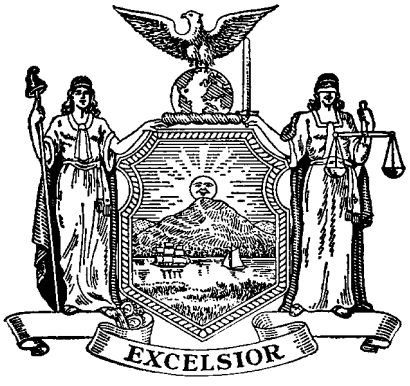
STATE OF NEW YORK
DEPARTMENT OF PUBLIC SERVICE



Case 11-G-0565

198 Joseph Street, Horseheads
Natural Gas Explosion
January 26, 2011
New York State Electric and Gas Corporation

Safety Section
Office of Electric, Gas & Water
Final Report January 2014

SUMMARY

Initial Report

In Gas Safety Staff's May 2012 investigation report (May 2012 Report), we recounted the information Staff had gathered up to that point from our own on-site inspections and interviews conducted following the explosion that occurred on January 26, 2011 at approximately 9:16 AM, at 198 Joseph Street, Horseheads, New York (Chemung County) in the service territory of New York State Electric and Gas (NYSEG). At that time, Staff was able to conclude that the event resulted from a release of natural gas from the service line to the residence at 198 Joseph Street and that the gas had migrated into the basement, where it ignited, most likely by the cycling natural gas furnace. One fatality and two serious injuries occurred to the occupants of the involved house. The fatality was a 15-month old boy. The injuries were to the boy's mother and to her grandfather.

After the explosion, investigators found a break in the gas service line approximately 35 feet from the foundation of 198 Joseph Street.[1] Coincidental with the break point, the service line was found wrapped with a black tape, which Staff at the time thought was similar in general appearance to electrical tape, for approximately 32-inches in length, suggesting that a field repair had been attempted at this location sometime in the past.

During the investigation, the gas service line to 194 Joseph Street, next door, was also exposed, revealing additional applications of this same type of tape. The investigation also found distinct downward deflections (sags) in these two gas service lines (plus one other at 192 Joseph Street) that

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[1] Due to the seriousness of the incident, investigators from many governmental agencies were on-site following the explosion.

corresponded with the relative location of where the gas services had been crossed by water and sewer lines.

Sections of the gas service lines to both 198 and 194 Joseph Street were cut out, removed from the trench, and boxed for preservation and transport. Because the Chemung County District Attorney at the time thought criminal charges may be warranted, the Chemung County Sheriff Department and District Attorney's Office (DA) maintained lead agency status on the investigation and took control of all of the physical evidence removed from the site. The DA sent all of these removed facilities to the FBI laboratory in Quantico, Virginia for analysis and testing. The typical practice is for the involved utility to send evidence involved in an incident to a laboratory for testing in accordance with the gas safety regulations, 16 NYCRR 255.827 which states:

> (a) Each operator shall establish procedures to analyze each failure or accident for the purpose of determining its cause and to minimize the possibility of a recurrence. This plan shall include a procedure to select samples of the failed facility or equipment for laboratory examination when necessary.
>
> (b) The procedures shall also provide for complete cooperation with the Department staff, in testing or surveying, including using independent consultants, any equipment or systems deemed necessary by staff for the investigation and analysis of any failure or accident to determine its cause and to minimize the possibility of recurrence.

FBI Test Results

The service line from 198 Joseph Street and related infrastructure remained under the DA's control until May 2013, well after Staff's May 2012 Report.[2] Once the FBI completed its tests, the Chemung County DA chose not to issue any indictments related to the explosion. Therefore, Staff was able to obtain copies of the FBI's metallurgical and other tests as well as the Chemung County Sheriff's Department's complete investigation file. In addition to the evidence Staff obtained in its initial investigation, the Department has reviewed the results of the FBI testing and Sheriff's investigation (in addition to Staff's earlier investigation), which are described more fully in the body of this report. Staff also conducted an audit of NYSEG's Public Awareness Program (PAP), which is required by the Department's gas safety regulations, 16 NYCRR Part 255.

See pages 25-26 for additional conclusions pertaining to the incident.

FBI Analysis of Gas Facilities Involved in Incident

The Chemung County Sheriff requested that the FBI perform the following analysis:

I. Section of gas service line to 198 Joseph Street containing fracture (see May 2012 Report, Photo 4, page 13).

[2] Because the FBI had not yet completed its testing, Staff's May 2012 Report stated:

> These facilities have been sent to the FBI laboratory in Quantico, Virginia for analysis and testing. Pending the completion of this testing, DPS Staff cannot make a determination as to who or what caused or contributed to the cracked main. Therefore, culpability associated with the damaged service line cannot be attributed to NYSEG at this time.

A. Metallurgical testing to include but not limited to the following:
   1. The composition of the pipe itself to include both the metal, as well as any coverings or wrapping;
   2. Any manual cuts made to the pipe and/or tool marks;
   3. Failure analysis;
   4. Any trauma or fatigue to the pipe;
   5. Any latent fingerprint evidence available on the pipe.

B. Analysis of what appears to be black electrical tape (hereafter referred to as "198 fracture tape"):
   1. An analysis of the tape itself to identify any individual characteristics and/or class characteristics;
   2. Latent fingerprint evidence;
   3. Swab for DNA.

II. Section of gas service line to 198 Joseph Street containing elbow near east foundation wall (see May 2012 Report, Photo 1, page 9).
   A. Comparison of the tape on this item (hereafter referred to as " 198 elbow tape") to the 198 fracture tape and to the tape on the service line to 194 Joseph Street (hereafter referred to as "194 service tape") – two pieces – A and B;
   B. Latent fingerprint evidence on the tape;
   C. Swab for DNA;
   D. Upon removal of the electrical tape, an inspection to reveal any signs of an anomaly to the pipe itself;

III. 194 service tapes A and B.
   A. Comparison of the tape found on these pipes to that of the 198 fracture tape and 198 elbow tape;
   B. Latent fingerprint evidence on the tape;

C. Swab for DNA;

D. Upon removal of the tape on these two items, an inspection which may reveal any signs of an anomaly to the pipe itself.

The FBI analysis consisted of six separate reports:

1. Chemistry Unit (metallurgy examination).
2. Chemistry Unit (tape examination).
3. Firearms/Toolmarks Unit.
4. Trace Evidence Unit (Hair and Fiber).
5. Latent Print Operations Unit.
6. Nuclear DNA Unit.

In the FBI nomenclature below, Q1 and Q1.1 refer to pipe segments on either side of the fracture in the gas service line to 198 Joseph Street.[3] Q1.2 refers to the electrical-type tape that was found at the fracture location (198 fracture tape).

The tests of most interest to DPS Staff were those by the Chemistry Unit involving the failure analysis of the fractured gas service line pipe to 198 Joseph Street (metallurgy examination), and various tape specimens from the gas service lines to 198 and 194 Joseph (tape examination). Before discussing those tests in detail, a summary of the other test findings are as follows:

(1) No latent fingerprints of value were found on any of the pieces of evidence (Latent Print Operations Unit).

[3] The FBI could not identify which specimen (Q1 or Q1.1) was closer to the house and which was closer to the road when in the ground. Staff does not believe this information is critical to this analysis.

(2) Male DNA was detected on the 198 fracture tape, but it was not suitable for matching purposes (Nuclear DNA Unit).
(3) No DNA results were obtained from the other pieces of evidence (Nuclear DNA Unit).
(4) No hairs or fibers were found on any of the pieces of evidence (Trace Evidence Unit).
(5) The exposed metal at the exterior of the fractured end of specimens Q1 and Q1.1 had no apparent tool marks (Firearms/Toolmarks Unit).
(6) The sheathing (corrosion coating) on specimen Q1 had impressed tool marks consistent with a tool having an edge. The sheathing on specimen Q1.1 had impressed tool marks and an abrasion. All of these indications lacked microscopic marks of value for comparison purposes (Firearms/Toolmarks Unit).

The FBI lab reported that when it received the boxed, fractured service line to 198 Joseph Street, the steel pipe was completely separated and the electrical-type tape was torn but not completely separated. However, when the service line had been removed from the ground and boxed at the incident site, Staff at the time observed that the pipe did not appear completely fractured; it apparently became completely fractured during transit. The following are relevant verbatim excerpts from the Chemistry Unit reports (metallurgy and tape examinations).

Chemistry Unit (metallurgy examinations)

Metallurgical analysis determined that the Q1-Q1.1 items are nominal 1 inch, schedule 80, carbon steel pipe segments that fractured from one another due to stress corrosion cracking (SCC). SCC requires a source of stress, a corrosive environment

and time for the penetration of the crack through the material until structural integrity is compromised.

Stress: A permanent bow exists in the Q1 and Q1.1 pipe segments. This bow indicates that the pipe experienced significant bending stress that put the region of the SCC initiation site in tension. There is no indication that any cut or other mechanical damage contributed to the initiation of the fracture.

Environment: Humid air or acidic soil are two potential sources of corrosion for plain carbon steel. Insulation that remains tightly adherent and intact on several regions of the Q1-Q1.1 pipe is missing in the area of the fracture. The edges of this insulation are severely degraded adjacent to the missing region. The un-insulated exterior of the pipe adjacent to the fracture is severely corroded, indicating that exposure to a corrosive environment occurred.

Time: The fracture surface of the Q1-Q1.1 pipe reflects three distinct modes of fracture. At the origin, exposed grain facets are covered with a thin, dark, adherent oxide. Significant secondary cracking is present in this area. Beyond the darkened region, a mixture of grain boundary cracking and cleavage exists. This crack surface morphology exists where the crack penetrated through the wall thickness of the pipe. The remainder of the crack surface exhibits cleavage fracture. The time required to initiate the crack, and the duration of crack extension to final fracture, were unable to be determined.

A pressure test of the Q1.1 pipe segment revealed that additional through-wall penetration exists in this pipe beneath the degraded, but adherent, insulation.

Removal of a section of intact insulation far from the fracture on the Q1 pipe exposed the un-corroded exterior of the pipe in this region.

When received at the FBI Laboratory, the Q1.2 tape was wrapped around the Q1-Q1.1 pipe segments over a region that included the fracture and degraded insulation. Residue on the tape indicates that it was originally applied after the insulation in this region had degraded. The stress corrosion crack would likely not have been visible on the exterior of the pipe, prior to its complete fracture, due to the corrosion product present.

Methodology, Interpretation and Discussion

Visual and microscopic examination and physical testing were used to examine the pipe segments. Metallography, x-ray fluorescence spectrometry and scanning electron microscopy with energy dispersive spectroscopy were additionally used to analyze the Q1.1 pipe segment.

Stress corrosion cracking is an insidious mechanism of failure. Cracks generated in such a manner often remain tightly closed and are not visually detectable until structural integrity is compromised enough to cause complete failure. It is essential that metallic components under stress be protected from the corrosive environments in which they are susceptible to SCC.

It is not generally a good practice to cover pipe that has started corroding with tape. The tape can trap contaminants and does not block moisture. Any protective layer placed over carbon steel should be applied to a clean surface and assured to adhere tightly to resist moisture penetration.

On February 20, 2013 DPS Staff was able to speak directly with the FBI scientist who performed the metallurgical examination. In that discussion, we clarified the FBI's terminology and obtained a better understanding of the FBI's reported results. For instance, "insulation" in the FBI's report refers to what appeared to be the mill-applied corrosion control coating. "Tape" (item Q1.2) refers to what Staff described in the May 2012 report as "electrical-type" tape, which we refer to as "198 fracture tape" in this report.

With respect to the FBI report stating: "*Insulation that remains tightly adherent and intact on several regions of the Q1-Q1.1 pipe is missing in the area of the fracture*", Staff asked whether this means the insulation was not present at all, or present but not tightly adhering? The FBI answered that it meant no insulation was present at all. Regarding the statement: "*residue on the tape indicates that it was originally applied after the insulation in this region had degraded*" the FBI scientist explained that the underside (sticky side) of the

tape had residue of degraded insulation (i.e. corrosion coating).

Staff asked about the apparent point of origin of the fracture. The FBI's scientist was unsure because she did not know the original orientation of the pipe in the trench, but did mention that the pipe was bowed (as Staff had observed upon its initial inspection; see May 2012 Report, Photo 8, page 19). Staff explained to the FBI that when the pipe was in the trench, the bow was at the low point, i.e. 6 o'clock position. With that information, the FBI placed the fracture's origin at the outside surface of the pipe at the 6 o'clock position, which would have been the tensile side. The FBI was able to reach this conclusion because a dark oxide started at the outer wall and penetrated the wall thickness – approximately 7/8 of pipe wall at 6 o'clock, making a crescent pattern, covering about ¾ of the wall thickness at 4 and 8 o'clock positions. At the 6 o'clock position, the last 1/8 of wall thickness had a "shinier" appearance.

Staff and the FBI scientist discussed stress corrosion cracking (SCC). She stated that the dark oxide observed at the fracture origin is a characteristic of SCC. She also explained that SCC will originate in an area of high tensile stress. For pipelines that operate at low stress levels from internal pressure, externally-applied stresses can provide the stresses that contribute to SCC.

The following are excerpts from an Advisory Bulletin (ADB-03-05) issued in 2003 by the U.S. DOT Pipeline and Hazardous Materials Association (PHMSA) regarding SCC:

> SCC is the cracking induced from the combined influence of tensile stress and a corrosive medium. The impact of SCC on a material usually falls between dry cracking and the fatigue threshold of that material. The required tensile

> stresses may result from directly applied stresses (pressure and overburden) or in the form of residual stresses (fabrication and construction). The most effective means of preventing SCC are to: (1) properly design the pipeline using appropriate materials; (2) reduce pipeline stresses; and (3) remove critical environmental electrolytes, such as hydroxides, chlorides, and oxygen.
>
> Two types of SCC are found on pipelines: high pH (9 to 11) SCC and near-neutral pH (6 to 8) SCC. Characteristics of both forms of SCC as summarized by experts are as follows:
>
> - Cracks usually oriented in longitudinal direction (cracks may exist at other orientations, depending on the direction of tensile stress).
> - Occurrence in clusters consisting of several cracks to hundreds of cracks.
> - Cracks tend to interlink to form long shallow flaws (cracks may grow to cause ruptures).
> - Fractures faces are covered with magnetite and carbonate films.

Staff finds the FBI's analysis consistent with PHMSA's Advisory Bulletin ADB-03-05.

Chemistry Unit (tape examination)

DPS Staff's descriptions of the tape samples correspond to the FBI labeling system as follows:

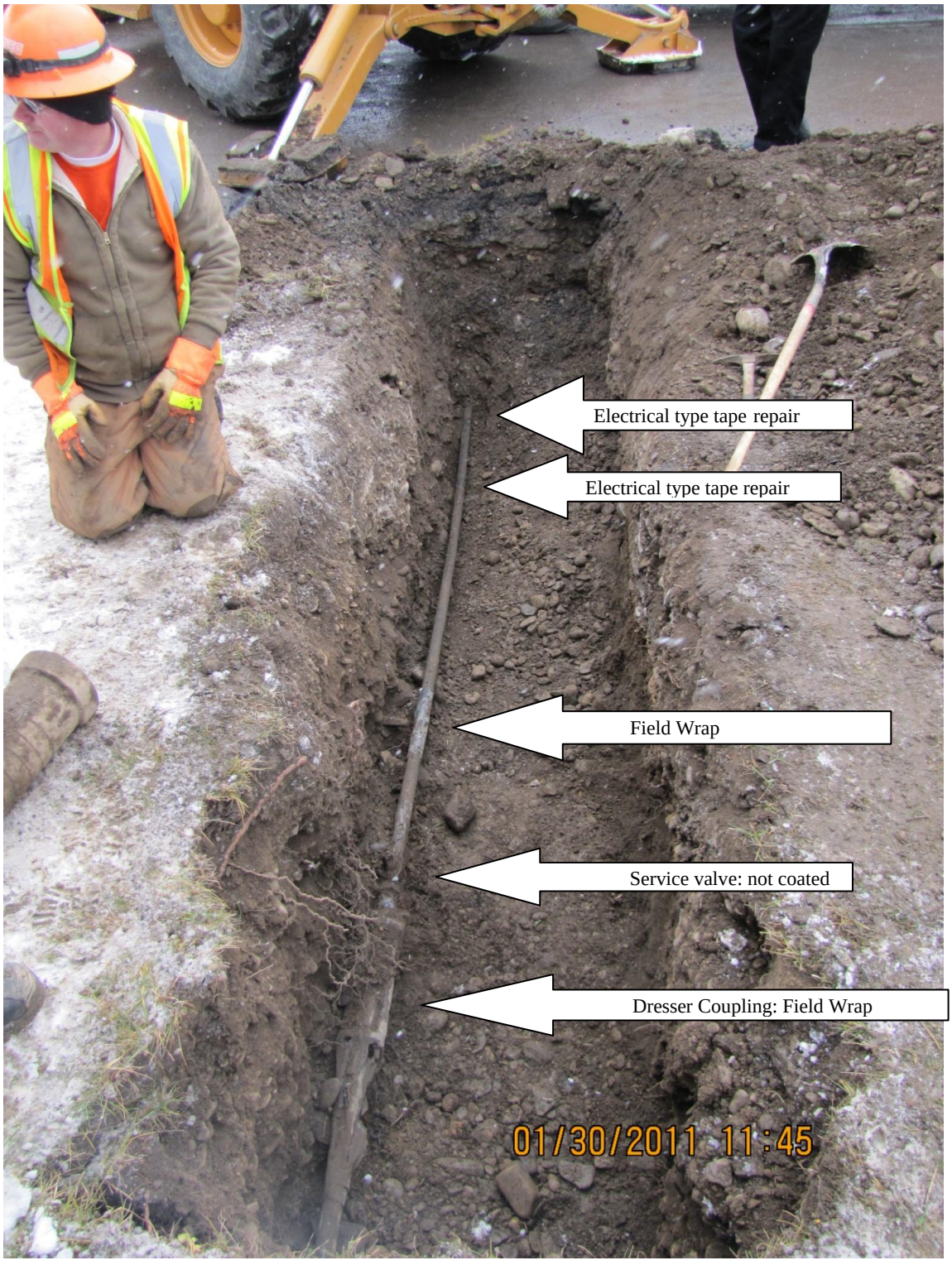
- Q1.2 = 198 fracture tape
- Q2.1 = 198 elbow tape
- Q3.1 = 194 service tape A
- Q4.1 = 194 service tape B

> The FBI's Report of Examination states that the Q1.2 tape:
>
> . . . is 2 inches wide (nominal) with a black polyethylene backing that is 8-9 mil thick. The adhesive is butyl rubber. Based on industry contacts and a search of the internet, this type of tape is designed for use on underground oil and natural gas lines. According to both sources, this type of tape product has been used for this application for over 60 years.

The Q4.1 tape

> . . . is also 2 inches wide (nominal) with a 8-9 mil thick black polyethylene backing and a butyl rubber adhesive. It is the same type of tape product as (the fracture tape). Because other tapes exist that are comparable in physical characteristics and chemical composition to (these specimens), it cannot be inferred that they originated from the same roll, or were manufactured by the same company.
>
> At least two types of black tapes were present in Q2.1 and Q3.1 and they differ from Q1.2 in thickness and/or width. Both are a different tape product from Q1.2. No chemical examinations were conducted on the Q2.1 and Q3.1 tapes.

Photo 7 from the May 2012 report is shown on the following page. Correlating the descriptions of the pieces of evidence by the Chemung County Sheriff (CCS) and the laboratory analysis by the FBI, it appears that (1) FBI specimen Q4.1 is CCS "194 service tape B" and is one of the two arrows labeled "Electrical type tape repair" and (2) FBI specimen Q3.1 is CCS "194 service tape A" and is either the "Field Wrap" arrow or the "Dresser Coupling Field Wrap" arrow.


Electrical type tape repair
Electrical type tape repair
Field Wrap
Service valve: not coated
Dresser Coupling: Field Wrap
01/30/2011 11:45

Staff's May 2012 Report described the tape found on the gas service lines to 198 and 194 Joseph Street as "similar in general appearance to electrical tape." On February 22, 2013 DPS Staff spoke to the FBI scientist that performed the analyses of these tape specimens in order to obtain a better understanding of the FBI's reported results. She distinguished the 198 fracture tape from common electrical tape by comparative analysis of the backings and adhesives. The 198 fracture tape was 2 inches; common electrical tape is nominal ¾ inches. The backing on the 198 fracture tape was polyethylene; common electrical tape is usually plasticized PVC (polyvinyl chloride). The adhesive on the 198 fracture tape was butyl rubber; common electrical tape is typically some combination of isoprene, butadiene, and styrene, depending on manufacturer.

Regarding the "search of the internet" referred to in the FBI report, the FBI scientist referenced a data sheet for POLYKEN Utility Tape that the 198 fracture tape appeared consistent with (see attached). It states that:

> The Polyken utility tape coating systems have a rich tradition in the pipeline industry since their introduction in 1950. Designed specifically for the gas utility, oil field, and plumbing industries, the polyethylene backing and butyl rubber adhesives are highly conformable and remain flexible over a wide temperature range.

What Staff referred to as "electrical type tape," i.e. the 198 fracture tape and the 194 service tape B in the May 2012 Report were not actually electrical tape, but a utility tape coating such as Polyken or another manufacturer. The FBI reported that they are the same type of products, but it is uncertain whether they were from the same manufacturer or even the same roll because there were no identifying features. Both were consistent with common types of tape used in the plumbing and gas industries and available at the time. No chemical

analysis was performed of the 198 elbow tape and 194 service tape A, but they were, in any event, different from the 198 fracture tape and 194 service tape B. Staff's May 2012 Report noted that the 198 elbow tape "appeared consistent with commonly seen field repair tape on gas lines of this vintage, and more durable than common electric tape."

Staff's May 2012 Report also stated:

> NYSEG learned from the Town that after a severe flood in 1972, residents in the area of Joseph Street and Arthur Street started having issues with their water wells, and the Town installed municipal water in the area. NYSEG [subsequently] identified 25 gas services in the Mayfair development that crossed the water and/or sewer lines. This subdivision is the area bordered by Chemung Street and Grand Central Avenue and includes all of the streets therein (see Figure 4 below), not including Blostein Blvd. NYSEG performed exploratory excavations at these 25 gas services, from January to early April 2012, and found 8 instances of what appeared to be coating damage repaired with electrical type tape similar to that found at the fracture on the gas service to 198 Joseph Street. NYSEG replaced all the mains and services in the Mayfair subdivision, consisting of approximately 7000 feet of mains and 80 services. This work began in January 2012 and was completed in April.
>
> In May/June of 2011 [six months after the explosion at 198 Joseph Street], while performing a routine survey of its facilities in the area of a road milling project, a leak was found on a gas service on Winding Way, which is about two miles north of the Mayfair development. Again, electrical type tape was found on the gas service where it crossed over the sewer main. NYSEG replaced all the gas services on Winding Way.

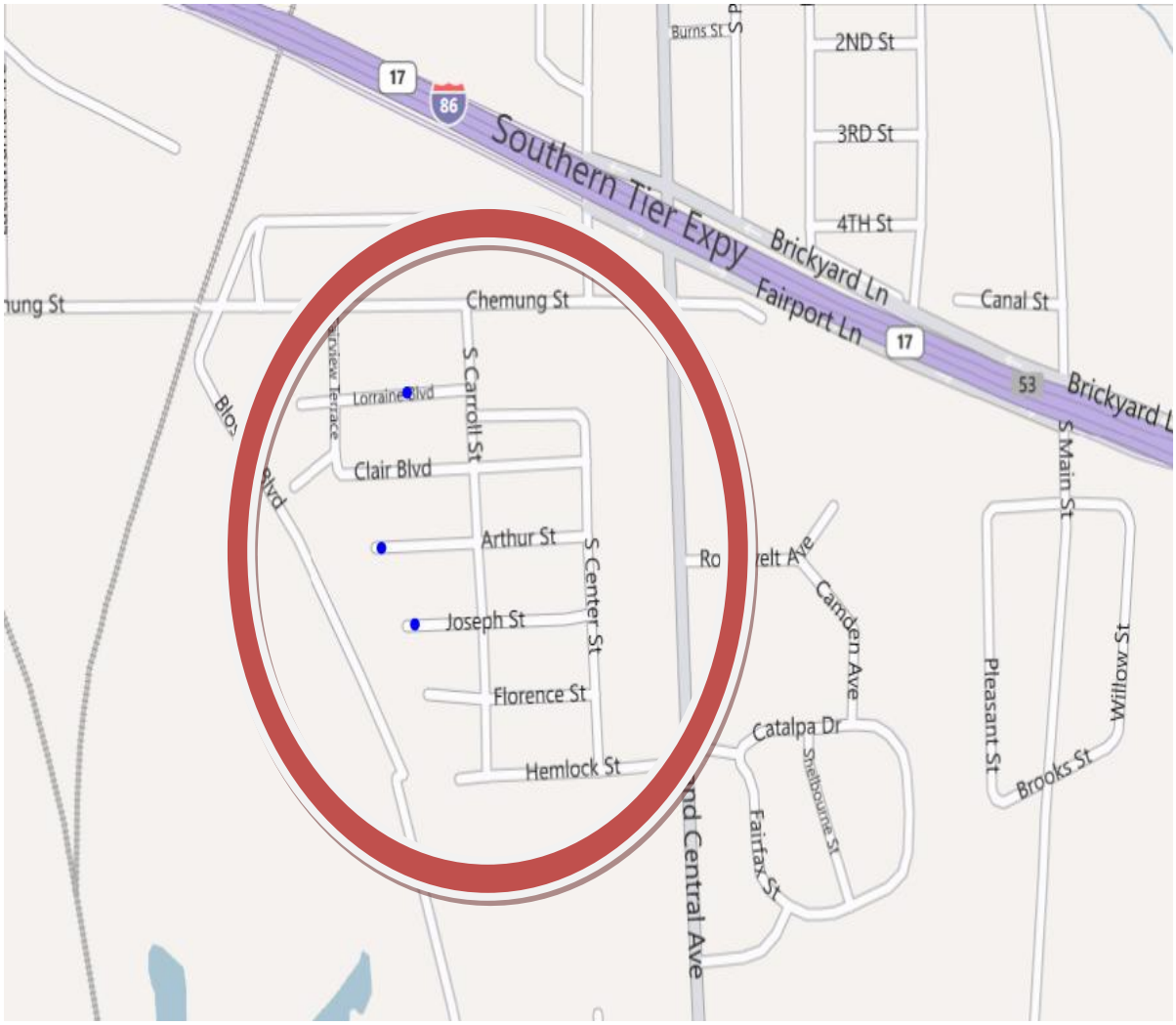


Figure 4 (from May 2012 Report)
Mayfair Development (bounded by red circle)

Note that the FBI only performed laboratory analysis on the 198 fracture tape and 194 service tape B. All other observations of "electrical tape similar to that found at the fracture . . ." in other areas of the Mayfair Development and on Winding Way are based on visual observations only.

NYSEG's Gas Service Replacements Subsequent to the Joseph Street Incident

Staff's May 2012 Report described other actions NYSEG has taken since the incident at 198 Joseph Street, including conducting more frequent leakage surveys in Horseheads,

increasing its public awareness campaign about reacting to natural gas odors and calling 811 prior to excavation work.

In addition, NYSEG retained a metallurgical consultant, Lucius Pitkin, Inc. (LPI) to perform a fitness-for-service (FFS) assessment of 1 and 1-¼ inch medium pressure steel gas service lines in the Town and Village of Horseheads. The analysis included exposing gas service lines where they are crossed by sewer and water utilities to look for damage to the protective coating and the metal pipe. For comparison purposes, it also included exposing gas facilities not crossed by other utilities.

In addition to the previously discussed replacement work performed in the Mayfair Plot and on Winding Way, 67 gas services were excavated and inspected as part of LIP's FFS analysis. LPI's conclusions were as follows:

- 33% of all selected services adjacent to a sewer main exhibited deflection of the gas service profile/trajectory at the location of the sewer main crossing beneath.

- Several of the selected gas services exhibiting significant deflections had similar severity compared to the fractured gas services at 714 Fox Street[4] and 198 Joseph Street, based on finite element deformation and stress analysis.

- 60% and 38% of all selected services adjacent to a sewer and water main, respectively, exhibited severe damage to the gas service, compromising the protective coating.

- 19% of all selected services adjacent to a sewer and/or water mains exhibited significant loss of metal pipe wall thickness at locations of severe coating damage, ranging from 25% to 72%.

[4] An explosion occurred at this location on December 10, 2005, injuring the 5 occupants and damaging 25 structures, including destruction of the incident building. The gas leaked from a fracture on the threads of the service valve on the bare steel portion of the gas service. The fracture was approximately 27 feet from the building.

- No selected services remote from sewer and/or water mains or other structures, such as catch basins or dry wells, exhibited deformation or coating damage.

LPI's report also noted that "tape" was observed on 11 of 48 selected service lines adjacent to sewer mains and 2 of 24 selected services adjacent to water mains. All of these gas services where tape was observed also exhibited coating damage near the crossing sewer or water main exposing the metal pipe.

LPI recommended that, given the presence of the observed and extensive third party damage, NYSEG replace all 1 and 1-¼ inch medium pressure steel services in the Town and Village of Horseheads that are adjacent to sewer and/or water utilities, in a timely manner.

NYSEG has approximately 1500 medium pressure services (1-inch and 1-¼-inch) services in the Town and Village of Horseheads, of which approximately 800 cross water and sewer lines. NYSEG began the replacement work in mid-September 2013 and so far has replaced approximately 137 services that the Company considered the most at-risk. While replacements have been discontinued due to frozen ground, NYSEG expects to resume the work as soon as conditions allow and to complete the work by August 2014. The replacement prioritization is based on a methodology devised by LPI so that the areas with the highest levels of damage and nearby similarly situated services are addressed first. NYSEG began a public relations effort in the Horseheads area that describes the work and the reason for it.

NYSEG will also begin a sampling of other service areas, with 30 services being excavated in each of the following areas to determine if there is damage similar to that seen in Horseheads. The areas are:

- Chemung County (Elmira area)
- Rochester (Rochester Gas & Electric)
- Lockport
- Binghamton

Staff expects NYSEG/RG&E to act on all recommendations that LPI makes regarding gas service replacements in Horseheads and in other areas of the NYSEG/RGE systems being studied. Staff recommends that NYSEG be required to develop and submit a written action plan to accomplish gas service replacements throughout Horseheads, and that NYSEG provide monthly progress reports to Staff on these replacements.

Staff also recommends that NYSEG perform a risk assessment of its entire distribution system to determine if conditions similar to those found in Horseheads are present or are likely to be present in other locations.

Staff recommends that this report be shared with the other natural gas LDC's in New York State, with a recommendation that they identify and assess the risks associated with their gas facilities and submit a plan within six months to mitigate the risks identified. This would include an assessment of facilities in each LDC's service territory where other underground utilities had been installed after and deeper than existing gas facilities. If, for instance, the utility identifies an historical pattern of leaks in certain areas or the utility has any other basis to do so, these areas should be the focus of, at least, more routine leakage surveys until the risk is mitigated. In the interim, gas utilities should review their records of exposed pipelines to ensure that they are accurate, complete, and logically consistent. Similarly, records indicating that damage may have occurred should be maintained, organized and readily available for review by Staff. Data gathered during these activities should be utilized in the

gas utilities gas distribution integrity management programs (DIMP – see 16 NYCRR 255.1001 – 255.2015) and used to identify trends or patterns that warrant further investigation.

Chemung County Sheriff's Information and Reports of Natural Gas Odors

After the DA decided not to press charges, Staff requested and received a copy of the Chemung County Sheriff's case file. A review of those files found that following the incident, the Sheriff's Office had received several reports, of which Staff was previously unaware, from persons in the area who had noticed natural gas odors prior to the incident. One person reported noticing an odor on Blostein Boulevard, which backs up to Joseph Street (see map, below) about an hour prior to the explosion. Another reported noticing a "rotten egg" odor on Clair Boulevard, two streets over, sometime between 8:30 and 9:00 AM on the morning of the incident. Another reported smelling an odor of natural gas on South Center Street at approximately 6:00 AM the morning of the incident. Yet another reported observing a gas odor one week earlier, on January 16, 2011 on Grand Central Avenue. These locations are to the west, north and east of the incident location. None of these individuals reported the odor to NYSEG.

As Staff's May 2012 Report discussed (at pp. 4-6) Joseph Street residents noticed odors on the morning of the incident – some associating the odor with natural gas and some not - but did not report them. Only one natural gas odor was reported to NYSEG, from [redacted] Lorraine Boulevard at 12:50 AM on the morning of the incident. NYSEG responded to this call and did find a small above-ground leak on the gas regulator inlet piping at the next-door building. In May 2012, Staff concluded that: ". . . it is theoretically possible that the odor [on Lorraine Boulevard] was

Redactions pursuant to NY Public Officers Law 87(2)(b).

emanating from Joseph Street, a few blocks away, although it is impossible to know for certain. Staff does believe, however, that the NYSEG gas fitter who responded to the Lorraine Boulevard call conducted a proper investigation into that odor call and took appropriate actions based on his findings."

Inasmuch as the individual reports of gas odors increase in proximity to Joseph Street in terms of distance and timing of the incident, Staff believes it is more probable that those reported odors were related to the gas leak on Joseph Street. Given the many nearby observations of gas odors, it seems more probable to Staff as well that the gas leak on Joseph Street contributed to the odor report from Lorraine Boulevard in the early morning hours that day. However, it is still difficult to conclude that the NYSEG gas fitter who responded to the Lorraine Boulevard call should have been able to trace the odor report to Joseph Street. Doing so would have been nearly impossible since it would have required a near perfect and continuous set of wind and atmospheric conditions for the odor to travel three blocks without dissipating (natural gas is lighter than air and tends to rise in open atmosphere). The gas fitter's investigation of the area was thorough and in conformance with NYSEG's procedures. Moreover, he did find a leak in the area of Lorraine Boulevard that was later repaired.

Public Education on Reporting Natural Gas Odors

That a number of people in the community noticed possible gas odors but did not report them to NYSEG is obviously an area of concern, and raised justifiable questions about NYSEG's Public Awareness Program (PAP). The New York State pipeline safety regulations – 16 NYCRR Part 255, Transmission and Distribution of Gas – contains the following rule:
255.616 - Customer education and information program

(a). . . each pipeline operator must develop and implement a written continuing public education program that follows the guidance provided in the American Petroleum Institute's (API) Recommended Practice (RP) 1162 (as described in section 10.3 of the Title).
(b) The operator's program must follow the general program recommendations of API RP 1162 (as described in section 10.3 of the Title) and assess the unique attributes and characteristics of the operator's pipeline and facilities.
(d) The operator's program must specifically include provisions to educate the public, appropriate government organizations, and persons engaged in excavation related activities on:

(3) physical indications that such a release may have occurred;
(4) steps that should be taken for public safety in the event of a gas pipeline release; and
(5) procedures for reporting such an event.

The following are excerpts from API Recommended Practice (RP) 1162:

4.3 LEAK RECOGNITION AND RESPONSE

The pipeline operator should provide information in the following key subject areas to the affected public and excavator stakeholder groups.

4.3.2 How to Recognize a Pipeline Leak

Information should address how to recognize a pipeline leak through the senses of sight, unusual sound, and smell and describe any associated dangers as appropriate to the product type.

4.3.3 Response to a Pipeline Leak

Information should address an outline of the appropriate actions to take if a pipeline leak or release is suspected.

Staff's Evaluation of NYSEG's Public Awareness Program

Staff's May 2012 Report noted that:

> NYSEG has also increased its public awareness efforts to further educate the public about what should be done if the odor of gas is detected. It conducted radio and print advertising, and bill inserts, describing the smell of natural gas (including a "scratch and sniff" brochure) and

> described the steps to take if the odor is detected, including: avoiding the possibility of an ignition source; leaving the building and calling NYSEG from a neighbor's phone; and not assuming somebody else will do so.
>
> NYSEG also increased its public awareness to homeowners, contractors, and Villages and Towns about calling 811 (Dig Safely New York) prior to performing excavation in order to prevent construction damage to buried facilities.

These are typical methods that gas utilities use to inform the public about natural gas odors and steps to take when it is noticed. Gas operators are generally considered to be in compliance with the regulations by performing these activities.[5]

In February 2013, as part of its routine review of PAPs, Staff performed an audit of NYSEG's program using US DOT Pipeline and Hazardous Materials Association (PHMSA) inspection guidance. Staff found that NYSEG's program was "unsatisfactory" in some areas. The finding most relevant to an incident such as this one was NYSEG's failure to sufficiently assess the effectiveness of its PAP plan. API 1162 – Public Awareness Programs for Pipeline Operators (referenced above in the State pipeline safety regulations), includes recommendations for evaluating the effectiveness of the program and making improvements (see excerpts below). They include:

- Establishing an evaluation process.
- Determining input data sources (e.g. company surveys, industry surveys, reply cards, feedback from participating employees, and feedback from recipient audiences, etc.).
- Assessing the results of message awareness and applicability of operator and/or industry-sponsored evaluations.

[5] The Department's Office of Consumer Policy (OCP) also analyzed local distribution companies' gas safety outreach and education programs (Case 11-G-0282). While finding generally that gas utilities' education programs were adequate, OCP did make suggestions for improvement.

- Documenting evaluation results.

- Determining program changes or modifications based on results of the evaluation to improve effectiveness. Program changes may be areas such as: audience, message type or content, delivery frequency, delivery method, supplemental activities or other program enhancements.

- Documenting program changes.

- Determining future funding and internal and external resource requirements resulting from program changes made.

- And Implement changes.

However, due to the vague nature of these requirements, they are unenforceable. In fact, the PHMSA answers the question pertaining to the enforceability of a Public Awareness Program rule this way:

> Q: Are the appendices in API Recommended Practice (RP) 1162 enforceable?
>
> A: As stated in the final rule, the appendices to API RP 1162 provide additional information and resources but do not specify additional requirements. The public awareness regulations only specify baseline and supplemental requirements; therefore, for inspection purposes, the API RP 1162 appendices are not enforceable. Appendices are intended to provide clarification, examples, and additional information and together can be viewed as a separate document.

Nonetheless, NYSEG must thoroughly review its Public Awareness Program and take necessary actions to enhance it to ensure that all the necessary PAP elements are included and that NYSEG makes continuous improvements. NYSEG should use this incident to apply a "lessons-learned" approach, particularly with regard to the public's response to gas odors. For instance, NYSEG could perform targeted mailings, surveys, or

focus groups (to name a few) with the goal of assessing the public's understanding of the importance of reporting gas odors to the Company. If some insights are obtained as to why members of the public might not report a gas odor, this information could be used to determine if new messages and/or delivery approaches are needed. Given that Staff identified a number of weaknesses in NYSEG's PAP, NYSEG should consider hiring outside expertise, such as a marketing consultant, to assist and advise the Company on message improvements.

Finally, Staff observed that, although NYSEG's customer education materials do attempt to inform the public about actions they should take when they notice a gas odor, that message is often mingled with many other messages, such as carbon monoxide prevention, call-before-you dig/811, energy efficiency, and retail choice. Moreover, while a bill insert is a convenient and efficient way for a utility to provide material to a customer, it's likely that no one other than the family bill-payer looks at it, and even for that person it may become "background noise" after a while. Therefore, NYSEG should develop a campaign that targets natural gas odor awareness alone at certain times of the year.

NYS Office of Fire Prevention and Control

The material provided by the Sheriff's Office included a report by the NYS Office of Fire Prevention and Control. The conclusion of that report is shown below. Staff finds it entirely consistent with its own investigation.

Conclusion

> As stated in the May 2012 Report
>
> This event resulted from a release of natural gas from the natural gas service line to 198 Joseph Street, which

> migrated into the basement, where it ignited, most likely by the cycling natural gas-fed heating furnace. A break was found in the gas service line approximately 35 feet from the foundation of 198 Joseph Street. Coinciding at the break point, the service line was found wrapped with a black tape similar in general appearance to electrical tape for approximately 32-inches in length, suggesting that a field repair was attempted at this location sometime in the past.
>
> These facilities have been sent to the FBI laboratory in Quantico, Virginia for analysis and testing. Pending the completion of this testing, DPS Staff cannot make a determination as to who or what caused or contributed to the cracked main. Therefore, culpability associated with the damaged service line cannot be attributed to NYSEG at this time.

Subsequent to the May 2012 Report, Staff has obtained additional material including the results of the FBI's laboratory testing, the results of LPI's Fitness-For-Service analysis, and information from the Chemung County Sheriff and the NYS Office of Fire Prevention and Patrol. With this new information, Staff makes the following additional conclusions:

- The cause failure of the gas service line to 198 Joseph Street was stress corrosion cracking.
- Numerous examples of damage (coating and pipe metal) to gas service lines were found throughout Horseheads in close proximity to sewer and water mains.
- The gas service line to 198 Joseph Street was found with a sag in the area where the water and sewer lines crossed it. In addition, as the gas service line to 198 Joseph Street was being exposed during the investigation shortly after the incident, there was a release of an apparent stress (sag) in the service line, causing the fracture on the

bottom of the service to close. This suggests that the service line had been under downward pressure or force, likely before the explosion and perhaps during the subsequent excavation/exposure during the investigation.

- The tape specimens that Staff has referred to as "electrical type tape" (from 198 and 194 Joseph Street) were not actually electrical tape, but a utility tape coating such as Polyken or another manufacturer. These types of tape were designed for use by gas utility, oil field and plumbing industries. There were other examples found in Horseheads of tape that appeared visually similar, although laboratory analysis was not performed.
- It appears that at some time in the past one or more persons attempted to repair coating damage(s) on gas service lines in this area with this type of tape. However, due largely to the passage of time, insufficient information exists to determine whether the attempted repairs were performed by NYSEG personnel[6], by the Town or Village, or their contractors such as when the Town installed municipal sewer (1960's) or water systems (1970's), or during other excavations by other parties.

Recommendations

1. Staff recommends that NYSEG be ordered to:
   a. Develop and submit within 21 days a written action plan to replace the gas services throughout the Town and Village of Horseheads and provide monthly progress reports to Staff until such work is completed;

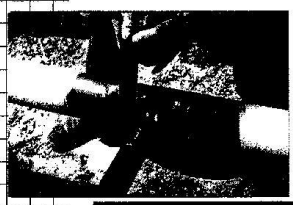
[6] Such as in response to reports or observations of damaged coating by third party contractors.

b. Conduct continuous leakage surveys in the Town and Village of Horseheads until the 650 as yet unmitigated gas service replacements are completed;
c. Perform a risk assessment of its entire distribution system to determine if conditions similar to those found in Horseheads are present or are likely to exist elsewhere;
d. If the risk assessment required by (3) indicates similar issues exist in other portions of its service territory, NYSEG shall develop and submit to Gas Safety an action plan (that NYSEG should be required to follow) to mitigate the risks, and to provide monthly progress reports to Staff until the risk assessment and any remedial work that results is completed;
e. Continue its public outreach efforts in the Horseheads area and areas identified under (3) that are at increased risk, targeting at-risk areas, including, but not limited to, the customers served there and all buildings adjacent to these customers;
f. Provide customers in the 650 areas waiting to be mitigated separate, individual notice, that is not included with bills, that reinforces the need to call NYSEG in the event they smell gas;
g. Address the benefits of hiring an outside expert to assist and advise the Company on improvements to its public information program, which should include the use of new media and new messages emphasizing the need to report gas odors.

2. All Local Distribution Companies should be required to:

a. Identify and assess the risks associated with their gas facilities and to submit a plan within six months of the order to mitigate the risks identified.
b. Review their records of exposed pipelines to ensure that they are accurate, complete, and logically consistent.
c. Maintain all records indicating that damage may have occurred to facilities, and that they be organized and readily available for Staff review.
d. Make and retain an audio recording of natural gas odor calls.
e. Collaborate with all other gas utilities to develop "best practices" for continuing public education on reporting natural gas odors.
f. Explore ways to reach more local governmental entities, to educate them on the potential hazards associated with excavations near gas facilities.
g. Review their public awareness programs to make concrete improvements to increase customer understanding of the need to report gas odors. Each LDC should report results to the Commission within 60 days.

Polyken® Pipeline Coatings



POLYKEN®
Utility Tape

System Description
The Polyken utility tape coating systems have a rich tradition in the pipeline industry since their introduction in 1950. Designed specifically for the gas utility, oil field, and plumbing industries, the polyethylene backing and butyl rubber adhesive are highly conformable and remain flexible over a wide temperature range.

Product Advantages

- Established and proven performance
- Exceeds LT 1512-A, LT-0077, and MIL I-7798
- Conformable to irregular shapes specifications
- Hand or machine application
- Compatible with most generic plant coating systems

System Products

Polyken #900
General utility tape designed for small diameter pipe applications on elbows, fittings, field joints, and pipe sections. Highly conformable hand applied system for tight uniform protection on a wide variety of metal substrates.

Polyken # 910
All purpose field applied tape coating system for use in the oil patch and gas fields. Suited for hand application on a variety of steel structures common to the oil field. Frequently used for small makeshift repair and temporary corrosion protection behind protection diameter pipe gathering systems.

Polyken # 911 # 908
General utility tape coating system for temporary makeshift repair of primary coating systems. Engineered for either hand or machine application,(only 911, not 908) the system is suited for the in-ground protection of joints, elbows, and tees.

Polyken # 920
General utility tape coating system to be used where higher mechanical protection is required. Designed for hand or machine application, the conformable polyethylene backing delivers a tough, uniform corrosion protection system.

System Components

1027 Primer Layer
Percent solids: 30%
Wt/gal: 7.3 lbs

Flash point: 40° F
Also available: low VOC and zero VOC primer

Utility Coating
Roll width: 1, 2, 4, 6 inch
Roll length: 100 feet
Colors: Black, gray, yellow

Physical Properties	# 900	# 908	# 910	# 911	# 920
Thickness: Total Thickness • ASTM D1000	12 mils 0.3 mm	8 mils 0.20 mm	10 mils 0.25 mm	9 mils 0.23 mm	20 mils 0.51 mm
Backing Thickness	8 mils	5 mils	6 mils	6 mils	15 mils
Adhesive Thickness	4 mils	3 mils	4 mils	3 mils	5 mils
Tensile Strength: • ASTM D 1000	5 lbs/in 44 N/10 mm	12 lbs/in 21 N/10 mm	18 lb/in 32 N/10 mm	25 lb/in 44 N/10 mm	35 lb/in 61 N/10 mm
Elongation • ASTM D 1000	175%	300%	250%	100%	250%
Peel Adhesion to Primed Pipe: • ASTM G 17	← 100 oz/in 11 N/10 mm →				
Dielectric Strength: • ASTM D 149	13 kv	7 kv	8 kv	13 kv	16 kv
Water Vapor Transmission Rate: • ASTM F 1249 100°F, 100%RH	← 0.05 g/100 in² /24 hr - 0.8 g/100 cm² /24 hr →				
Holiday Detection Voltage: • NACE RP-02-74	4.3 kv	3.5 kv	4.0 kv	3.8 kv	5.6 kv
Temperature Range: • Normal in-ground service	← -30° to 150°F -34 to 66°C →				

DS-Utility Tape-REV4-1207

Result of Internet searches