnel whether the service line is damaged under ground. When underground damage is indicated, the PFR Representative shall continue investigating buildings for leaks and performing the building investigation as required by the Leak Classification.

8. CHECK FOR OUTAGES

- a. The PFR Representative's investigation should include checking the adjacent properties for outages.

## 9. REPORT

- a. A Premise Condition Report shall be completed on all damaged pipelines. All communications by a PFR Representative with the Field Operations Supervisor or MSF personnel shall be noted on the Premise Condition Report, Form No. 1701.

## H. LEAK STANDBY PROCEDURE

### 1. GENERAL

- a. A Standby can be initiated after the leak investigation has been completed.
- b. The Standby PFR or MSF personnel shall check all buildings within the leak migration area that have positive CGI readings and any other buildings deemed appropriate.
- c. Standby PFR personnel may transfer Standby duties to MSF personnel upon mutual agreement or direction by the Field Operations Supervisor.

### 2. CHECKING BUILDINGS

- a. Buildings shall be checked with a CGI at intervals consistent with the potential hazard, but at least once every hour, as long as gas is present within any building. Leak migration conditions can suddenly change because of different ventilation or other external conditions.
- b. At least hourly, buildings previously CGI'd (Can't Get In) within the initial 200 foot leak investigation area shall be checked in an attempt to gain entrance.
- c. Occupants in all buildings should be instructed not to close any windows or doors that have been opened for ventilation. The Standby PFR or MSF personnel shall take precautions necessary to minimize property damage, such as, but not limited to, maintaining a constant flow of water through water pipes to prevent them from freezing when a building has been ventilated during the winter.

### 3. INCREASING GAS BUILDUP IN BUILDINGS

- a. If on-site, the PFR Representative or MSF crew on Standby shall check the buildings adjacent to the building with increased CGI readings, which could indicate that the leak migration pattern is expanding. Depending upon the CGI readings obtained in all of the buildings checked, the PFR Representative or MSF crew may re-institute the 200 foot Leak Investigation. If the PFR Representative is not on-site and the 200 foot Leak Investigation has been re-instituted by MSF personnel, the MSF personnel shall:
  - Call Emergency Dispatch for a PFR Representative to be dispatched to perform the 200 foot Leak Investigation.
  - Begin the 200 foot Leak Investigation and transfer the investigation to the PFR Representative upon arrival.
  - While performing the 200 foot Leak Investigation, continue work to eliminate or mitigate the leak.

- b. The Standby PFR Representative or MSF crew shall notify Emergency Dispatch and the Field Operations Supervisor as soon as practicable after re-instituting the 200 foot Leak Investigation, and continue to notify them at least hourly thereafter. This is especially important if a building does not have adequate means for ventilation. In such situations, an excavation (vent hole) may be necessary to minimize the flow of gas into a building.
- c. Gas may continue entering through a foundation for some time after a leak has been located and repaired because of the residual gas in the earth.

#### 4. CLOSE OUT AND MONITORING

- a. If CGI readings are still present, but stabilized or are decreasing, and the leak has been repaired or controlled and ventilation is no longer needed, the Standby can be closed out and put into the monitor procedure. The PFR or MSF personnel should advise the customers of the situation and make the necessary arrangements to have the buildings monitored.
- b. When readings indicate that gas is no longer entering any building, the leak Standby may be closed out by the PFR or MSF personnel or called off by a Supervisor.
- c. Prior to closing out the leak investigation procedure or initiating the monitor procedure, a re-check of the affected area shall be completed.
- d. Before leaving the location, a Standby that has been closed out, or closed out and put into the monitor procedure, the PFR or MSF personnel should return all electric switches and doors and windows to their original positions.
- e. The PFR or MSF personnel shall complete the appropriate Company forms and notify Emergency Dispatch that the Standby has been closed out or that the monitor procedure has been initiated. In any case the Standby can be closed out with or without a follow-up or monitoring at the discretion of a Supervisor. When the monitor procedure has been initiated, the Standby PFR or MSF personnel shall provide Emergency Dispatch with any addresses and CGI readings when the Standby was closed out, and any information relative to gaining access to buildings.

#### 5. RELIEF STANDBY REQUIREMENTS

- a. Standby personnel ("Standby") and Relief Standby personnel ("Relief") may be either PFR or MSF personnel. Upon arriving at the location, the Relief shall report directly to the Standby. The Standby shall acquaint the Relief with all pertinent information relative to the leak and all the details of actions taken by the Standby.
- b. The Standby shall take the Relief into all the buildings with positive CGI readings and any other buildings that have been included in the Standby procedure, and explain all ventilation procedures being used. The original positions of doors, windows and switches, and other pertinent information, such as where keys will be available and what arrangements have been made to gain access to places of business after hours.
- c. The Relief shall be given the second copy of all Premise Condition Reports, Form 1701. The duplicate copies of the Premise Condition Report shall remain on the job until the leak is closed out. The Standby shall ensure that the Relief has all the addresses involved entered on a new Form 1701,

- including all buildings previously CGI'd (Can't Get In). At least hourly, CGI'd buildings shall be checked by the Relief in an attempt to gain entrance.
- d. Before leaving the location, the Standby should introduce the Relief to the MSF personnel on the job to facilitate communication and providing assistance that may be requested.
  - e. The Standby shall notify Emergency Dispatch when leaving the location after a Relief has assumed the Standby's responsibilities.

## **I. MONITOR PROCEDURE**

### **1. GENERAL**

- a. The monitor procedure allows each building with a positive CGI reading, to be checked periodically. The monitor procedure can be initiated after the leak has been repaired or controlled, ventilation is not necessary, CGI readings have stabilized and are not increasing, and there is no hazard to the public or any building.
- b. REQUEST FOR MONITOR CHECK - The PFR or MSF personnel shall request, when necessary, that a monitor check be instituted at the time of the close out of a Leak Investigation or Standby.
- c. The PFR or MSF personnel closing out the Leak Investigation or Standby shall decide on the need for, and time frame of, a monitor check based on:
  - d. The assessment of the Leak Investigation and/or Standby personnel;
  - e. The conditions that existed at the time the leak was closed out; and
  - f. When available, communications with MSF field personnel.

### **2. MONITOR WORK ORDER**

- a. Emergency Dispatch shall issue a Monitor Work Order ("SFOL") which includes all buildings and information regarding CGI readings. A Monitor Work Order may be cancelled at the discretion of the appropriate Supervisor.
- b. Emergency Dispatch shall keep a log of all monitor locations, the assigned PFR Representative, and the time of the monitor check.

### **3. MONITOR CHECK**

- a. The monitor check shall be done with a CGI. The PFR Representative shall request that an additional monitor check be conducted in accordance with I.1.a above, an hourly Standby be re-opened, or a Leak Investigation be conducted. Emergency Dispatch shall advise the appropriate PFR or Field Operations Supervisor of the request.
- b. At any building CGI'd (Can't Get In) during the monitor check, the PFR Representative shall check readings at the foundation and through all available openings in the foundation, walls, or windows. Positive CGI readings at any of those locations may require forced entry.
- c. Emergency Dispatch shall be notified of all buildings CGI'd (Can't Get In) and reissue an additional monitor check within four (4) hours.
- d. Emergency Dispatch shall be notified of the conditions at the completion of the monitor check. In the event that the monitor check requires re-opening the Standby procedure, the Field Operations Supervisor or on-call Field Operations Supervisor shall be notified by Emergency Dispatch. The PFR

Representative shall complete the results of the monitor check on the Mobile Data Terminal (MDT) Work Completion Screen as a SFOL for the issued address. Additional addresses checked shall be cloned and completed.

## **J. INSIDE LEAK INVESTIGATION**

### **1. GENERAL**

- a. PFR Representatives, other Company personnel or Contractors responding to leak complaints shall ask the customer where, in the customer's opinion, the odor is most noticeable and use that location as the starting point of the investigation. If a leak is not found at that point, the Representative shall not assume that there is no leak, and shall continue the investigation. If a leak is found, the Representative shall consider whether there may be other leaks. Examples of places to check are accessible Company and customer-owned gas pipe, meters and regulators, gas-fired appliances, openings in foundation walls, and locations that may emit odors similar to natural gas. All inside leak investigations shall include a check at building walls.
- b. The Representative shall ensure that all leaks have been found, repaired and/or made safe before leaving the premises.
- c. If the inside leak investigation indicates that gas is entering the building from the outside, the Representative shall immediately start an outside leak investigation.

### **2. INSIDE LEAK DETECTION METHODS**

- a. The PFR Representative or other Leak Investigation personnel shall use a CGI or equivalent device when conducting the investigation. The use of leak detection solution (liquid soap), the sense of smell, or observation of meter dial movement are other methods that may be used to assist in the investigation. The Company Representative shall never use a match or any other open flame to search for a gas leak. On occasion, it may be necessary to leave the building to purge the CGI or clear one's sense of smell.
- b. If the investigation leads to an appliance and a leak is located, and a minor repair can make the condition safe the PFR Representative may make the necessary repair or adjustment.
- c. If the repairs are of a temporary nature, a Warning Notice, Form 211, which is completely filled out and signed by the customer, shall be left on the appliance.
- d. If the leak cannot be repaired or made safe, the appliance shall, shut off, a Warning Notice (Form 211) shall be issued, and the customer shall be advised of the situation.
- e. If the investigation leads to the customer's piping, and the location cannot be determined with the use of the CGI, the sense of smell, or liquid soap, the PFR Representative shall use the gas meter test dial to determine if the leak is in the downstream piping.
- f. In order to conduct this test, the Representative should ensure that the test dial is functioning by observing movement of the dial with an appliance burner on. Then the Representative shall shut off all appliances and watch the test dial of the meter to determine whether gas is passing through the meter. The

following table shall be used to determine the length of time the dial must be observed.

**OBSERVE TEST DIAL  
METER TEST DIAL      FOR AT LEAST**

1/2 FT. DIAL	5 MINUTES
1 FT. DIAL	7 MINUTES
2 FT. DIAL	10 MINUTES
5 FT. DIAL	20 MINUTES
10 FT. DIAL	30 MINUTES

**3. MINOR LEAK REPAIR OF CUSTOMER'S PIPING**

- a. If a leak is indicated and can be located, and a minor repair can make the condition safe.
- b. The PFR Representative may make the necessary minor repair or adjustment.
- c. If repairs are of a temporary nature, a Warning Notice, Form 211, shall be issued and the customer shall be advised of the situation. If the leak cannot be located or repaired, the meter shall be removed, the meter bar shall be locked off, and a Warning Notice shall be left at the meter location. The Warning Notice shall be completely filled out and signed by the customer.
- d. When a Warning Notice (Form 211) has been issued, the appropriate screen on the MDT relative to Warning Notice shall be completed by a PFR Representative. Completing the MDT "Conditions Found" portion automatically posts the Warning Notice information to the customer record.
- e. If the investigation indicates that a problem exists with Company-owned facilities, the Representative shall make permanent repairs to any affected inside service line piping, if possible.

**4. LEAK TESTING**

- a. PFR Representatives or other Leak Investigation personnel shall leak test any fittings, connections, meter connections, or similar parts which have been disturbed, connected, or replaced.
- b. PFR Representatives or other Leak Investigation personnel shall leak test all fittings between the service inlet and the customer's piping after a meter fit has been repaired or rebuilt. The service line entry point at the foundation wall shall be tested with a CGI.
- c. FOUNDATION CHECK WITH CGI - A PFR Representative shall perform a foundation check throughout the basement with a CGI as part of an inside leak investigation, provided access to the foundation wall is available.

WARNING NOTICE — AVISO

CUSTOMER COPY

STREET CALLE	CITY CIUDAD	OWNER PROPIETARIO	TELEPHONE TELÉFONO
CUSTOMER CLIENTE	SUITE APARTAMENTO	ADDRESS DIRECCIÓN	

TELEPHONE TELEFONO

THE FOLLOWING PROBLEM MUST BE CONNECTED IMMEDIATELY:  
LOS SIGUIENTES PROBLEMAS DEBEN SER CONECTADOS INMEDIATAMENTE:

EXPLAIN:  
EXPLIQUE:

YOU MUST CONTACT A QUALIFIED CONTRACTOR FOR REPAIR:  
COMUNIQUESE CON UN CONTRATISTA ESPECIALIZADO PARA EFECTOS DE LA REPARACION:

PLUMBER  
PLOMERO

ELECTRICIAN  
ELECTRICISTA

CHIMNEY CLEANER  
PERSONA QUE LIMPIA EL CANOCH  
O NUMERO DE CHIMENEA

OTHER: \_\_\_\_\_  
OTRO: \_\_\_\_\_

THIS WARNING NOTICE IS FOR YOUR SAFETY AND PROTECTION. AFTER  
REPAIRS ARE MADE CONTACT BOSTON GAS FOR RESTORATION OF SERVICE.  
ESTE AVISO ES PARA SU SEGURIDAD Y PROTECCION. PARA LA  
RESTITUCION DEL SERVICIO COMUNIQUESE CON BOSTON GAS DESPUES  
DE QUE LAS REPARACIONES HAYAN SIDO HECHAS.

GAS LEFT  ON - CONECTADO  METER LOCKED  YES - SI  
EL GAS SE ENCUENTRA  OFF - DESCONECTADO  NO - NO

CUSTOMER SIGNATURE:  
FIRMA DEL CLIENTE:

DATE  
FECHA

APPLIANCE  
ARTIFACTO DE GAS

LOCKED  
CERRADO CON LLAVE

YES - SI

NO - NO

APPLIANCE  
ARTIFACTO DE GAS

LOCKED  
CERRADO CON LLAVE

YES - SI

NO - NO

TENANT  
INQUILINO

OWNER  
PROPIETARIO

EMPLOYEE  
EMPLEADO

## **K. FIRES AND EXPLOSIONS**

### **1. GENERAL**

- a. This section provides procedures and guidelines for responding to a fire and/or explosion that actually involved gas is alleged by others to have involved gas, or the Company believes may have involved gas.
- b. It also provides a guide for actions to be taken at fires and explosions in buildings where gas is not a cause of the fire or explosion, but where gas service to the building or other structures in the vicinity of the incident exists.
- c. The initial report of a fire or explosion shall be considered as an emergency that, potentially, could involve the leakage of gas.

### **2. REPORTING TO THE FIRE DEPARTMENT**

- a. Company personnel shall identify and report to the Fire Officer in Charge upon arrival at the scene of the incident.
- b. If the assistance of Company personnel is not required immediately upon reporting to the Fire Officer in Charge, Company personnel should standby at the scene of the incident, and continue to be available to assist the Fire Officer until the Fire Officer has given clearance for Company personnel to leave the scene.

### **3. SHUT OFF OF GAS SUPPLY TO BUILDINGS**

- a. A fire and/or explosion inside a building shall require the gas supply at the meter, at the curb valve, or at both locations to be shut off as soon as reasonably possible. However, shutoff shall not be performed until the Fire Officer in Charge has granted permission to do so. If conditions warrant, PFR Representatives shall request a fireman to accompany them. Whenever possible, a building shall not be entered alone.
- b. The gas supply shall be shut off, the meter(s) shall be removed, and a lock plug installed whenever the gas piping or meter(s) have been involved in or exposed to the heat of the fire. This will allow a test for tightness of the pipe and an inspection by local officials to be made before the gas is turned back on.

### **4. LEAK INVESTIGATION**

- a. All buildings in the immediate vicinity of a fire and/or explosion shall be promptly checked for the presence of gas.
- b. If it has been determined that gas is present, the appropriate Leak Investigation Procedures in §1 shall be implemented.

### **5. GAS METER TEST DIAL INVESTIGATION**

- a. A meter test dial investigation shall be performed whenever property damage or injury has been alleged or is suspected to be the result of gas leakage. The test shall not be performed until fire officials deem it safe to do so.
- b. The position of the fire valve should be noted and if it is closed, another one shall be installed before the test is performed.

## 6. PUBLIC OFFICIALS

- a. Personnel shall cooperate with State and local officials and representatives of regulatory agencies having jurisdiction at the scene of the incident, such as, but not limited to, the Fire Department, Fire Marshall, and the DTE.

## 7. ANSWERS TO INQUIRIES

- a. Inquiries by public officials or news media shall be answered only by the Director of Emergency Operations, or designee, or the Corporate Affairs representative. Personnel shall refer persons making any inquiry to the aforementioned individuals. The positions taken by the Company and the responses to inquiries should be as consistent as possible at the scene of the emergency and the Corporate Affairs office.

## L. EMERGENCY GAS TURN-OFF AND TURN-ON

### 1. GENERAL

- a. When an interruption of service or outage of the gas supply to any area occurs, gas shall not be allowed back into the mains and service lines of the affected area until every customer therein has been shut off. This shall eliminate the possibility for gas appliance burner valves that may have been in the open position at the time of the outage, from releasing unignited gas into a customer's premises when re-pressurizing a distribution system.

### 2. PERFORMING THE TURN-OFF

- a. Briefly explain the purpose of your visit to the occupant, if present to admit you.
- b. Locate and determine the type of service line supplying the building. Check for sub-services.
- c. On low-pressure service lines, shut off the service valve and the meter cock at each meter being supplied by the service line.
- d. On high-pressure and intermediate-pressure service lines, shut off the gas at each meter being supplied by the service line and then shut off the service valve.
- e. Notify the occupant that gas has been shut off and that a Company representative will return to turn on the gas when gas service is available. Ask the customer not to turn on any appliances while the gas is shut off.
- f. On the Customer Listing, note the manner of turn-off or circumstances responsible for not making a turn-off.
- g. All listings shall be returned to the Field Authority, or designee, with the appropriate completion information.
- h. All incomplete turn-offs shall be brought to the attention of the Supervisor and a second attempt to turn-off shall be made. Additional information or other special instructions to achieve turn-off may be provided at this time.

### 3. PREPARATION FOR TURN-ON

- a. Before attempting to perform turn-ons, consider the actions that could be taken if a component breaks and causes gas leakage. The following should be considered:
- b. Upon entering the cellar or meter location area, note the location of the main electric supply switch and any oil burner and oil burner switch. It may be possible to throw a switch to the "off" position before gas accumulates, should something break. Switches shall never be operated after gas has accumulated within the premises.
- c. Low-pressure gas escaping from a broken pipe or fitting or valve can be held by hand pressure or permagum or tape. Intermediate-pressure and high-pressure gas cannot be held by hand pressure or permagum. The flow of gas may be restricted by using a wooden peg.
- d. No attempt shall be made to disassemble any service shut-off valve, regulator, or any fittings upstream of the regulator. Such work shall be referred to the Field Operations Supervisor.

### 4. PERFORMING THE TURN-ON

The following procedures shall be used when turning a customer back on:

- a. Identify yourself as the Company representative assisting in service restoration.
- b. Locate and determine the type of service line supplying the building. Check for sub-services.
- c. On low-pressure service lines, check to determine that all meters being supplied are shut off at their individual meter cocks. Then proceed with the complete turn-on procedure for each individual meter before turning on the next meter.
- d. On high-pressure and intermediate-pressure service lines, check to determine that all meters are shut off at the individual meter cocks. Then turn the service shut-off valve on slowly to allow the regulator to setup properly. For an inside meter set, check that there is a regulator vent to the outside. Verify that the regulator is not venting. Then, complete the turn-on procedure for each individual meter before turning on the next meter.
- e. Immediately upon turning on each meter, watch the test dial on the meter index for movement. If the test moves more than slightly, quickly shut off the meter cock and check all appliances for open valves. Slight movement is permissible to allow for gas range pilots which cannot be shut off.
- f. If the test dial has not moved or slightly moved, purge the air out of the house piping through the gas range's top burners. If no gas range is present, select the next best point for purging; but never purge into a confined space such as a range oven, house heater, or water heater combustion chamber.
- g. After the gas range is lighted, purge and light the remaining appliances. If an appliance cannot be turned on by MSF personnel, report the condition to the appropriate Field Operations Supervisor. If it cannot be turned on by PFR personnel, tag the appliance and report the condition to the appropriate Field Operations Supervisor. When turning on water heaters and house heaters

keep your body and face away from the heater door so that if the flames should flash out, you will not be burned.

- h. When all appliances are turned on, indicate on the Customer Listing sheet that the turn-on has been completed. All Customer Listing sheets shall be returned to the appropriate Field Operations Supervisor, or designee, with the appropriate completion information for each address.

## **M. NATURAL DISASTER**

1. If a natural disaster occurs during scheduled working hours, all field personnel should make the job they are working on safe; and then report to their regular reporting station, unless directed otherwise by Emergency Dispatch.
2. All personnel shall prepare to turn off customers in areas that are adversely impacted by the natural disaster. (See Emergency Plan.)
3. For other information regarding natural disaster emergencies, see Emergency Plan.

## **N. MULTIPLE INCIDENT EMERGENCIES**

### **1. GENERAL**

- a. A multiple incident emergency is an emergency situation or incident that requires the response of an extraordinary number of PFR personnel. The incident may be a gas outage or unscheduled shutdown involving more than 50 customer-outage hours.
- b. The PFR Representative or Field Operations Supervisor responding to the incident shall immediately assess the situation and notify Emergency Dispatch of the personnel and equipment required to resolve the emergency.
- c. All personnel assigned to the field shall be assembled at reporting locations or placed on standby as determined by Emergency Dispatch.

### **2. WORK ASSIGNMENTS FOR FIELD PERSONNEL**

- a. Field personnel shall be dispatched to a specified location in the vicinity of the incident by Emergency Dispatch. All Field Operations Supervisors shall report to the Field Authority at that location. Field personnel shall report to the Field Operations Supervisor, or designee, assigned to maintain a Service Representative Arrival/Release Log, Form 2232.
- b. The Arrival/Release Log, Form 2232, shall be used to monitor field personnel assigned and released from the site of an incident. The Field Operations Supervisor, or designee, shall note each assignment of field personnel under the Remarks column.
- c. The Field Operations Supervisor, or designee, shall assign field personnel to a second Field Operations Supervisor, or designee, who will assign the work. The Field Operations Supervisor, or designee, assigning work locations shall maintain a Service Representative Location Log, Form 2233.
- d. The Service Representative Location Log, Form 2233, shall be completed, including the status of turn-off and turn-on, and any repairs executed.

- e. Field personnel assigned to a street shall maintain a Service Representative Assignment Log, Form 2234 or Form 1249 cards, as required by the assigning Field Operations Supervisor, or designee. The Assignment Log shall be used until the listing of gas accounts is received in the field.
- f. Field personnel shall complete an Assignment Log, Form 2234, and return the log to the Field Operations Supervisor, or designee, immediately after completion.

### 3. CUSTOMER LISTING

- a. Each Field Operations Supervisor or designee shall maintain a listing of gas accounts in their assigned territory. As an incident requires, three customer listings, three copies of customer listing check-off sheets will be generated by Information Services for use at the incident location.
- b. The Field Authority shall initiate the use of the Customer Listings as the incident requires.

### 4. EMERGENCY COMMAND CENTER VEHICLE

- a. The Emergency Command Center Vehicle may be sent to a specific location to provide facilities for PFR and MSF personnel and serve as a communication link with the emergency location and other appropriate Company locations.
- b. The Emergency Command Center Vehicle shall be sent to an incident location as requested by the Field Authority. The Dispatch Operations Emergency Box shall be sent to the incident location in the vehicle. As needed, a Field Operations Supervisor and a Dispatcher shall be assigned to the Emergency Command Center Vehicle.

### 5. RELEASE OF FIELD PERSONNEL

- a. Field personnel shall report to the Field Operations Supervisor, or designee, at a specified location in the vicinity of the incident in order to be released from the emergency location.
- b. The Field Operations Supervisor, or designee, shall note the release on the Arrival/Release Log.







## **O. PREMISE CONDITION REPORT - FORM 1701**

- a. PFR or MSF personnel shall use the Premise Condition Report, Form 1701, when covering street leaks. Form 1701 is a two-part form and is used during Leak Investigations and Standbys to record addresses checked for leaks and the status of MSF activities.
- b. Emergency Dispatch shall maintain a Form 1701 on each active Standby and record all premises checked, including buildings CGI'd (Can't Get In) and buildings with zero gas readings.
- c. PFR or MSF personnel shall notify Emergency Dispatch of all readings recorded on Form 1701, including buildings CGI'd and with zero readings. The notification shall be made on a timely basis, but in no case shall the notification time exceed one hour from the previous notification.
- d. Form 1701 is an official company document, which shall be filled out accurately and completely. The failure of PFR and MSF personnel to accurately record the required information could seriously damage the creditability of the record and adversely affect the Company in potential legal action.
- e. When a PFR Representative determines that there is a street leak, the reported address on the MDT work order shall be the address to be recorded as "Reported Address" on the Form 1701. The first PFR Representative dispatched to the leak shall put his/her name in the block labeled "EXECUTED BY" and employee number in "EMP. NO." The "DATE OPENED" is the date and time the leak was first opened by "THE FIRST SERV. REP." All subsequent Premise Condition Reports shall have the same "DATE OPENED" as the first PFR Representative's. The "DATE ARRIVED" and "DATE LEFT" is the appropriate date and time the PFR Representative arrived and left Leak Investigation or Standby status.
- f. Each PFR or MSF personnel investigating a street leak shall fill out a Form 1701 for the premises investigated.
- g. The Gas Leak Investigation Procedure contained herein (LEAK-5010) shall be followed.
- h. All addresses checked shall be listed on Form 1701 with the time and CGI readings recorded under "Time" and "Read" and called into Emergency Dispatch approximately each hour.
- i. At the completion of the initial 200 foot check, the PFR Representative shall initial the Form 1701 in the appropriate box indicating that the 200 foot check has been completed. The PFR Representative should be aware that the 200 foot area shall be continually checked while the Leak Investigation is ongoing.
- j. When PFR or MSF personnel are relieved from a street leak, Form 1701 shall be turned in with their work. If the street leak is still active when the PFR Representative is relieved, the PFR or MSF personnel shall ensure that the relief PFR Representative has all the addresses involved entered on a new Form 1701. All duplicate copies of the Form 1701 shall be left with the relief PFR Representative. The duplicate copies shall remain on the job until the job is closed out.

- k. The PFR Representative shall, after discussing Form 1701 with MSF personnel at the location, initial the Form 1701 in the appropriate box and enter the name and employee number of the MSF Crew Leader and/or Field Operations Supervisor at the location of the street leak in the appropriate boxes at the bottom of the Form 1701.
- l. The PFR or MSF personnel being relieved shall enter the name and employee number of the relief PFR Representative in the bottom right corner of the Form 1701; and enter in the appropriate block the time relieved.
- m. The relief PFR Representative shall enter the name and employee number of the PFR Representative who was relieved in the "Comments Section".
- n. The time of the close out of the street leak shall be recorded in the "Comments Section". PFR or MSF personnel shall turn in each Form 1701 and duplicate copies of Form 1701 for the same street leak with their work.



## **P. INCIDENT REPORT - FORM 1509**

1. The Incident Report, Form 1509 shall be completed in its entirety, provided the information is readily available, when reporting an incident involving property damage, injury to a customer or the general public, or evacuation of one or more buildings actually or allegedly caused by a gas leak, fire, or explosion. Some examples of incidents that require Form 1509 to be completed are:
  - a. When one or more persons claim to have been injured as a result of a fire or explosion.
  - b. When one or more persons claim an illness caused by a gas leak or combustion odor.
  - c. When one or more persons claim to have been injured while lighting or using a gas appliance.
  - d. When there is property damage to a building that was actually or allegedly caused by a gas fire or gas explosion.
  - e. When there is property damage to an appliance that was not caused by a Company employee.
  - f. When there is property damage caused by Company personnel that cannot be repaired by Company personnel.
  - g. When a customer claims a loss as a result of gas service being interrupted by the Company.
2. A complete list of all persons in the affected building, and their condition, should be completed for incidents described above.
3. A complete list of all persons in the building should be completed when a gas leak or combustion odor described above is not confined to one apartment of the building.
4. When a Form 1509 is required, a MDT Order should also be completed. The MDT Order shall include any information pertaining to the following:
  - a. Type of equipment, safeties, and method of lighting an appliance, if any.
  - b. The safeties and operation of any equipment and appliance that was checked.
  - c. A description of any repairs or adjustments made.
  - d. The buildings where a gas leak investigation was performed and the results of the investigation.
5. The Form 1509 should be turned in to the appropriate Field Operations Supervisor at the end of scheduled work hours.

**INCIDENT REPORT - FORM 1509**

STREET & NO.		CITY & ZIP	DATE & TIME OF INCIDENT		NO. OF APT. IN BLDG.
				AM PM	
OWNER'S NAME			OWNER'S ADDRESS		
NAME	SUITE	GAS FIRST SMELLED	GAS CO. NOTIFIED	WHERE WAS INJURED TAKEN?	
		AM PM	AM PM		
HOME ADDRESS		IF MEDICAL AID, BY WHOM?			
INJURIES CLAIMED					
NAME	SUITE	GAS FIRST SMELLED	GAS CO. NOTIFIED	WHERE WAS INJURED TAKEN?	
		AM PM	AM PM		
HOME ADDRESS		IF MEDICAL AID, BY WHOM?			
INJURIES CLAIMED					
STATEMENTS MADE BY OTHERS					
F 1509 REV. 72					

PROPERTY DAMAGE (FULL DESCRIPTION)					
DESCRIPTION OF INCIDENT					
STATEMENT OF EMPLOYEE					
				<b>INCIDENT REPORT</b>	
WITNESSES	ADDRESS	DATE	TIME	AM	PM
NAME	ADDRESS	SIGNED			

## **Q. ELECTRICAL BURNOUTS**

1. Electrical burnout refers to the overheating of insulating materials on underground electrical cable lines. A foreign odor and presence of a combustible gas mixture may accompany an electrical burnout.
2. The gas produced by an electrical burnout will give the same kind of readings on a CGI as natural gas, but the intensity of the readings will last for a shorter duration.
3. The existence of an electrical burnout may be indicated by the absence or erratic operation of street or house lighting. A more definitive method of determining the existence of an electrical burnout is by taking samples of the atmosphere for a combustible gas mixture by using a carbon monoxide indicator. If carbon monoxide is indicated, an electrical burnout exists. If carbon monoxide is absent, the combustible gas mixture is from an escape of natural gas.
4. When evaluating the emergency, consideration should be given to the potential for the simultaneous presence of an electrical burnout and an escape of natural gas (e.g., potential burn holes in nearby steel or plastic pipelines).



**PREMISE INVESTIGATION SUMMARY  
(FOR E.R.U. USE ONLY)**

LIST ALL ADDRESSES IN THE ORDER THAT THEY WERE CHECKED

LEAK MONITORING RESULTS

	ADDRESS	READ	COMMENTS
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			

	DATE	READ	COMMENTS
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			

**LEAK INVESTIGATION COMPLETED**

YES   
NO

START TIME   
END TIME   
TOTAL TIME

**COMMENTS:**

---



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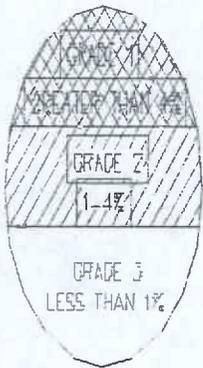


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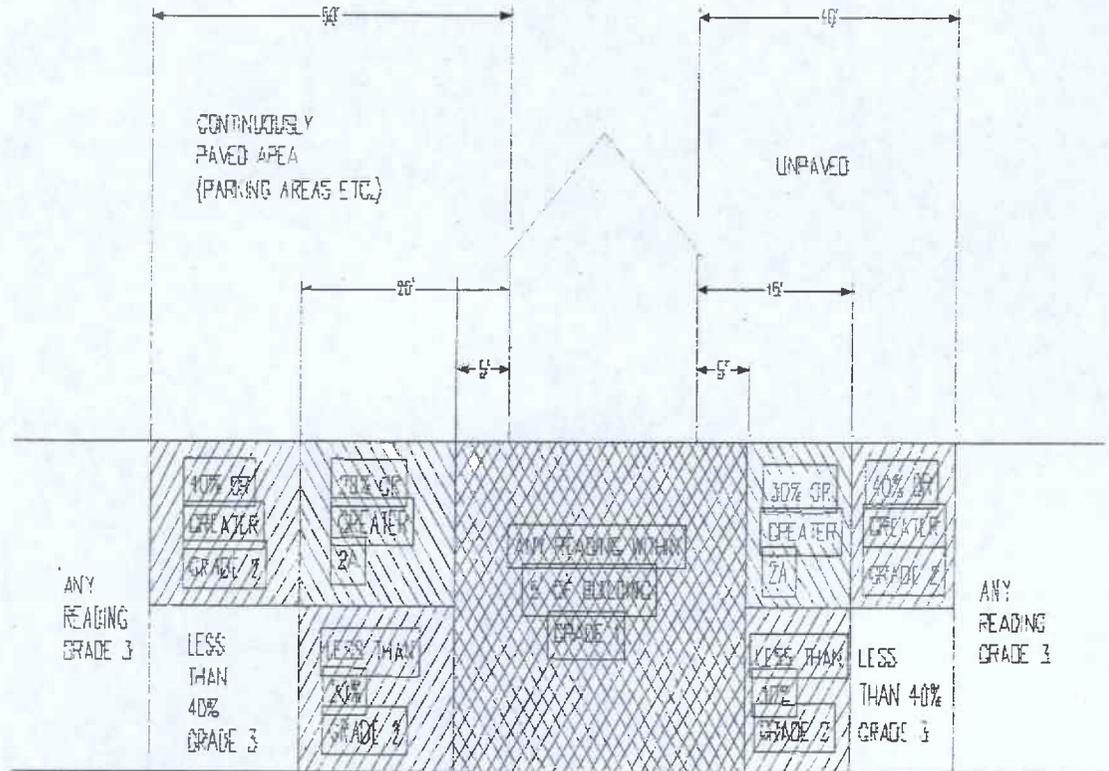
Appendix A

LEAK CLASSIFICATION

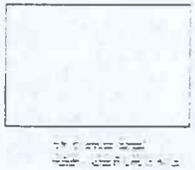
MANHOLES, VAULTS  
OR CATCHBASINS



READINGS ARE PERCENT  
GAS IN AIR WITH STRUCTURE  
IN NORMAL CONDITION



1-1/2" DIA. (10")  
 CENTER TOP POSITION - NO DUCTS  
 BY 2" ANGLES OR THE EQUIV. - 1" SPACING  
 10" TO SCALE



DATE: \_\_\_\_\_

BY: \_\_\_\_\_

APPROVED: \_\_\_\_\_

REVISIONS: \_\_\_\_\_

O & M - 1

(End LEAK-5010)

## LEAK-5030: Leak Receipt and Classification

<b>Date:</b>	07/01/04	<b>Filed:</b>	Yes	<b>Application:</b>	MA
		<b>Review:</b>	Annual	<b>Lead Org:</b>	Field Ops
<b>Revision:</b>					

### DESCRIPTION

This procedure describes the classification of leaks. This procedure outlines steps required for the surveillance or monitoring of active leaks.

### PROCEDURE

#### A. Leak Classification

1. Based on an evaluation and/or magnitude of a leak, one of the following three leak grades shall be assigned to all street leaks that have been reported, investigated, and/or confirmed as a gas leak:
  - a. Grade 1 - A leak that represents an existing or probable hazard to persons or property, and requires immediate repair or continuous action until conditions are no longer hazardous.
  - b. Grade 2 or 2A- A leak that is recognized as being non-hazardous at time of detection, but justifies scheduled repair based on probable future hazard.
  - c. Grade 3 - A leak that is non-hazardous at the time of detection and can be reasonably expected to remain non-hazardous.
2. A leak that is classified as a Grade 1 leak shall be considered either a Level "A" or Level "B" emergency.
  - a. **Level "A":** Level "A" emergency is any gas-related incident of significant nature that, in the opinion of the Dispatcher or an Authority, requires personnel, equipment, or expertise beyond that required for a Level "B" emergency, or requires an extraordinary field response from other Divisions.
  - b. **Level "B":** Level "B" emergencies include, but are not limited to:
    - A service outage or unscheduled service shutdown involving more than fifty customer-outage hours, or one involving less than fifty customer-outage hours requiring more personnel than would be required for a Level "C" emergency.
    - Any incident where a fire, explosion, or injury of a significant nature has or was reported to have occurred.

- An evacuation of people from any building.
- An unintentional escape of gas that, because of such conditions as location, weather, extent of leak migration, or other factors, requires more personnel or equipment than required for a Level "C" emergency.
- An earthquake, recorded earth tremor, hurricane, blizzard or other severe weather condition.
- An emergency which can be investigated and corrective action taken by personnel normally dispatched to the site. When a field response is required from other Divisions, the emergency could be designated as Level "A".

c. **Level "C":** Level "C" emergencies include, but are not limited to:

- Any report indicating an odor, a gas leak, or other potentially hazardous system failure requiring immediate response or corrective action for which routine operating procedures performed by readily available personnel are deemed proper.
  - Any incident where a fire, explosion, or injury of a minor nature has or was reported to have occurred.
  - A gas outage or unscheduled shutdown involving less than fifty customer-outage hours.
3. After initial investigation and evaluation, a leak that is classified as a Grade 2, 2A or Grade 3 leak shall not be considered as a leak that requires an emergency response for repair.
  4. An indication of gas in an electric, telephone, water, or sewer manhole may signify that gas is entering a building or structure through the ducts or pipes entering or leaving the manhole, therefore the classification of a leak based upon the amount of gas found in a manhole may or may not reflect the actual classification of the leak if the gas is migrating to buildings through the aforementioned ducts or pipes.

**B. Monitor Procedure**

1. The monitor procedure allows each building with a positive CGI reading, to be checked periodically. The monitor procedure can be initiated after the leak has been repaired or controlled, ventilation is not necessary, CGI readings have stabilized and are decreasing, and there is no hazard to the public or any building.
2. Request For Monitor Check - The PFR or MSF personnel shall request, when necessary, that a monitor check be instituted at the time of the close out of a Leak Investigation or Standby.

3. The PFR or MSF personnel closing out the Leak Investigation or Standby shall decide on the need for, and time frame of, a monitor check based on:
  - a. The assessment of the Leak Investigation and/or Standby personnel;
  - b. The conditions that existed at the time the leak was closed out; and
  - c. When available, communications with MSF field personnel.
4. Monitor Work Order
  - a. Emergency Dispatch shall issue a Monitor Work Order ("SFOL") which includes all buildings and information regarding CGI readings.
  - b. Emergency Dispatch shall keep a log of all monitor locations, the assigned PFR Representative, and the time of the monitor check.
5. Monitor Check
  - a. The monitor check shall be done with a CGI.
  - b. The Company Representative may request that an additional monitor check be conducted, an hourly Standby be re-opened, or a Leak Investigation be conducted.
  - c. Emergency Dispatch shall advise the appropriate Field Operations Supervisor of the request.
  - d. At any building CGI'd (Can't Get In) during the monitor check, the PFR Representative shall check readings at the foundation and through all available openings in the foundation, walls, or windows.
  - e. Positive Combustible Gas Indicator readings at any of those locations shall require forced entry.
  - f. Emergency Dispatch shall be notified of all buildings CGI'd (Can't Get In) and reissue an additional monitor check within four (4) hours.
  - g. Emergency Dispatch shall be notified of the conditions at the completion of the monitor check. In the event that the monitor check requires re-opening the Standby procedure, the Field Operations Supervisor or on-call Field Operations Supervisor shall be notified by Emergency Dispatch.
  - h. The PFR Representative shall complete the results of the monitor check on the Mobile Data Terminal (MDT) Work Completion Screen as a SFOL for the issued address.

*(End LEAK-5030)*

# Keyspan-Massachusetts Leak Classification

		Grade 3	Grade 2	Grade 2A	Grade 1
Manholes		Less than 1%	1%-4%	N/A	Over 4%
Above Ground Piping					
Outside		Fuzz only	Bubbles	N/A	Blowing Gas
Inside		N/A	Fuzz only	N/A	Blowing Gas
Underground Piping		N/A	N/A	N/A	Bubbles
	Distance from Building				
Wall to Wall Paving					
	0'-5'	N/A	N/A	N/A	Any % Gas Reading
	5'-20'	N/A	Less than 20%	20%-100%	Blowing Gas
	20'-50'	Less than 40%	40%-100%	N/A	Blowing Gas
	Beyond 50'	Any % Gas Reading	N/A	N/A	Blowing Gas
Not Wall to Wall Paving					
	0'-5'	N/A	N/A	N/A	Any % Gas Reading
	5'-15'	N/A	Less than 30%	30%-100%	Blowing Gas
	15'-40'	Less than 40%	40%-100%	N/A	Blowing Gas
	Beyond 40'	Any % Gas Reading	N/A	N/A	Blowing Gas

Notes: All readings are expressed as "percent gas."

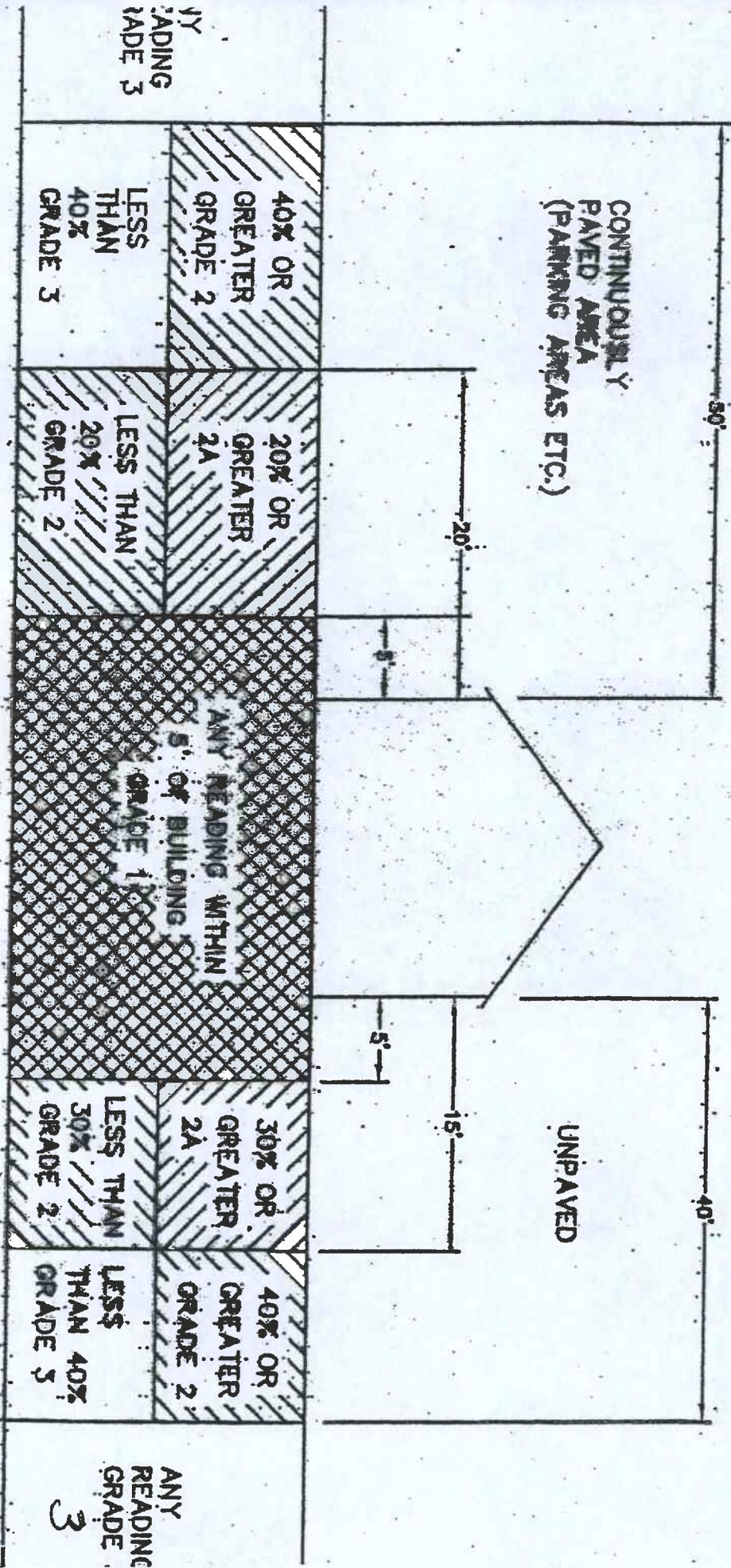
All readings are "sustained" and must be repeatable.

Above ground piping leaks must be soap tested to be graded, unless the leak is obviously blowing gas.

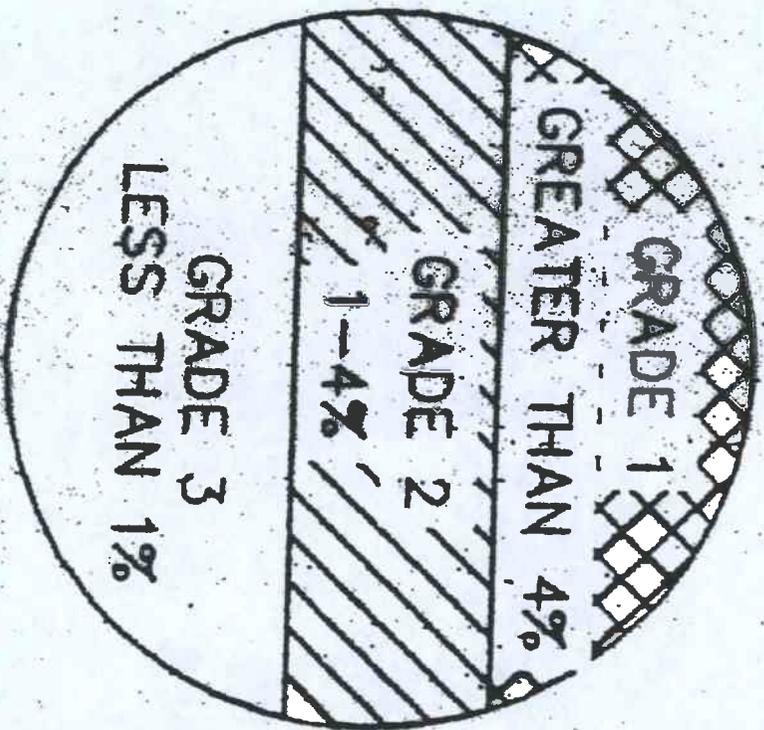
If there is a leak on piping at the point where it is going from below ground to above ground, whether inside or outside a building, it is to be considered an underground leak and graded accordingly.

Conditions which are important, but do not effect the Leak Classification, include (1) any disagreement you have with the above leak classification criteria, (2) level of odor being produced by the leak, (3) public awareness, (4) effect on vegetation. These should appear on the leak report form and, as appropriate, pointed out to your supervisor. Although the leak classification will not change, the dispatching priority for that leak probably will change.

# LEAK CLASSIFICATION



MANHOLES, VAULTS  
OR CATCHBASINS



READINGS ARE PERCENT  
GAS IN AIR WITH STRUCTURE  
IN NORMAL CONDITION

## TRAINING OVERVIEW

### EMERGENCY RESPONSE UNITS

Emergency Response Units (ERU) utilize combustible gas indicators (CGI) and hydrogen flame ionization units (FI) to investigate the reported leak location. The investigation is to determine whether gas is leaking and, if it is, to determine if it poses a potential hazard to public or property, to classify the leak and to take appropriate actions.

The ERU Representative shall start and test his/her FI prior to going en route to a reported leak location. FI's shall be tested according to manufacturer's requirements and Company procedures at each start-up. An appropriate test gas shall be utilized in front left funnel to verify operation of FI. (At least daily, *all* funnels on the vehicle should be tested.) Each start-up test shall be documented on a FI log sheet. All FI reads shall be verified with a CGI machine to confirm the reading. FI's shall be calibrated according to Company policy on a periodic basis.

The ERU shall proceed to a reported leak location with the FI on and tested. When driving across town to the leak location leave FI unit on the "B" scale (1K PPM on Heath), then switch to the most sensitive scale ("D" or "10") when approaching the leak location. One should always assume the worst possible conditions exist until investigation proves otherwise. Proceed to the reported address and investigate the premise. Inside investigations shall be conducted with a CGI machine. Positive CGI readings inside a premise require appropriate actions to protect the public and property, such as ventilation or evacuation. Evacuation of the premise shall be considered any time there is a concentration of gas in the atmosphere inside a building. Buildings adjacent to buildings with positive reads require immediate investigation when the reads are the result of an outside leak. If no readings are found in the initial house, the ERU shall proceed with an FI check of the area to help determine if gas is leaking in the area. When a building cannot be entered, the FI should be used as an additional tool to determine whether forced entry is necessary. If hazardous indications are found, actions should be taken to protect the public. If the indications are considered non-hazardous the migration area should be determined, the leak subsequently classified and an appropriate area check performed based on the leak classification.

Under normal circumstances the FI unit should not be used inside a premise. The FI is not intrinsically safe, but when it is deemed necessary to use a FI inside, a CGI shall be used first to determine that a hazardous atmosphere does not exist inside the building.

When the leak is found to be an outside leak, the leak migration area shall be determined using the FI unit. When utilizing the FI in the mobile mode the ERU shall drive at a maximum of 10 MPH. When a hazardous reading is detected in a manhole, take appropriate action to protect the general public, such as venting the manhole. When readings are detected in a manhole, a full 200' investigation will be required to help classify the leak. Check manholes

that belong to the same utility (e.g., telephone, electric, sewer) in which readings were obtained. Continue to check all manholes in all directions until zero readings are found. Begin an inside leak investigation at the buildings in closest proximity to the manhole where the highest reading was obtained. After the leak migration area and potential hazard have been established, the leak shall be classified using the ASME Guide.

When a leak is classified as a Grade I, the ERU shall concentrate his/her investigation on the buildings in the immediate migration area, then proceed to check buildings within 200 feet on both sides of the street(s) in all street directions beyond the last place where gas was detected. Leaks classified as Grade 2 or 3 require the check of two buildings beyond the gas migration area, or all buildings within 200 feet of the gas migration area whichever is less. In either case, all buildings within the migration area on both sides of the street shall be investigated. When a building cannot be entered (can't get in), a pogo bar reading at the outside foundation wall, ~~or~~ a reading through any available opens to the inside, shall be taken. The FI unit should also be used to determine whether forced entry may be required. When any positive reading is obtained, forced entry shall be required. The Fire Department and/or the Police should be requested to assist in the forced entry, unless the situation requires immediate action to be taken.

 Dispatch Center shall be notified of the leak classification. On leaks classified Grade I, dispatch shall be notified whether the FI check of the area is completed. Dispatch shall also notify the area MSF Group Leader/ or On Call Group Leader of the location of each Grade I leak.

After authorization by the Dispatch Center or Group Leader, the ERU may leave the site of an unabated Grade I leak under the following conditions:

- ✓ • Mark the location of the leak and convey information to the Dispatch Center
- After arrival of, and communication and agreement with, the Group Leader or MSF crew
- ✓ • After arrival of, and communication with a stand-by PFR Representative. In this instance, the departure of the ERU may occur before the arrival of the Group Leader or MSF crew.

The ERU shall complete the MDT Leak Completion Screen, FI Start-up Log, and the Leak Investigation Form (Form No 2236), when required. Addresses checked shall be listed on the rear of the Leak Investigation Form. A Premise Condition Form (1703) shall be required when inside readings are found.

### Module 3: Using the Flame Ionization Unit and Other Tools Required for Investigation of Street Leaks

#### Objectives:

- 3.1 Understand the nature and purpose of an F.I. unit.
- 3.2 Know the different types of F.I. units currently used by Boston Gas.
- 3.3 Be able to use a C.G.I. machine to verify reads from an F.I. unit.
- 3.4 Be able to use other tools and equipment needed for outside leak investigation.
- 3.5 Know why, how and when to complete an F.I. Start-up Test Log.

#### Instructional Plan:

1. Properties of Natural Gas
  - A. Lighter than air (specific gravity .62)
  - B. Explosive range (5% to 15%)
  - C. Ignition temperature approx. 1200° F
  - D. Naturally odorless
  - E. Mercaptan added as odorant
    - can be filtered out by soil conditions
  - F. Possible sources of odor other than gas
    - gasoline, solvents, paints, chemicals
    - electrical burn-out
    - vents
    - decaying organic matter
2. The Combustible Gas Indicator (CGI machine)
  - A. Purpose
    - primary tool to quickly determine gas hazard
    - detects presence in percent (%) gas
    - required to verify F.I. reads
  - B. Types of CGI machines
    - Davis
    - Scott
    - GMI
    - MSA
  - C. Scales
    - "LEL Scale" or "5% Scale": 0 to 5% gas
      - use if suspect read location could be considered a *hazardous* location such as at foundations, in manholes, etc.
    - "100% Gas Scale": 0 to 100% gas
      - use for checking in barholes in the street away from foundations

#### Materials:

- D. Anatomy of a CGI machine
    - on/off switch & scale selection
    - zero adjust knob(s)
    - aspirator bulb
    - hose and wand (Caution around electrical)
    - water trap and other filters
    - charcoal filter
  - E. Care and maintenance (for each use)
    - checking for proper operation
      - checking for sampling leaks [Tightness test]
      - battery test
      - ensure scales are set to zero
      - wand, water trap, and filter check
      - most recent calibration (w/in 30 days)
    - changing the batteries
      - use proper batteries; most require carbon-zinc
3. The Flame Ionization Unit (F.I. unit)
- A. General
    - Theory of operation: It detects the presence of a hydrocarbon by drawing a sample across flame. If a hydrocarbon is present, such as natural gas, it will give off ions as it burns and the ions will be detected in parts per million (PPM)
    - To quickly and accurately help determine the migration area and potential hazard of an outside leak
    - Can be used as a mobile unit in vehicle
    - Can be used as a portable unit
    - Gives *indication* of hydrocarbon gas, will not give % gas readings
    - Reads must be verified with CGI
  - B. Types of F.I. units
    - Dafrol Model A600 (Module 3)
    - Heath Tech DP-3 (Module 4)
    - Dafrol Model DA 6000 (Module 5)
  - C. Mobile versus Portable use of F.I. unit
    - Determine whether to survey in mobile or portable modes based on location and conditions at suspect leak location

CGI machine

water traps, cotton filter  
charcoal filter

- Most leaks require utilization of both methods to accurately determine leak migration pattern
  - How the methods differ
  - portable will yield higher reads because sample is draw directly out of ground
  - in mobile operation you must ensure all bumper mounted funnels are drawing samples
  - Both methods require caution to prevent sucking water into system, especially the Heath
- C. Where & How to take readings
- survey entire area on most sensitive scale to determine total migration of gas ["D" or 10]
  - change scales and re-survey area to determine "hot" spots and/or center of the leak
  - Investigate most hazardous situation first (take action as necessary) as defined by:
    - Proximity to Buildings & presence in confined spaces
    - All else being equal, highest readings
    - Other factors - frost, asphalt, etc.
  - Mobile use:
    - Drive manholes first
      - \* "hesitate" over manholes/catch basins
    - drive street at 5-10 mph; slower is better
    - start and stop at same place
    - ride curbs/edge of road
    - verify all readings with CGI machine
  - Portable use:
    - walk with unit with probe funnel in contact with ground or opening
    - place probe funnel no more than 2' between sampling points
    - check all available openings, manholes, curb boxes etc.
    - check at curbs in paved areas (@ cracks)
    - check at foundations
    - verify all readings with CGI machine (FI detects other hydrocarbons such as vehicle exhaust, paint, petroleum, etc.)
- D. F.I. Start-up Test Log, Form #2259
- Purpose and information required
  - Must be completed each time unit is "fired up" or "re-fired" in portable mode
  - Complete at any time before conclusion of job

demonstrate proper method

Hand out & explain form

**Module 7: Emergency Response Unit Guidelines****Objectives:**

- 7.1 Know the definition of an "emergency" as used at Boston Gas.
- 7.2 Understand the Emergency Response procedure.
- 7.3 Know the procedure for notifying Dispatch of status and grade of leak.
- 7.4 Be able to properly complete a Leak Investigation Report and Premise Condition Report.
- 7.5 Know how to complete the MDT Leak Completion Screen.

**Instructional Plan:**

1. Definition of "Emergency"
  - Any gas related circumstance or combination of circumstances which causes or could lead to a hazardous situation.
  
2. Emergency Response Procedure
  - A. Start-up F.I. unit for mobile use
    - immediately upon confirmation of a leak order
    - allows unit to warm-up and equalize en route
    - Want unit to be tested and fully operational as you approach leak area
    - catch severe leaks that are "down the road" from reported address
    - when traveling across town to get to leak location F.I. should be set on "B" scale on the Dafrol A600 ("1K" ppm for the Heath DP-3)
      - this will prevent you from being distracted by extraneous leaks, we have thousands of known Class II and Class III leaks "on the books"
      - if you do pick up a leak enroute to a leak, note the address and immediately notify dispatch and let them know, ask if they want you to proceed to the original location or investigate the new location. Generally, you TOP priority is the original leak call.

**Materials:**

Customer Service  
Emergency Manual

- Leave F.I. on "B" scale (or 1K in the case of the Heath unit) when doing other work, such as meter changes or "offs" etc.
- B. Report to location
- Change FI from travel scale ("B" or 1K) to most sensitive scale ("D" or 10)
  - While approaching reported address F.I. must be on most sensitive scale
    - take note of gas indications as you approach address; "reading the street"
    - your not "FI-ing" at this point - still driving at normal speed but on lowest scale
  - Check F.I. unit upon arrival at address
- C. Enter premise of customer who reported leak
- D. Use CGI machine to do inside check for gas leaking into premise:
- at foundation walls and floor
  - any crack or hole in wall or floor
  - any utility (gas, water, electric, etc.)
  - sewer and drain lines
  - above foundation wall (FDW)
- E. If positive inside reads:
- take any appropriate action to protect public and property
  - report to Dispatch, advising that you will be conducting an area check rather than proceeding with F.I. check because Grade 1
  - use CGI to check for gas leaking into buildings in 200' area on both sides of street(s) in all directions beyond read
  - Forced entry required for any positive reads at foundation of building or through any available opening to inside
  - If positive inside leaks, take any appropriate action to protect public and property
  - Notify Dispatch as soon as situation permits that 200' area check has been completed
  - Once inside check is complete - find migration with FI outside (Do not get side tracked by MSF crew during the inside area check)

- F. If negative readings inside reported address, proceed with outside area check using F.I. unit (in mobile or portable mode, as appropriate)
- ensure F.I. has been tested and/or retested as needed
  - check manholes as first priority
    - if positive reads are found, check manholes in all directions to “zero”
    - when to vent; greater than 5% gas
    - use of wedges to safely aid venting process
    - carry 2 or 3 cones for safety when venting
  - check locations on lawns
    - foundation walls
    - fence and lamp posts
  - check locations on street and sidewalk
    - at curb
    - gate boxes
    - old excavations and bar holes
- Note: In watch out for traffic while using FI!*
- G. Verify positive F.I. readings with pogo and C.G.I.
- if positive read at outside FDW, enter building and check inside
    - forced entry required
    - notify dispatch for assist from fire and police departments
  - take appropriate action to protect public and property
  - notify Dispatch as soon as possible
- H. Determine migration area and grade leak
- edge of migration area is defined by zero reads in all directions using the CGI machine
  - for any outside Grade 1 leak (e.g., manhole), conduct 200' building check
  - for any Grade 2 or 3 leak, check buildings in immediate area of (adjacent to) leak “puddle”
    - 2 buildings or buildings within 200 feet, whichever is less, both sides
  - take appropriate action and notify Dispatch
- I. Notify Dispatch that investigation is complete
- J. Complete Leak Investigation Report, Premise Condition Report, and F.I. Unit Start-up Log
- K. Complete MDT Leak Completion Screen

indication ✓  
positive reads  
FI ✓ CGI

wooden wedge

## 3. Hands-on practice

**Note:** Leak field is an intersection - 4 houses of cinder block - wood is boundary of curb/lawn

## A. Portable use demonstration &amp; practice

- how to place probe on ground
- appropriate walking speed
- Demo walk off-speed 30-40 ft. **Improperly**  
(instructor does not look at machine)  
(only look at probe & listening for alarm)  
(does not check foundations or catch basin)
- Demo again **Properly:**  
looking at machine - looking where probe is placed - looking ahead for next location - looking for MH's gates etc.
- 1st leak - right rear house gate box
- designed to show
  - i. high concentration in gate can extinguish flame in unit - "blowing out flame"
  - ii. grade 1 leak at foundation
  - iii. windy days will spread leak thru yard
  - iv. how to obtain reads in MH's & boxes
  - v. verification of FI reads w/CGI & pogo
  - vi. requires thorough investigation  
allow student to go wrong
  - vii. shows wind consideration  
which way is wind blowing  
block wind w/body & feet  
try to approach from wind direction  
pogo & test to rule out effects of wind
- Priority is Safety - not to find the/a leak
- could be more than one leak
- one positive read *does not mean* checking houses, *unless* read location is considered "hazardous"
- where to check; foundations, cracks, curbs, openings, pipes, etc.
- be cautious of "blowing the flame out"
- systematic analysis of area -- don't be distracted by reads -- focus on finding hazards or total migration area

Divide into two groups:  
one mobile, on local leaks  
one portable, in leak field

have students analyze style

good odor & reads at  
foundations

FI seems OK but isn't

point out errors when  
complete

must make it safe  
make complete check of  
area

- B. Mobile use demonstration & practice
- have each student mobile an area with known leaks
  - demonstrate the difference speed makes in picking up leaks
  - stress not to worry about location of facilities
  - stress that mobile survey only determines one half of migration pattern
  - hesitate over manholes, catch basins, etc., to *help* determine if there is a build-up of gas inside
  - stress why we ride the curb
    - seams are where gas will vent
  - review and/or demonstrate basics of "Reading the Street"
    - look for gas patches, and barholes
    - other utilities, above or below ground
    - water main; usually same side as hydrants
    - gas main usually opposite side, commonly 12-13 feet off property line
    - notice hills and valleys
    - fresh patches, manholes, catch basins

#### 4. Leak Investigation Report (Form 2236)

##### A. Grade of Leak

##### B. Checklist sections

- Gas Detected [where]
  - e.g., barhole, manhole, atmosphere
- Method of Test
- Pressure of facility
- Leak Appears to be [on what]
  - e.g., main, service
- C.G.I. Test
- Odor Present
- Type of Area
- Cover (grass, asphalt, cement)

##### C. Leak Sketch

- sketch of migration area showing pertinent *positive and negative* reads including:
  - high read

- foundations and respective reads (both positive and negative)
  - manholes and respective reads (both positive and negative)
  - migration boundaries
  - valve boxes and respective reads
  - buildings and houses with addresses
  - document boundaries of migration area by showing "O's" on sketch
- D. "Comments" section
- E. "Contacted" section and Signature
- F. When to complete the form
- must be completed for all leak investigations; positive or negative reads
  - may complete it as you go along
  - must be completed when investigation is complete and leak is classified
5. Premise Condition Report
- A. Review of information required
  - B. Now requires grading of leak information
6. MDT Leak Completion Screen
- A. Purpose
  - B. Information to be entered

## Module 14: Leak Investigation and Repair

### Objectives:

- 14.1 Understand that the Company's primary focus is public safety.
- 14.2 Know and understand the uses of a CGI.
- 14.3 Know and understand how to check and use a CGI.
- 14.4 Be able to properly check the calibration of a CGI unit.
- 14.5 Know and understand the purpose of a flame ionization (FI) unit.
- 14.6 Understand the limitations of an FI unit.
- 14.7 Understand the differences between the different types of FI units currently used in Boston Gas Company.
- 14.8 Be able to set up, start, and check calibration of an FI unit for mobile use.
- 14.9 Be able to set up, start, and check calibration of an FI unit for portable use.
- 14.10 Know and understand what is required to find the total migration of a gas leak.
- 14.11 Be able to properly investigate and classify an outside gas leak.
- 14.12 Know and be able to identify sources of ignition.

Rem - se

? NOT IN  
CGI

### Instructional Plan

1. Introduction and General Principles
  - A. What is the purpose of a leak investigation?
    - Protect the general public from harm
    - Quickly ascertain and mitigate the hazard
    - The key factors in leak investigation include:
      - total migration
      - proximity to buildings
      - presence in confined spaces
    - Notify and mobilize appropriate parties to repair
  - B. Review of natural gas properties
    - Lighter than air (specific gravity = .62)
    - Explosive range (5% to 15%)
    - Ignition temperature approximately 1200°F
    - Naturally odorless
    - Mercaptan added as odorant
      - can be filtered out by soil conditions
    - Dangerous in a confined space
      - explosion
      - asphyxiation
    - Venting in the air—danger of ignition
    - Sources of ignition
      - light switches, door bells, telephones, refrigerators, etc.
      - static electricity (shoes on rugs, etc.)
      - vehicles, running gas or diesel engines, etc
      - flashlights, CGI units, etc.
      - fireplaces, wood burning stoves, etc.
      - matches, open flames, cigarettes, etc.

### Materials

1. Find the GCS
  2. Determine the Level of H  
1, 2, 2A, 3
- CGI - FI

2. The Combustible Gas Indicator (CGI machine)
- A. What is a Combustible Gas Indicator
- A machine used to detect natural gas concentrations
  - How it works:
    - an air sample is drawn across an element at a controlled rate using an aspirator bulb; a direct reading of combustible gas content of the sample is then obtained,
  - Primary means of confirming the presence of gas for BGC employees
  - First line of defense against being exposed to potential hazards from concentrations of natural gas (i.e., fire, explosion)
- B. Common names
- CGI
  - Davis Machine
  - Vapor Tester
  - Scott Machine
- C. Anatomy
- "On" switch
  - Meter
  - Battery test indicator (if equipped)
  - How to change scales
  - Inlet filter
  - Sample tubing and wand
  - Water trap(s), (filter)
- D. Scales
- 5% or LEL scale
    - how to read, i.e., "20" = 1% gas
    - use in confined space or equivalent
  - 100% or gas scale
    - change to this scale if exceed full scale on LEL
- E. Verification check; prior to each use
- ⊙ Battery test
  - ⊙ System leakage: tightness check to ensure you are sampling from the appropriate part of the probe
  - ⊙ Zero adjust, in clean atmosphere
  - ⊙ Filters in place and unobstructed
- F. Calibration checks
- Documentation of calibration check (Form from GOS 100-07)
  - Must be checked first week of every month
  - Repair or replace immediately if a problem is found; let supervisor know
  - Whomever CGI is assigned to is responsible for calibration

Procedure #815

CGI: several examples

Copy of Calibration Log

Non ERU will go to bldgs as soon as any gas is detected - They have no FI

- Must verify calibration on both scales
  - Minimum acceptable Cal-Check test results:
    - 5% scale: Cal-Chek Test gas = 2.5%;  
Acceptable reading = 2.5–2.8%
    - 100% scale: Cal-Chek Test gas = 100%;  
Acceptable reading = 90–100%
  - G. How to change the batteries
    - specific type of battery depends on actual CGI; most require carbon-zinc type replacements
3. The Flame Ionization Unit
- A. General Use
- To detect presence of PPM gas in outside leak investigations by drawing sample across flame
  - To quickly and accurately help determine the migration area and potential hazard
  - Can be used as a mobile unit in vehicle
  - Can be used as a portable unit
  - Gives *indication* of hydrocarbon gas, will not give % gas readings
  - Reads must be verified with CGI
- B. Types of F.I. units
- Dafrol Model A600
  - Heath Tech DP-3
  - Dafrol Model DA 6000
4. Other tools used in leak investigation
- A. Barring bars and sledge hammers
- In pavement, drill out hole ~~with rock~~ drill, then bang down barring bar with 12 lb sledge hammer confirming test holes are same depth
  - Bar to same depth; if obstructed, disregard test hole
- B. Plunger bar (pogo)
- In soil cover, gravel, etc., test holes can be put down by hand with plunger bar (same depth)
  - Demo both techniques and check test holes with CGI
5. Leak classification guidelines—"Grading a leak"
- A. Hazardous (Grade 1)
- ASME guidelines
  - Any leak posing a danger to public or property
  - Examples from Tip Card
    - inside read for leak migrating from outside
    - leak at manhole likely to migrate into building

Demonstrate how to access battery compartment

(F.I. unit)

Boston Gas "Leak Classification Tip Card"

- Person(s) identifying a Grade 1 leak must take appropriate action to protect the public
- Crew will respond to repair leak (make safe)
- B. Non-hazardous (Grade 2)
  - ASME guidelines
  - Not considered an immediate danger at time of detection
  - Examples from Tip Card
  - Work will be scheduled based on probable future hazard
  - Law states must be repaired within 15 months
  - BG Company policy requires repair within one year
- C. Non-hazardous (Grade 3)
  - Reasonable expected to remain non-hazardous
    - not near house or building
  - Examples from Tip Card
    - gate box leak
  - Re-evaluated at least annually
  - No requirement to repair

6. Investigating Leaks

- A. Any report of a gas leak that has not been classified shall be considered a Grade I leak until such time a determination has been made that an immediate hazard does not exist
- B. Determine the severity of each leak by finding:
  - total migration of gas
  - proximity to buildings
  - presence in confined spaces
- C. Find the total migration of gas and its highest concentration by:
 

Note: To perform a proper and complete leak investigation, you do not need to know location of facilities. You care where gas is or isn't, not where pipes are!

  - Taking CGI readings in plunger bar holes and other available openings (e.g., manholes, catch basins, boxes)
  - Tests with mobile and portable FI units
  - In areas of wall to wall pavement (gas is lighter than air), plunger bar tests should be made in cracks along curb and in available openings using CGI or FI unit
  - If gas is detected in manholes (or other confined spaces), test the next manhole (same kind) in each direction to rule out gas traveling from manhole to manhole

- If gas read is greater than 4% gas, open or remove cover to aid in venting process
- If there are verified indications of gas at outside wall of a building, building(s) shall be entered and leak tested to determine if there is an immediate hazard
  - if a Service Rep is available send him (her) in to check the inside
  - If a Service Rep is not available, it is your responsibility to go inside to check building
- If determined necessary, evacuate or ventilate building; call for a Service Rep or call for additional Distribution assistance

Note: When you enter a building, turn your CGI and flashlight on prior to going inside. Do not turn anything on or off inside until you have determined the atmosphere is "clear."

- Centering is using the pogo and CGI and/or FI unit to find the total migration of gas, its proximity to buildings and presence in confined spaces; centering allows for a rapid and accurate evaluation of the situation and accomplishes two important goals:
  - establishes the potential hazard involved, thereby allowing classification of the leak using the ASME Guide Grade I, II, III
  - establishes the area where concentrated pinpointing activity should begin

D. Reading the "street"

[As you investigate the leak, try to notice the following to aid in pinpointing leak location.]

- Evidence of gas main, gas boxes, recent trenches
- Water main usually same side as hydrants
- Gas main usually opposite side from water main, commonly 12-13 feet off property line
- Other utilities; above or below ground
- Notice hills and valleys
- Manholes and vaults
- Outside meters
- Regulators on outside meters
- Recent/current construction work
- Old Dig Safe marks
  - BGC
  - other utilities

7. Classification and Documentation
- A. After gas migration and potential hazard have been established (centering), classify the leak using the ASME Guide
- B. Leak Investigation Report (Form 2236)
- ✓ Grade of Leak
    - Checklist sections
      - / —where gas detected (e.g., barhole, manhole, atmosphere)
      - / —method of test
      - / —pressure of facility
      - / —leak appears to be (on what)—e.g., main, service
      - ✓ —CGI test
      - / —Odor present
      - / —Type of area
      - / —Cover (grass, asphalt, cement)
    - Leak sketch
      - sketch of migration area showing pertinent positive and negative reads including: high read, foundations and respective reads, manholes and respective reads, migration boundaries, valve boxes and respective reads, buildings and houses with addresses
      - document boundaries of migration area by showing "0's" on sketch
  - ✓ • "Comments" section
  - ✓ • "Contacted" section and signature
  - ✓ • When to complete form
    - must be completed for all leak investigations; positive or negative reads
    - may complete it as you go along
    - must be completed when investigation is complete and leak is classified

8. Pinpointing Leaks

Note: Pinpointing activities shall begin as soon as possible and as dictated by existing circumstances.

- A. Prior to drilling test holes:
- Emergency mark out of all utilities should be requested via "Dig Safe"
  - Locate gas lines (main and services) in migration area
  - Note locations of manholes and other pre-existing utility facilities in the area, if pinpointing and excavation is necessary prior to response from other utility/mark out personnel

premark the area  
See D prev p

- B. In soil, gravel cover, etc., use plunger bar (pogo)  
In pavement, use rock drill and driving bar
- C. Bar holes should be uniform size and depth and extend to a point slightly deeper than bottom of main
- D. Pinpointing the area
- Place first bar hole at center of leak migration and near BG underground facility
  - Drill one hole on each side of the first hole, 12' apart; you now have 3 holes and are able to test 24'
  - Highest reading will determine location of next test holes
  - Drill additional holes until the leak is located and pinpointed by finding the test hole that produces the highest reading

Note: The ability to identify factors that affect spread of gas; good main and service sketches, and adherence to uniform testing are keys to accurate pinpointing

- E. Problems
- Leaking gas spreads from a leak in a pattern which is affected by soil type and substructures present (duct lines, large boulders, etc.)
  - When multiple 100% gas readings are obtained and one high reading cannot be isolated, one or more of the following techniques can be used:
    - sight: look across the top of the test holes, escaping gas fumes may be visible and indicate the bar hole closest to the leak
    - soap bubble test: soap top of barhole so that a bubble forms; the hole closest to leak will blow bubbles the fastest
    - feel: place the back of your hand over the test hole, to feel hole venting the strongest
    - aeration: use a soil purger; a soil purger often reduces the size of leak pattern and gas readings; test how quickly the readings return to the test holes; the quickest return often indicates the leak location

Note: Never blow air into ground; purge gas out!

- top of the bar hole testing: lay probe flat on ground so that end of probe is at center of test hold

—odor: plastic smell pipes can be used in certain instances where many test holes are blowing gas; the bar hole nearest the leak may have the strongest odor

Note: Mercaptan, the chemical added to natural gas to give its odor, can be scrubbed out in soil, when it travels underground.

- F. In the event of miss, assemble all available information and test over, under, and parallel with the pipe at each end of the opening, as well as both sides; determine direction from which gas is moving

9. Soil aerating

- A. Leak investigation: soil purges should be avoided when pinpointing a leak, as they disrupt the natural venting of a gas leak; the soil purger (aerator) should only be used to pinpoint leaks when a definite "hot" spot cannot be located due to large spread and consistency of gas readings
- B. Residual gas: upon completion of a leak repair, soil purging (aeration) may be necessary to eliminate residual gas from foundation and other confined spaces
- Purge at the main or service connection at main at the point of highest reading or adjacent to the location of a hole is open
  - CGI test holes readings regularly to ensure that the levels of residual gas are dropping
  - Never place soil purges at building walls, since they will draw gas towards the building
  - Where clay type soils are present, multiple purge points may be necessary
  - Where methane/propane (heavier than air) mixtures exist, multiple and deep bar holes may be necessary

Procedure #715

10. Hands-on Practice: Locating a Leak and Purging Soil

## Module 2: Leak Classification Guidelines

### Objectives:

- 2.1 Understand Leak Classifications Guidelines
- 2.2 Be able to Properly classify various leaks
- 2.3 Know why and when to perform inside area checks

### Instructional Plan:

1. Grading a Leak
  - A. Hazardous (Grade 1)
    - ASME guidelines
    - any leak posing a danger to public or property
    - examples from Tip Card
      - inside read for leak migrating from outside
      - leak at manhole likely to migrate into bldg manholes
    - manholes
      - when to vent;
        - \* greater than <sup>4</sup>5% gas
        - \* less than ~~5%~~ as needed (if area check determines it is getting in somewhere)
      - if positive reads are found, check manholes in all directions to "zero" (before area check) [especially manholes belonging to the same utility]
        - ~~40%~~ 5% or greater is automatic Grade I - greater than 4% address the hazard (i.e. vent manholes) then begin area check <sup>40%</sup>
    - \* — if less than ~~5%~~ further investigation will be necessary to determine classification
      - \* continue checking manholes until zero found
      - \* finish outside migration area check, then complete full 200' check as part of your investigation to determine Grade
  - person(s) identifying a Grade 1 leak must take appropriate action to protect the public
  - crew will respond and repair leak or "make safe"
- B. Non-hazardous (Grade 2)
  - ASME guidelines

### Materials:

Pass Out Plastic Leak Classification Tip Cards

Several examples put on board

Location, Location

- not considered an immediate danger at time of detection (but could become a danger in future)
  - examples from Tip Card
  - work will be scheduled based on probable future hazard
  - law states must be repaired within 15 months, company policy requires repair within 12 mo.
  - will be monitored twice per year
- C. Non-hazardous (Grade 3)
- reasonably expected to remain non-hazardous —not near house or building or in a manhole
  - examples from Tip Card
    - gate box leak
    - nearest house 2000' away, etc.
  - re-evaluated (monitored) at least annually
  - no requirement to repair
- D. General Classification Guidelines
- Key factor is leak location - NOT actual % read
  - Odor calls from the public generally will be graded no less than Grade 2 because the public is aware of the leak
  - Grade of leak is always based on the *Hazard* - other factors such as chronic complaints do not change the grade but might effect *how soon a leak is scheduled for repair*
  - Manholes require special attention as outlined above

New - GRADE 2A

- EXAMPLES FROM TIP CARD
  - Closer to Buildings (NOT within 5')
  - Higher % Readings

## A. Mobile (driving) and walking surveys

- Mobile Surveys:
  - Used for "summer or winter" survey of mains
  - Cast iron encroachments, like sewer jobs, or construction over or near our cast iron mains
- Walking Surveys:
  - Allows us to go in areas not accessible to driving
  - Like business (Downtown) districts, specifically to the outside walls of the businesses
- Where:
  - Service lines from curb to point of entry into house, not just valve
  - In paved areas, you want to enlarge your walking area because gas trapped under pavement could spread anywhere
- When walking service lines, also check:
  - The condition of the meter
  - Condition of regulator and vent line
  - Condition of service riser, and riser cock
  - Check need for meter protection
- How to walk a service:
  - Sidewalk parallel to main, along the foundation to all houses and commercial structures
  - "Criss-Cross" or "X" the lawn
- When to go walking also:
  - After blasting
  - Before a city or town will pave a street
  - After underground construction
- Properties
  - Gas is lighter than air, therefore it will rise, (unless under pavement, cement, frost etc...). Gas if it cannot rise will spread sideways, it will never be absorbed in the soil. The chemical we add for smell MERCAPTAN may be absorbed in soil, but not the GAS itself.
  - Frost surveys are especially important, because gas may not rise through frost; therefore it will spread towards houses making the leak much more serious.

## B. The FI unit

- Use
  - FI does require "warm up" before it can be used accurately in a leak survey
  - When you get a reading on an FI you must verify it with a CGI machine
  - You must check the unit with test gas before each survey
  - If you get indications that come and go, you are detecting gas in the wind and therefore you have a leak, but not in the immediate area
  - You must keep your probe or funnels close to the ground, otherwise the wind will effect you more and you may not detect all leaks
- Readings
  - Upon getting any reading at an outside foundation your next move must be inside the house to make sure gas is not entering
- Main value of the FI
  - To quickly and accurately find the migration area of the leak (how far has the leak spread)
  - FI is much more sensitive than CGI, FI measures in parts per million of gas, CGI measures in % of gas
  - FI works by sampling across a flame, if hydrocarbons are detected it makes the needle rise on the FI PPM Meter
  - However, FI cannot determine between hydrocarbons. It would react the same on natural gas, swamp gas, gasoline, fuel oil, Edison burn out etc...
- Troubleshooting FI units
  - If clogged, changing filter(s) will usually correct the problem
  - "Flame out", check your pressure it's probably too low
  - When you test your machine, prior to use, if it takes longer than 2-3 seconds for the needle to rise your system is starting to clog
  - "Float" is the description of the FI needle moving without a presence of hydrocarbon, usually it's an indication that the pressure is too high

## C. Patrolling

- Patrols are on transmission lines. Patrols are conducted to inspect pipe and the immediate "Right of Way" the pipe is in. You can conduct a leak survey + pipe patrol at the same time. Look for dying vegetation, it's also an indication of gas leak.
- Problems to look for on a pipe patrol
    - Anyone digging in the area
    - Flood / erosion of soil away from the pipe, reducing its support
    - Any construction in the Right of Way

# Review 20B

## Training Outlines

1. All bar holes (Pogo) must be the same depth and size.  
Completely ignore holes that do not go to the same depth (example: 10")
2. Combustible Gas Indicator (CGI)
  - Purpose: takes readings which determine gas levels
  - Calibration: minimum once per month, on Natural Gas reads may be distorted on other items such as gasoline or Edison burn outs. You must calibrate once per month. (You should calibrate whenever you feel it necessary, according to our O&M policy and according to the manufacturer's recommendations.
  - "Checks" prior to use
    - Tightness of fittings
    - Voltage
    - Calibration
  - Make all reported leak locations safe (or make appropriate call) at all times, even if you find a hydrocarbon other than ours
3. Classifying leaks
  - 3 factors to grading all leaks
    - Location (at outside foundation) -
    - Migration (how far and to where has gas spread)
    - % Readings (especially in manholes)
  - Class 1
    - Definition - Potentially hazardous to life or property, (receives prompt attention)
    - Examples - Blowing gas, ignited gas, indication that gas is in or under a building
    - Indication that gas is close to or at a building wall
    - LEL levels in substructures such as manholes, vaults, catch basins, (where migration into a building may occur)
  - Class 2
    - Definition - Not considered hazardous at the time but could become hazardous if not repaired (should be scheduled for future repair)
    - Examples - Substantial readings between building and curb in an unpaved area (any gas leak under frost, gas can not vent, large concentration of class 3 leaks in a wall to wall paved area)

- Class 3
  - Definition – Not considered hazardous at the time and not expected to be a hazard (can be scheduled for repair on a routine basis or re-checked within the next 15 months)
  - Examples – Small indications of gas leakage in valve boxes, LEL readings in street not migrating toward buildings or structures
- Grade is based on risk, location etc..., if gas cannot vent, manholes (confined space) wall to wall paved areas (cannot vent)