



National Transportation Safety Board
Washington, D.C. 20594

Date: July 2, 2019

Emergency Response Group Factual Report

A. Accident Identification

Operator: Columbia Gas of Massachusetts
Location: Merrimack Valley Area, Massachusetts
Incident Date: September 13, 2018, multiple incidents
NTSB No.: PLD18MR003

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1 **C. Accident Summary**

2 On September 13, 2018, about 4:00 p.m. eastern daylight time,¹ explosions and fires occurred
3 after high pressure natural gas was released into a low-pressure gas distribution system in the
4 northeast region of the Merrimack Valley, Massachusetts. The distribution system was owned and
5 operated by Columbia Gas of Massachusetts (CMA), a subsidiary of NiSource. The over-pressure
6 event damaged 131 structures in the city of Lawrence and the towns of Andover and North Andover
7 (See Figure 1). Most of the property damage was a result of fires and explosions ignited by gas-
8 fueled appliances. One person was killed and 22 other individuals, including three firefighters, were
9 transported to the hospital.

10 **D. Site and Company Description**

11 1) Lawrence, North Andover and Andover are part of Essex County, Massachusetts. They are also
12 identified as part of the Merrimack Valley, which is a community of cities and towns that surround
13 the Merrimack River in both New Hampshire and Massachusetts.

14 The U.S. Census Bureau estimates the populations for the three municipalities:

- 15 • City of Lawrence, Massachusetts: 80,162.
- 16 • Town of North Andover, Massachusetts: 31, 013.
- 17 • Town of Andover, Massachusetts: 35,937.

18 2) Columbia Gas of Massachusetts, previously Bay State Gas, has been serving as a natural gas
19 operator in the state since 1847. It was acquired by NiSource Inc. (NiSource) natural gas distribution
20 companies in 1999.

21
¹ All times are reported in Eastern Daylight Time (EDT), unless otherwise noted.

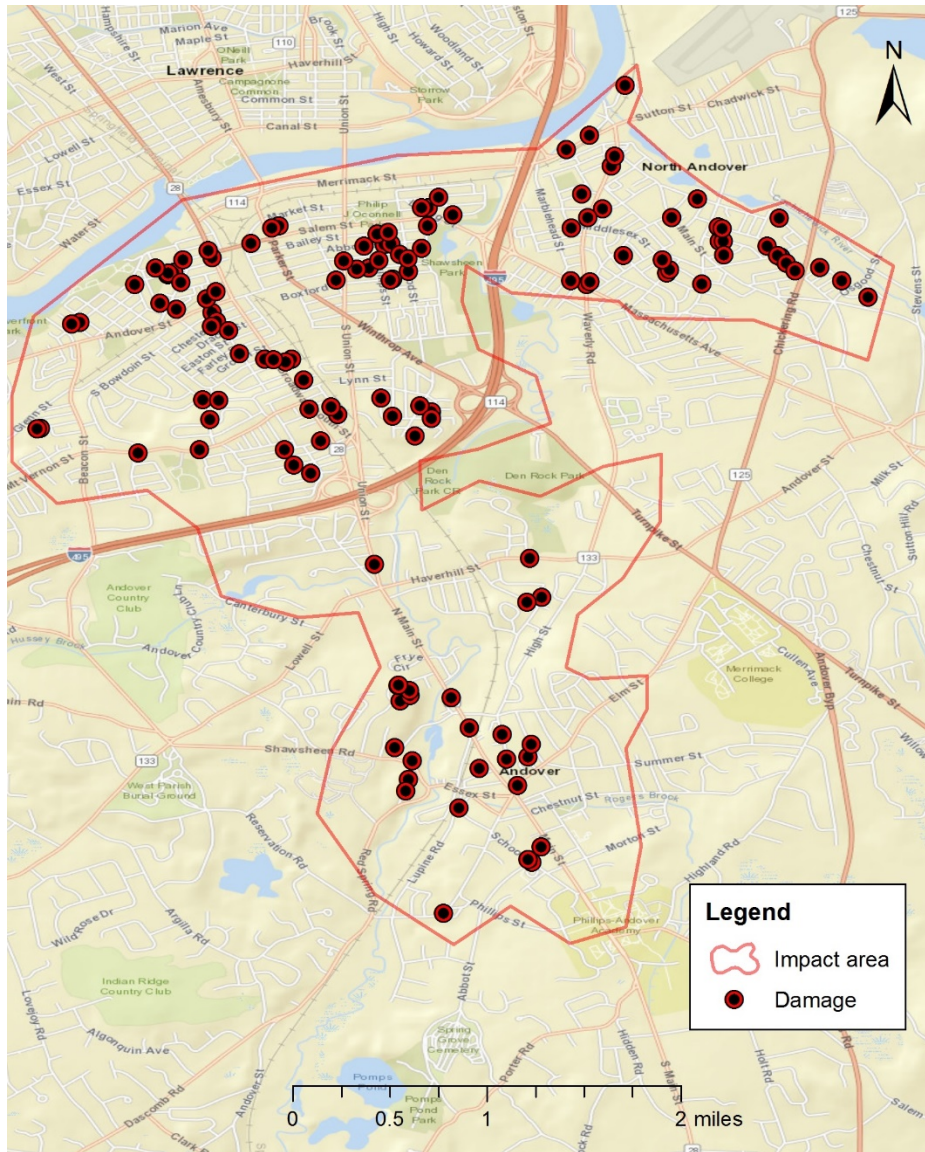


Figure 1: Area impacted on Sept. 13 and identifying damaged structures.

1

2 **E. Consequences**

3 i. Injuries

4 Twenty-three individuals were transported to the hospital; twenty were residents and three were
 5 firefighters. An 18-year old male was killed while sitting in his car and a chimney from a house
 6 explosion fell on to his vehicle (See Figure 1). Two others were seriously injured from the same
 7 address; one was located on the second floor of the house and the other was also in the vehicle at the
 8 time of the explosion. Some of the injuries to the residents included respiratory injuries related to
 9 smoke inhalation from fires, and musculoskeletal injuries from evacuating. The other transports were

1 related to ongoing medical attention that could not be carried out in the home due to the evacuation.
2 A total of five firefighters were reported injured. None of the firefighter injuries were serious and
3 required admission to the hospital; two were treated on scene and three were treated in the hospital
4 emergency department and released.
5

6 ii. Property Damage

7 The over pressurization of natural gas resulted in fires and/or explosions that caused minor to
8 severe damage of residences and businesses. The Fire and Explosion Investigation Unit of the
9 Massachusetts State Police inspected residences and concluded a total of 131 residences were
10 impacted by the incident, over 50% of which were in Lawrence. The State Police identified that
11 almost all the fires and explosions occurred from a natural gas-fueled appliance such as a furnace,
12 boiler, gas stove, or water heater. One was reported as an electrical fire. The State Police will be
13 completing a final report and will provide it to the NTSB.

14 The NTSB formed a fire damage assessment group and documented the residence where the
15 explosion and fatality occurred as well as two of the other locations that sustained major damage.
16

17 35 Chickering Road, Lawrence MA

18 This home experienced a gas explosion which resulted in the total destruction of the structure.
19 Based on the structural damage the explosion appeared to have originated on the first floor of the
20 residence and biased towards the right side of the residence as viewed from the street. The explosion
21 displaced the structure towards the right and caused the upper portion of the brick chimney to topple
22 over and land on a vehicle in the driveway. The portion of the chimney crushed the driver's side of
23 the vehicle and resulted in the fatality of the driver that was inside. The explosion did not result in a
24 fire. Due to the instability of the structure no entry was made to further identify the seat of the
25 explosion (See Figure 2).
26



1
2 *Figure 2: Exploded House where fatality occurred and two other severe injuries.*
3

4 85 Colonial Road, Lawrence MA

5 This residence experienced an explosion that damaged the windows on the first floor of the
6 home. The windows had been already covered with plywood at the time of the examination. The
7 basement casement windows had also been damaged by the explosion and were also covered with
8 plywood. Above one of the casement windows thermal damage was observed on the vinyl siding of
9 the home indicating a fire having been present in the basement. The homeowner was not present, and
10 no entry was made into the home (See Figure 3).
11



Figure 3: 85 Colonial Road, Lawrence, MA

60 Jefferson Street, Lawrence MA

This home was completely consumed by fire. The examination of the structure suggests that no explosion took place. The fire damage pattern suggests that the fire originated from the basement and then spread upwards and outwards through the rest of the structure. A gas furnace was visible in the rubble on the left side of the basement as viewed from the front steps of the home. No entry was made due to the instability of the structure (See Figure 4).



Figure 4: 60 Jefferson St., Lawrence, MA

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2
3
4 iii. Electric Utility

5 The Massachusetts Electric Company, National Grid (NG), is the utility company that provides
6 electricity to Essex County. It serves 269,640 customers in that county.^{2, 3}

7 As part of their standard operating procedures, NG provided a dedicated, priority phone number
8 for municipal first responders. Local Fire Department officials submitted a request to the NG System
9 Control Center for a specific location and reason for the request to de-energize an area. On
10 September 13th, NG received several requests using the priority phone number to de-energize
11 different areas of the three different municipalities to reduce the number of sources that could ignite
12 the released natural gas. Staff from the NG New England Control Center used a mapping feature
13 from their Outage Management System (OMS) to identify the supply feeders that needed to be
14 shutdown, which is summarized below on the day of the incident:

² National Grid numbers: <http://mema.mapsonline.net/public.html>.

³ “About National Grid”, <https://www.nationalgridus.com/Our-Company/>.

- 1 • The first request to de-energize came from the Lawrence Director of Public Works in
2 conjunction with the Mayor of Lawrence to shut down power to five different schools in
3 Lawrence at approximately 5:20 p.m. Three of the schools were remotely shutdown by
4 5:33 p.m., and the two others were done by a switch person to open circuit breakers at a
5 substation.
- 6 • The North Andover Fire Department requested that NG cut electrical service at a pole on
7 Herrick Road at 6:10 p.m., which manually disconnected the service at 7:15pm.
- 8 • National Grid, represented by a Senior Supervisor and Manager, integrated with Unified
9 Command at the ShowCase Cinema location. The utility received a request to de-
10 energize everything south of Merrimack Street in Lawrence at 6:36 p.m.
- 11 • Finally, at 7:26 p.m., NG received the final requests to de-energize large geographic areas
12 of Andover and North Andover, which started at 7:54 p.m. In total, 17, 822 customers
13 were affected by the electrical outage. The breakdown included 10,419 customers in
14 Lawrence; 5,403 customers in Andover, and 2,000 in North Andover. ⁴

15 Power was later restored in stages between September 14 through September 16 in Lawrence,
16 Andover and North Andover, restoring almost all customers. NG's coordination with CMA and
17 Eversource to restore power required a lengthy process to ensure that it was safe to re-energize and
18 not potentially ignite gas in the homes.⁵ Since the electric grid was not designed geographically the
19 same as the natural gas low pressure system, NG requested maps from CMA of its system to overlay
20 on their maps to ensure NG would turn on the right electric feeders. NG then waited for the gas
21 companies and the local fire chiefs to provide the all clear to re-energize. As a precaution, the fire
22 department sent an apparatus to the neighborhood in case a structure fire started. If the gas
23 companies could not give the "all clear", NG manually disconnected the service, which they did for
24 approximately 270 structures. Additionally, NG manually patrolled their feeders to ensure that the
25 electric utility infrastructure was not damaged.

⁴ National Grid response, "NTSB Information Request".

⁵ On September 14, 2018, the Massachusetts Governor declared a state of emergency and authorized Eversource to manage the restoration of the utility services in south Lawrence, Andover and North Andover, see link: <https://www.mass.gov/news/governor-baker-declares-state-of-emergency-regarding-incidents-in-lawrence-andover-and-north>.

1 NG has an Emergency Response plan that is updated annually and filed with the Massachusetts
2 Department of Public Utilities, as required by the Code of Massachusetts regulations, which requires
3 them to be prepared to restore service to its customers in a safe and reasonably prompt manner. The
4 regulation also requires utility company personnel to perform emergency drills annually. ⁶

5
6 iv. Evacuations

7 The Mayor of Lawrence issued an evacuation order for the area of South Lawrence. The
8 boundary between north and south of the city is divided by the Merrimack River. An alert was issued
9 over cell phones, and to the media to notify residents in the area.

10 Evacuations for North Andover and Andover were less defined because no physical boundary,
11 such as a river, existed. The North Andover deputy chief was told that approximately 1600 natural
12 gas services were impacted in North Andover, which serviced residential structures such as single-
13 family homes, townhouses, apartment complexes, and schools. North Andover issued a voluntary
14 evacuation for all, natural gas service customers, as they were unaware of whether it was just the
15 low-pressure system or also the high-pressure system that was affected. The town used local cable
16 channels, town website and Reverse 911, a citizen notification alert system, to send out the message.
17 ⁷ People could return to their homes in North Andover on Sunday, September 16, 2018. ⁸ The
18 Andover fire chief called for an evacuation through Reverse 911 and used social media, (Facebook,
19 twitter, town website), to communicate to residents to turn off their gas meter if they knew how and
20 to evacuate if they did not feel safe or smelled gas. ⁹

21 Over 50,000 residents were asked to evacuate after the incident. ¹⁰ Five reception/evacuation
22 centers were set up in the three municipalities, four of which turned into overnight shelters, which
23 remained open for several days.

24
25
26
27

⁶ “Standards of Performance for Emergency Preparation and Restoration of Service for Electric Distribution and Gas Companies”, 220 CMR 19.00.

⁷ The alert system automatically calls every landline; a cell phone or private number must be registered.

⁸ Interview of the North Andover Deputy Fire Chief.

⁹ Interview of the Andover Fire Chief.

¹⁰ MEMA Reports, “Special Edition Covering August-October 2018”, Volume 17, Issue 7, November 26, 2018.

1 v. Road Closures

2 The Massachusetts State Police dispatched almost immediately after the emergency calls came
3 into the Merrimack area around 4 p.m. In the first 24-hour period, they sent 135 uniforms, 55 detectives,
4 7 members of the fire and explosion group, and 9 crime scene technicians. A total of 362 uniform assets
5 were utilized for the first four days. They assisted in closing off exit ramps on the Interstate 495 that
6 entered the affected area, as well as Route 28, and Rt 114, entering the City of Lawrence. State Police
7 also assisted in escorting firefighters and crew technicians during meter shutoffs and patrolled the area.¹¹

8

9 **F. Accident Response**

10 i. Fire Departments

11 On September 13, the three fire departments in Lawrence, North Andover, and Andover were
12 inundated with emergency calls shortly after 4 p.m., with reports of structure fires and explosions.
13 The incident commanders from each of the three municipalities in their interviews told NTSB
14 investigators that because Lawrence, North Andover and Andover are geographically adjacent to
15 each other, this became an immediate challenge for resources because they were listed as each
16 other's mutual aid, as well as sharing the similar aid from other jurisdictions. All three fire
17 departments had within the first half hour exhausted their run cards, which outlines the list of mutual
18 aid depending on the fire alarm level (1-10). The incident commanders from all three fire
19 departments, who were either the fire chief or deputy chief, told NTSB investigators they had never
20 responded to a gas incident of this magnitude.¹²

21 In this incident, the 10th alarm was reached, which triggered a request to the Massachusetts
22 Emergency Management Agency (MEMA) to activate the state-wide Fire Mobilization Plan.¹³ The
23 plan activated 15 Task Forces across the state and over 180 fire departments responded that included
24 133 from Massachusetts, 50 from New Hampshire, and 1 from Maine. The number of fire apparatus
25 included 167 engines and 65 ladder trucks.¹⁴ Additional assets also included 660 law enforcement

¹¹ NTSB Investigator Email 9.21.2018 and MA State Police Email Correspondence (April 2019).

¹² Interviews of the Lawrence Deputy Fire Chief, North Andover Deputy Fire Chief, Andover Fire Chief.

¹³ Massachusetts Fire Mobilization Plan: <https://www.mass.gov/fire-mobilization>.

¹⁴ MEMA Reports, "Special Edition Covering August-October 2018", Volume 17, Issue 7, November 26, 2018.

1 officers from 140 responding departments, and 54 advance life support and basic life support
2 ambulances.¹⁵ These resources rotated every twelve hours until Monday, September 16, 2018. ¹⁶
3 During interviews, firefighters told NTSB investigators they experienced a number of challenges,
4 such as:

5 1) Communication with each other: The fire departments had only one tactical channel for fire
6 ground operations. The volume of “chatter” across the frequency made it difficult to clearly
7 request additional resources or communicate on-scene.

8 2) Communication with CMA: The incident commanders did not receive timely information
9 within the first couple of hours of the incident from CMA regarding the cause of the gas incident,
10 the area that was affected, and how long it would take to secure the gas release.

11 12 Lawrence

13 The Deputy Fire Chief of Lawrence first dispatched to a 9-1-1 call at 4:11 p.m. responding to a
14 basement fire. Within minutes of this first call, dispatch notified him of four other structural fires.
15 The deputy fire chief radioed dispatch requesting mutual aid from other fire departments. The
16 Lawrence fire chief arrived 10 minutes after and assumed command of the incident within his
17 municipality. The fire chief told investigators that a majority of the 125 firefighters in his department
18 responded. Typically, 24 firefighters are on duty during a shift. ¹⁷

19 Staging areas were set up in Lawrence as fire companies arrived. Level 1 staging was set up
20 around 5-5:30 pm. at the parking lot of a permanently closed cinema off Route 114. The Lawrence
21 emergency operations center (EOC) was also set up at Level 1, forming unified command with the
22 gas company and other state and local agencies. Between 7 p.m.-8p.m., Level 2 staging was set up at
23 the parking lot of a shopping center on Essex Street.

24 The deputy fire chief responded to the house explosion where the fatality occurred and witnessed
25 firefighters and paramedics already on-scene trying to resuscitate and rescue the injured from that
26 location. He also responded to many of the structural fires. He reported that because of the number
27 of incidents, firefighters had to act quickly to shut off the gas, extinguish the fire and then move on

¹⁵ Schwartz, Kurt, “The 2018 Gas Line Explosion in Merrimack Valley, Massachusetts”, Conference: Maine Partners in Emergency Preparedness, April 2019.

¹⁶ Fire Chief of Andover statement to U.S. Senate Committee on Commerce, Science and Transportation, “Pipeline Safety in the Merrimack Valley: Incident Prevention and Response,” 20 November 2018.

¹⁷ Email from Lawrence Fire Chief, “RE: NTSB request for information”, 9 May 2019.

1 to the next incident reported. Most of the homes in Lawrence were older and had gas meters inside
2 the basement, making it harder to extinguish the fire; the newer homes had gas meters installed
3 outside.

4 During the response, the deputy fire chief told NTSB investigators that he contacted dispatch to
5 get a status update to see if CMA had the gas incident under control, while recognizing also that the
6 gas company was likely responding to the incident. However, he received no updates from dispatch
7 at that time. About two hours after the initial fires, he assumed the gas company had resolved the
8 incident when he noticed there were no major fires and explosions reported, except for rekindling of
9 fires in homes.¹⁸

10 The Lawrence Fire Chief reported 9 structural fires; 53 boiler or furnace fires; and 5 explosions
11 in Lawrence.¹⁹ He reported four Lawrence firefighters suffered minor injuries while responding.

12 13 North Andover

14 North Andover Fire Department received its first 9-1-1 call at 4:13 p.m. to a boiler fire. While
15 the department was on route, multiple emergency calls from dispatch came in for other fire
16 incidents. As the calls were coming in, the Deputy Fire Chief of North Andover, who was Incident
17 Commander for North Andover, started listing fire companies on his run card, he learned that most
18 of his mutual aid resources were dispatched to Lawrence. He then requested smaller fire companies
19 farther away for assistance.

20 On duty that day was 1 Deputy Chief, 2 Line Lieutenants, 1 Fire Prevention Lieutenant and 10
21 firefighters. But after the incident occurred, they requested the entire department of 55 firefighters to
22 respond, of which 44 responded to the incident. Typically, the North Andover Fire department has a
23 minimum of 12 fire fighters on duty per shift.

24 After the Fire Mobilization Plan was activated, a total of 29 other fire departments from New
25 Hampshire, Maine and other parts of Massachusetts responded to North Andover. The deputy fire
26 chief would route over companies not needed in North Andover to Lawrence. The North Andover
27 Fire Department first established a staging area at St. Michael's Middle School and later at North
28 Andover High School and the North Andover Middle School.

¹⁸ Interview of the Deputy Fire Chief of Lawrence.

¹⁹ Email from Lawrence Fire Chief, "RE: NTSB request for information", 19 September 2018.

1 The Deputy Fire Chief reported a total of 33 dwellings with fire and explosion damage in North
2 Andover. This included 11 structure fires, 20 boiler water heater fires, and 2 dual boiler fires. He
3 reported one North Andover firefighter suffered a minor injury while responding.
4

5 Andover

6 Andover fire department received its first 9-1-1 call at 4:19 p.m. for a stove fire at a restaurant.
7 Within minutes, dispatch listed multiple addresses that were reporting structural fires. They had
8 between 15-17 firefighters on duty that day and the fire chief called in a code red alert. He then
9 heard over the fire communications that Lawrence and North Andover were experiencing similar
10 incidents.

11 The fire chief requested dispatch to notify MEMA to activate two task forces. He recognized the
12 events occurring were gas-related and contacted CMA through a regular dispatch number to provide
13 status updates so that the fire department could relay information to the public. He told NTSB
14 investigators that CMA did call him back over four hours later, while also acknowledging the delay
15 was likely caused by the number of emergency calls they received.

16 The fire chief activated their Emergency Operations Center (EOC) at the Town of Andover
17 Fire/Police Department within the first hour of the incident. Local agencies and organizations
18 represented in the Andover EOC included the town manager, the police chief and fire chief of
19 Andover, second and third command of the Andover police department, a MEMA liaison, Director
20 of the Department of Public Works, and representatives from the Board of Health, health inspectors.,
21 and electric utilities.²⁰
22

23 i. Fire Department Resources

24 All three municipal fire departments were staffed by paid career firefighters and listed the
25 following resources at the time of the incident:

26 Lawrence:

- 27 – Total full-time Fire Fighters: 125
 - 28 – Fire stations: 6, which includes a fire prevention office
- 29
30

²⁰ Interview of Andover Fire Chief.

1 North Andover:

- 2 – Total full-time Fire Fighters: 55
3 – Fire stations: 2 and each equipped with: 1 engine, 1 ladder and 1 ambulance

4 Andover:

- 5 – Total full-time Fire Fighters: 68
6 – Fire stations: 3 and each equipped with: 3 engines, 1 ladder and 1 deputy chief

7
8 ii. Unified Command

9 The Massachusetts State Fire Marshal was notified of the gas events within the first half hour of
10 the incident. Unified command was initiated by the State Fire Marshal and Director of MEMA and
11 were staged at the ShowCase Cinema parking lot in South Lawrence. There was no lead agency and
12 decisions were made by the State Fire Marshall and MEMA.²¹ CMA’s Director of Government
13 Affairs arrived between 6:00 p.m. and 7:00 p.m. and was later joined by the Lawrence Operations
14 Center Manager. ²²Multiple agencies from federal, state and local agencies were part of the unified
15 command, including:

- 16 – Massachusetts State Fire Marshal
17 – Massachusetts Emergency Management Agency
18 – Massachusetts State Police
19 – Massachusetts Department of Public Utilities
20 – Lawrence Police and Fire Departments
21 – North Andover Police and Fire Departments
22 – North Andover Emergency Management
23 – Columbia Gas of Massachusetts
24 – Mayor of Lawrence
25 – Town Manager of North Andover
26 – Town Manager of Andover
27 – Federal Bureau of Investigation
28 – Red Cross

²¹ Interview Notes of the State Fire Marshall and then Director of MEMA from NTSB Emergency Response Group members.

²² Email from NiSource VP of Engineering and Pipeline Safety 15 May 2019.

1 – National Grid

2 iii. 9-1-1 Calls

3 On September 13, the public safety answer points (PSAP) received a total of 1,588 calls between
4 4 p.m. through 8 p.m. for Lawrence, North Andover, and Andover. In Lawrence, the highest number
5 of calls were within the first hour of the incident and declined each hour until midnight.²³

6 Depending on the type of call (landline versus wireless call), and location, the call was directed
7 to the PSAP of jurisdiction. If the PSAP was unable to pick up a call after a certain amount of time,
8 it was directed to an Alternate PSAP that would take the call. If the Alternate PSAP also was unable
9 to handle the call volume, it would be routed to a final PSAP to receive the calls. Table 1 lists the
10 number of calls received by the PSAPs on September 13 between 4 p.m. and 8 p.m.:

11
12 *Table 1: 9-1-1 Call Distribution*

PSAP	9-1-1 Calls on Sept. 13 (4-8pm.)
Andover PD	89
Essex County Sheriff	564
Framingham S911D	222
Lawrence FD	57
Lawrence PD	389
Lawrence Hospital	20
Lowell PD	72
North Andover PD	80
Northampton SP	95
Total	1588

13
14 The Massachusetts State 911 Department within the Executive Office of Public Safety and
15 Security oversees the day-to-day administration of the statewide 911 system and provides wireless
16 911 call handling in Framingham. The Department has the authority to review and assess new
17 communication technologies and is given oversight and guidance by the State 911 Commission.
18 Massachusetts recently upgraded its system as of January 2018 to an i3 aligned digital or Internet
19 Protocol (IP)-based 911 system, also referred to as Next Generation 911.^{24, 25}

20
²³ Call statistics per hour for the City of Lawrence.

²⁴ Internet Protocol is the method by which digital data is sent from one computer to another on the Internet or other networks.

²⁵ Letter from Executive Director of State 911 <https://www.mass.gov/files/documents/2018/05/23/182911ago162.pdf>.

1 iv. Columbia Gas of Massachusetts Response

2 **September 13, 2018**

3 **3:57 p.m.-4:16p.m.**

4 On September 13, the NiSource Gas Systems Control monitoring center in Columbus, Ohio,
5 received pressure alarms on its Supervisory Control and Data Acquisition (SCADA) system, which
6 detected an over-pressurization in the low-pressure gas distribution system in South Lawrence,
7 Andover, and North Andover.²⁶ CMA reviewed the data from SCADA system from September 13
8 and identified that a sudden increase of pressure was recorded for the low-pressure system at 3:57
9 p.m. The first high pressure alarm went off at 4:04 p.m. at the South Lawrence SCADA pressure
10 monitoring point, noting a pressure of 15.02 inches water column (inwc).²⁷ A second high-pressure
11 alarm went off at Riverina SCADA pressure monitoring point in Andover noting a pressure 16.94
12 inwc at 4:05 p.m. The controller acknowledged both alarms and called the CMA technician on call
13 for Measurement and Regulation (M&R) at 4:06 p.m. The technician retrieved a company truck,
14 while other M&R technicians checked on regulator stations feeding the South Lawrence area. At the
15 monitoring center, a rate of change alarm went off at 4:07 p.m., as well as a high-high alarm at 4:08
16 p.m. for the Riverina station, which the controller acknowledged immediately. At 4:16 p.m. the on-
17 call technician reported to the monitoring center that he saw smoke and explosions from a distance.

18 ²⁸

19
20 CMA set up their incident command at their office building at 55 Marston Street in Lawrence.

21
22 **4:16 p.m.-5:28 p.m.**

23 A CMA engineer and field operations leader (FOL) were at a construction site at 24 North
24 Lowell Street in Methuen, when they received notification at 4:18 p.m. to contact construction
25 personnel, from whom they learned that fires were coming out of house chimneys.²⁹ Shortly after

²⁶ See Merrimack Valley Operations/Pipeline Integrity Group Chairman's Factual Report for additional details on the South Lawrence low pressure system.

²⁷ Interview with CMA controllers defined high pressure alarms as elevated pressure in the system and a high-high pressure is when the pressure in the system has reached its maximum allowable pressure.

²⁸ CMA Timeline (v.4) and Pressure Chart Extrapolation Analysis (03-12-19).

²⁹ A Field Operations Leader primarily handles customer requests and responding to gas incidents and leaks-See Interview of FOL.

1 the initial contact between the engineer and the CMA construction department, the engineer was told
2 that the construction crew were completing a tie-in at Salem and South Union streets and that the
3 crew removed the bypass, which was followed by a loud noise and the bypass ejected. The
4 construction crew tried to close the bypass tap manually, which is when they noticed the fire through
5 the chimneys.³⁰

6 At approximately 4:30 p.m., an M&R technician at the Winthrop Avenue regulator station
7 observed a loud sound and gas was flowing. He backed off the setpoint on the two regulators and
8 shut down the station. Flow began to drop as reflected in the SCADA monitoring system in Figure 5.
9

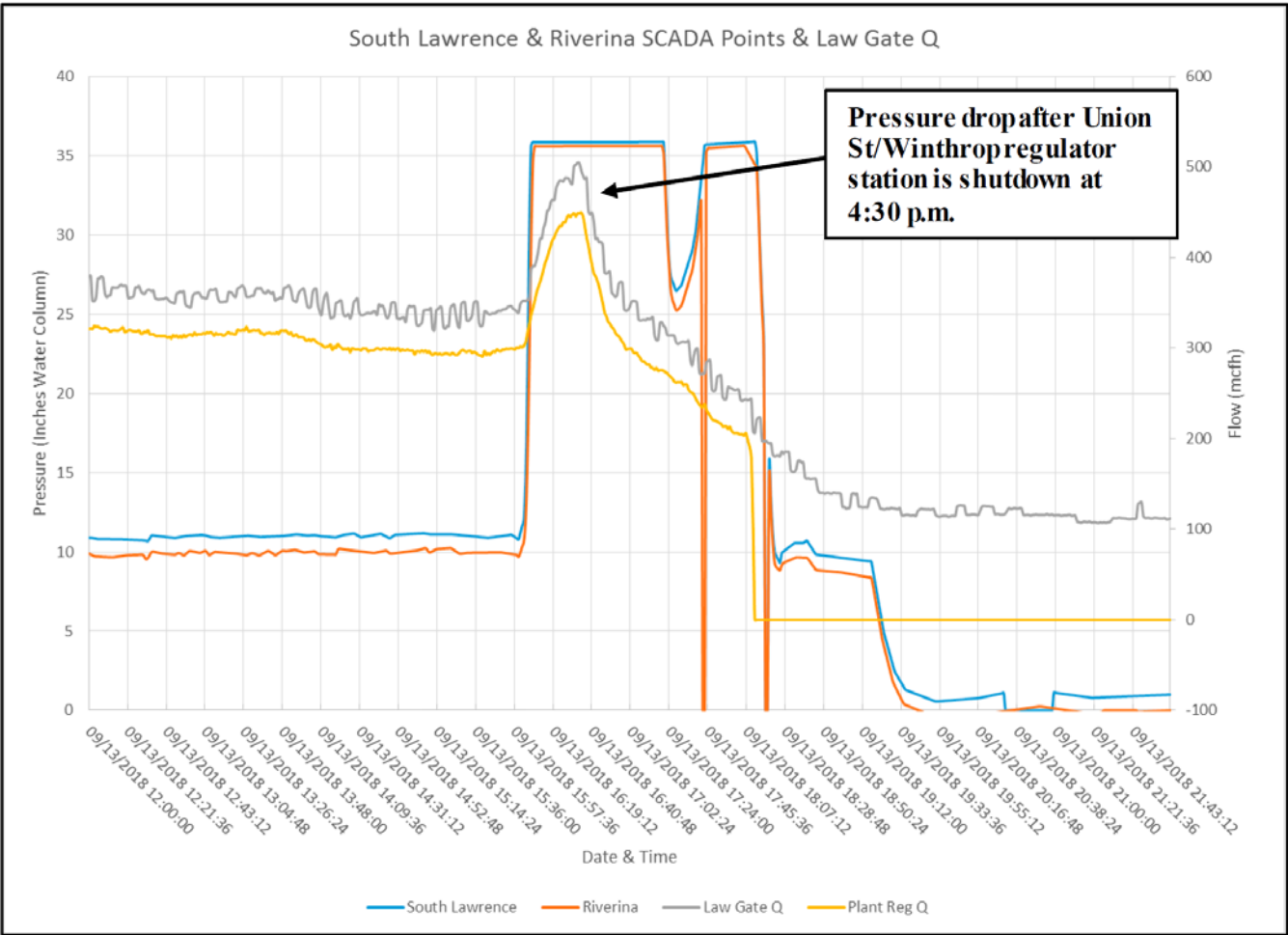


Figure 5: SCADA monitor data on September 13, 2018

³⁰ CMA Timeline (v. 4).

1 While en route to assess the situation at Salem and South Union, the FOL was flagged down by a
2 Methuen police officer to assist him in the evacuation of a burning apartment buildings at Inman
3 Street in Lawrence. He also witnessed other fires in homes.³¹

4 Due to traffic congestion, a police officer escorted the FOL towards Salem and South Union,
5 arriving around 5:08 p.m. The FOL then conferred with the construction crew on whether they had
6 confirmed low pressure to low pressure before removing the bypass, which they reported to him they
7 did. He then went to 78 Salem Street (near the Salem and South Union construction site) to identify
8 the pressure in the system and with the assistance of a pipefitter using a Kuhlman gauge, found there
9 was elevated pressure of 2.5 psi at 5:19 p.m. He then reported this to his supervisor, the Lawrence
10 Operations Center Manager, and recommended that they shut down the low-pressure system. The
11 Lawrence Operations Center Manager agreed and designated the FOL as the incident commander.³²

12 The FOL then called the engineering department to request the list of valves needed to be closed
13 in order to isolate and shut down the system. While waiting for this information, he requested help
14 from all distribution crews to meet him at the tie-in site. At 5:27 p.m., he is sent an email from a
15 field engineer in the engineering department that lists 13 regulator stations. He then verified on the
16 phone a minute later with that field engineer that he needed to close 14 regulator stations, which
17 included 15 critical valves and 1 distribution valve that needed to be closed to shut down the system.
18 He asked over the phone for the size and material of the valve for each regulator station. The FOL
19 then wrote out a list of all the valves by station, including the size and material of each valve, and
20 later tracked each valve's time of closure.

21 Once crews met the FOL, the FOL assigned them regulator stations to shut off the critical valves.
22 He directed the crews to verify with the engineering department the correct valve once they arrived
23 at the regulator station. Once confirmed, they were to close the valves. The crews have a GIS system
24 to assist them in locating the regulator stations, which also identifies the critical valves.³³

25
26 **5:45 p.m.-7:24 p.m.**

27 The FOL and crews shut down all 15 critical valves. Pressure continues to drop in the low-
28 pressure system.

³¹ The FOL location on September 13 was recorded by a GPS tracker in the CMA system-See FOL Driving Location 9.13.18-9.14.18.

³² Interview of CMA Lawrence Operations Center Manager

³³ Interview of FOL

- 1 • Critical valve 4-inch plastic closed at 5:45 p.m. at Elm/Pine (Andover)
- 2 • Critical valve 6-inch steel closed at 5:57 p.m. at Amherst and Beach (Lawrence).
- 3 • Critical valve 4-inch steel closed at 6:00 p.m. at Andover and State (Lawrence).
- 4 • Critical valve 4-inch steel closed at 6:05 p.m. at Broadway/Boyd (Lawrence).
- 5 • Critical valve 6-inch steel closed at 6:11 p.m. at Salem/Parker (Lawrence).
- 6 • Critical valve 4-inch steel closed at 6:14 p.m. South Union/Winthrop (Lawrence).
- 7 • Critical valve 6-inch plastic closed at 6:20 p.m. at Phillips Street LP (Andover).
- 8 • Critical valve 8-inch steel closed at 6:20 p.m. at Sutton/North Main (N. Andover)
- 9 • Critical valve 6-inch plastic closed at 6:29 p.m. North Main/Union (Andover)
- 10 • 2 Critical valve 4-inch steel closed at 6:38 p.m. Essex St. LP (Andover)
- 11 • Distribution valve 6-inch plastic closed at 6:41 p.m. at Salem/Parker (Lawrence)
- 12 • Critical valve 8-inch steel closed at 6:44 p.m. at Haverhill/High (Andover)
- 13 • Critical valve 6-inch steel closed at 6:53 p.m. at High/Harding (Andover).
- 14 • Critical valve 4-inch steel closed at 7:02 p.m. at Pleasant/Rt 125 (N. Andover)
- 15 • Critical valve 6-inch steel closed at 7:17 p.m. at Massachusetts Avenue LP (N.
- 16 Andover)³⁴

17 The closure of all critical valves and 1 distribution valve shut down the low pressure system for
 18 the Lawrence, N. Andover and Andover system at 7:17, which the FOL confirmed to an engineer at
 19 7:24 p.m.³⁵ The FOL then requested from the engineering department the location of the extremities
 20 of the system to send over pipefitters to put gauges on the risers to ensure that the gas was not back
 21 fed and that the low-pressure system was fully shut down.

22
 23 **7:24 p.m.-September 14.**

24 Low-low pressure alarms, reflecting that the system was at risk of losing pressure, were received
 25 from Riverina and South Lawrence SCADA pressure monitoring points, between 7:19 p.m. and 7:24
 26 p.m., confirming the system was shutting down. The President of Columbia Gas declared a Level 1
 27 Emergency, under CMA’s Emergency Response Plan at 7:43 p.m.³⁶

³⁴ CMA Timeline (v. 4).

³⁵ Interview of FOL

³⁶ Level 1 is defined in CMA’s Emergency Manual as “Catastrophic Event-Which if not handled in an appropriate manner may dramatically impact NiSource’s reputation, assets or cause liability. Corporate Crisis Plan activated.” Level 1 scenarios include a loss of a major gas facility or loss of critical gas infrastructure.

1 Beginning at 8:39 p.m., the FOL sent pipefitters to go look at different points in the system in
2 Lawrence, North Andover and Andover to take readings to see if the pressure was dropping in the
3 system. At around midnight, crews were dispatched to the affected area in all three municipalities to
4 assist the fire department in shutting off meters and responding to fires, leak calls and odor
5 complaints. Locksmiths were also requested so that technicians could access some of the properties
6 to be able to check for the presence of gas.

7 On September 14, at 2:52 a.m. NiSource submitted a request to the Northeast Gas Association
8 (utilizing the industry-standard American Gas Association request form) seeking mutual assistance
9 from other gas companies, specifically service technicians and supervisors. A total of 586 service
10 technicians and 57 supervisors from 27 different gas operators responded to the incident on
11 September 13.³⁷

12 During the night, the M&R group work at the FOL's direction to lock-in all regulator stations in
13 the affected distribution system.³⁸ At 5:01 am, the FOL was informed that 10 of the 14 regulator
14 stations were locked because the crew had difficulty closing a critical valve at one of the remaining
15 four regulator stations, the Massachusetts Avenue LP regulator station. The FOL dispatched a crew,
16 which completed the closure of that valve at 6:26 a.m. At 6:27 a.m., all 14 regulator stations were
17 locked in and the low-pressure system was confirmed shut down for the Lawrence area. A total of
18 10,894 customers were affected, which included those outside the impacted area of the low-pressure
19 system whose gas service was shutoff as a precaution. The low-pressure system impacted 8,447
20 customer services.³⁹

21 Once the system was completely shut off, CMA began the restoration phase, turning on service
22 for customers not in the impacted area. Eversource Energy was part of the CMA restoration process,
23 reporting to CMA. However, after the Governor of Massachusetts declared a State of Emergency, he
24 designated Eversource Energy as the lead organization for the recovery process.⁴⁰

³⁷ Columbia Gas Mutual Aid Company List-Friday, September 14, 2018.

³⁸ Lock-in refers to the inlet and outlet valves are completely closed and as a result, there is no gas flowing in the regulator station.

³⁹ CMA Email, "Re: no. of affected customers", 5.31.2019

⁴⁰ "Governor Baker Declares State of Emergency Regarding Incidents in Lawrence, Andover and North Andover, 14 September 2018, <https://www.mass.gov/news/governor-baker-declares-state-of-emergency-regarding-incidents-in-lawrence-andover-and-north>.

1 **G. Emergency Response Plan and Procedures**

2 All three municipal fire departments had an emergency response plan dated 2018 on file from
3 CMA, as required by Massachusetts law.⁴¹ This plan must be filed annually with the Massachusetts
4 Department of Public Utility on May 15. The ERP was identical for all three Fire Departments.

5 The Fire departments also reported that CMA conducted annual training for them. A former
6 CMA employee who had officially retired from CMA in July 2018, would conduct these trainings
7 twice a year on propane and natural gas for each fire department. All three fire departments also had
8 their own procedures for how to respond to a natural gas incident. They also reported doing drills
9 with CMA in the past, none of which addressed a system-wide over-pressure event that would
10 involve a multi-jurisdiction response.

11 CMA has a 244-page Emergency Manual that applies to all of Columbia Gas companies and was
12 last updated on January 1, 2018.⁴² It includes a procedure for “Emergency Notifications and
13 Response”, which includes procedures on how to dispatch resources in the event of a major gas
14 incident. Also included in the manual is a procedure for “Response to Over Pressure”, which lists
15 steps on how to identify and respond to an over-pressure event for a customer or system wide. It lists
16 specific actions the monitoring center takes when a high-high pressure alarm is triggered, which is to
17 notify gas operations personnel. Field personnel are then required to notify Gas Control upon arrival
18 and follow a point-to-point verification.⁴³ If the operating pressure of the distribution system is
19 exceeded, M&R personnel are to take steps to control the flow of gas and reduce the system pressure
20 to its MAOP or less. The procedure also states that “if risk to life or property is imminent,
21 emergency shutdown shall be considered.”

22 CMA provided annual emergency response training to its technicians and supervisors, including
23 both computer-based training on its Emergency Manual, and hands-on training at the company’s
24 training facility in Shrewsbury, Massachusetts. Over-pressure is a scenario that is discussed during
25 training and tabletop exercises.⁴⁴

26

⁴¹ Mass. Gen. Laws ch.164, § 85B.

⁴² Columbia Gas companies are in the following states: Kentucky, Maryland, Massachusetts, Ohio, and Pennsylvania and Virginia.

⁴³ Point-to-point verification is the process to verify the actual physical location of the pipeline system and verify that the data, information, and any control or alarm function to/from the point are being accurately represented on all SCADA displays on which it resides. See <https://www.phmsa.dot.gov/sites/phmsa.dot.gov/files/docs/technical-resources/pipeline/control-room-management/60636/faqs-control-room-management-20180726.pdf>.

⁴⁴ CMA “Table Top Exercise Over-Pressurization”

1 **H. Emergency Management**

2 Each municipality is required to have a comprehensive emergency management plan (CEMP)
3 that includes multiple annexes, which is required state-wide. The CEMP is an all hazards plan to
4 prevent, prepare for, respond to and recover from an emergency or disaster caused by natural or
5 man-caused hazards. Lawrence, North Andover and Andover all provided copies of its CEMP.

6 Every municipality in Massachusetts has an emergency manager, who administers this plan, and
7 is represented by either the fire or police chief, or a separate position. The Lawrence fire chief and
8 Andover police chief are the emergency managers. North Andover created a separate emergency
9 management branch under their public safety division and has its own selected emergency manager,
10 who has a deputy and other emergency management staff. This separate position in North Andover
11 gives the emergency manager the authority to declare a local state of emergency and request
12 additional resources. The North Andover Emergency Manager did declare this for North Andover on
13 September 13 at 4:45 p.m. and requested assistance from the Massachusetts Emergency
14 Management Agency. The Massachusetts Governor declared a state of emergency on September 14,
15 2018.

16 CMA has a designated NiSource Incident Commander/Emergency Coordinator, who is given a
17 list of contact information and resources to manage an emergency. The Operations Center Manager
18 is currently the Incident Commander/Emergency Coordinator for the Lawrence area.⁴⁵

19
20 **I. Restoration**

21 Residents who evacuated from the impacted area could go back to their homes by 7:00 a.m. on
22 September 16. As described above in Section E(iii), restoring power and electricity was a multi-step
23 effort. CMA restored gas service to most customers in the impacted areas of Lawrence, North
24 Andover and Andover by December 16, 2018.

25 Until gas service was restored, customers were without heat, hot water, and gas appliances such
26 as stoves and gas dryers. MEMA and the American Red Cross, and local officials set up a Recover
27 Resource Center to provide the communities with food and hotel vouchers, mental health
28 counselling, and other support services. Also, CMA and MEMA collaboratively set up an alternative
29 housing program that relocated almost 2,200 families in hotels, apartments, and trailers until they
30 moved back into their homes as gas service was restore.

⁴⁵ CMA Emergency Management Resource Contact List, Section 6—Operations Center, Content last revised 04/19/2017.

1 CMA set up a claims process center for customers in the impacted area for the following loss
2 categories: bodily injury, damage to property, disruption of businesses and every day activities
3 caused by the loss of gas service. As of June 1, 2019, more than 25 thousand claims
4 had been filed, and more than 97% have been closed. They also partnered with local officials and the
5 Massachusetts National Guard in delivering hot plates, space heaters and smoke and carbon
6 monoxide detectors. The gas company also reimbursed customers who temporarily or permanently
7 switched fuel sources (e.g. electric, propane, oil) for heating, hot water, cooking and other
8 appliances.⁴⁶ Throughout the recovery effort, the company worked to restore heat and hot water to
9 nearly 7,500 residential and business meters, and in the process has installed nearly 18,500 new
10 appliances and pieces of equipment (i.e. boilers, furnaces, ranges, and dryers). Additionally,
11 approximately 25,000 smoke and carbon monoxide detectors were distributed.

12 CMA and state and local officials announced in December 2018 that the gas restoration project
13 was “substantially complete,” noting that 98 percent of residential and business customers had
14 restored gas service. At that time, there were fewer than 200 remaining customers who decided to
15 “self-mitigate,” or complete necessary assessments and installations themselves on their own
16 timeline, independent of Columbia Gas contractors.⁴⁷
17

18 **J. Applicable Federal and State Regulations and Industry Standards:**

19 i. Pipeline Hazardous Materials Safety Administration: 49 CFR Part 192

- 20 a. 192.605 - Procedural Manual for operations, maintenance and emergencies; requirement
21 to have written procedures for emergency response, review them every 15 months and
22 have them available where O&M occurs. Must have procedures for making maps and
23 records available to appropriate operating personnel.
- 24 b. 192.615 - Emergency Plans; requires written procedures for a gas pipeline emergency
25 and requires operators to establish a liaison with public officials.

⁴⁶ MEMA Reports, “Special Edition Covering August-October 2018”, Volume 17, Issue 7, November 26, 2018.

⁴⁷ Press Release, “Columbia Gas, State and Local Officials Announce Gas Restoration Project ‘Substantially Complete’”, <https://www.columbiagas.com/massachusetts/news-center/article/columbia-gas-state-and-local-officials-announce-gas-restoration-project-substantially-complete>, 12 December 2018.

- 1 c. 192.616 - Public Awareness; includes requirements related to education for the public,
2 applicable government organizations; and persons engaged in excavation related
3 activities. This section incorporates by reference API 1162
- 4 d. 192.181 – Distribution Line Valves; includes a requirement to install valves to shut down
5 regulator stations in an emergency.
- 6 e. 192.631 Control Room Management; requires that operators have written procedures
7 governing the type of information provided to controllers, controllers’ roles and
8 responsibilities, alarm management, training and qualifications, and fatigue management.
- 9 f. 192.747 Valve maintenance: Distribution systems – Require that valves necessary for the
10 safe operation of a distribution system be checked and serviced at regular intervals at
11 least once per calendar year, not exceeding 15 months, and that operators take prompt
12 action to remediate any valve found to be inoperable.
- 13 ii. Massachusetts Department of Public Utilities
- 14 The Massachusetts Department of Public Utilities oversees investor-owned electric
15 power, natural gas, and water companies in Massachusetts. It oversees the safety of
16 natural gas pipelines and has the statutory authority to enforce PHMSA regulations under
17 49 CFR Part 192 through its PHMSA certification under G.L. c.164, § 105A
- 18 a. 220 CMR 19.00- Standards of Performance for Emergency Preparation and Restoration
19 of Service for Electric Distribution and Gas Companies
- 20 iii. Industry
- 21 a. API Recommended Practice 1162, *Public Awareness Programs for Pipeline Operators*
22 b. ANSI GPTC Z380, *Guide for Gas Transmission and Distribution Piping Systems*