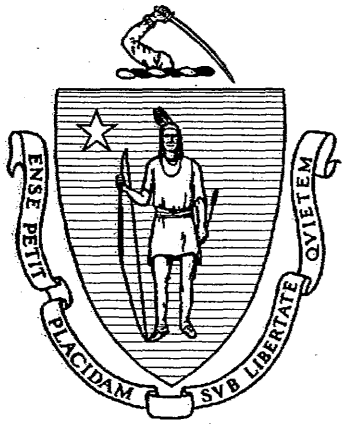
COMMONWEALTH OF MASSACHUSETTS

OFFICE OF CONSUMER AFFAIRS AND BUSINESS REGULATION

DEPARTMENT OF
TELECOMMUNICATIONS & ENERGY

PIPELINE ENGINEERING AND SAFETY DIVISION



INCIDENT REPORT

65 Main Street, Hopkinton, Massachusetts
July 24, 2002

Date of Issue: November 6, 2003

TABLE OF CONTENTS

I. INTRODUCTION

A. Scope of This Investigation

The Massachusetts Department of Telecommunications and Energy ("Department" or "DTE"), pursuant to G.L. c. 164, § 105A and a Federal Certification Agreement as provided for in 49 U.S.C. § 60105, has investigated a natural gas ("gas") explosion ("incident"),[1] that occurred at approximately 1:41 a.m. on July 24, 2002. The incident resulted in the death of two young girls and extensive damage to the multi-family dwelling at 65 Main Street, Hopkinton ("dwelling" or "structure"). NSTAR Gas Company ("NSTAR" or "Operator"), the operator of the distribution system, estimated the property damage to be between $300,000 and $400,000[2] (Exh. 1).

Upon notice of an incident, the Department conducts an investigation to determine the operator's compliance with the Minimum Federal Safety Standards contained in 49 C.F.R. Part 192 and the Massachusetts pipeline safety regulations contained in 220 C.M.R. §§ 100-113. The Department also enforces the drug and alcohol testing requirements contained in 49 C.F.R. Parts 40 and 199. Subsequent to this incident, the operator did not drug test employees due to the

---

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

[2] NSTAR informed the Department that the property owner's insurance carrier assessed the structure at a value of $282,000.

exclusion in 49 C.F.R. § 199.105(b), which states:

> "Each operator shall conduct the following drug tests for the presence of a prohibited drug:
> . . . .
> (b) *Post-accident testing*. As soon as possible but no later than 32 hours after an accident, an operator shall drug test each employee whose performance either contributed to the accident or cannot be completely discounted as a contributing factor to the accident. An operator may decide not to test under this paragraph but such a decision must be based on the best information available immediately after the accident that the employee's performance could not have contributed to the accident or that, because of the time between that performance and the accident, it is not likely that a drug test would reveal whether the performance was affected by drug use."

49 C.F.R. § 199.105(b). Because the last NSTAR service visits were to turn on gas and relight a water heater on June 5, 2002, NSTAR has complied with 49 C.F.R. § 199.105(b).

The Department has established procedures for determining the nature and extent of violations of regulations pertaining to the safety of pipeline facilities and the transportation of gas. These procedures also set forth the standards used to determine the amount of applicable civil penalty. The procedures are set forth in 220 C.M.R. §§ 69.01-69.12. Concurrent with the release of this report, the Department has issued a Notice of Probable Violation ("NOPV") stating that the Department has reason to believe violations of state and federal pipeline safety regulations may have occurred. The issuance of the Incident Report and NOPV commences an enforcement action as specified in 220 C.M.R. §§ 69.01-69.12. An operator served with a NOPV has a variety of response options. The operator may: (1) pay any proposed civil penalty; (2) submit an offer in compromise; (3) request an informal conference; or (4) submit a written reply disputing the alleged violations. 220 C.M.R. § 69.04. In addition, an operator served with a NOPV may request an adjudicatory hearing, 220 C.M.R. § 69.06, or enter into a consent order,

220 C.M.R. § 69.08. If the Department finds, after an adjudicatory hearing, that the operator has violated any provisions of any applicable codes, it may issue a remedial order. 220 C.M.R. § 69.07.

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

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

49 U.S.C. § 60105(c)(B).

This Incident Report is submitted to U.S. DOT in DTE's fulfillment of this regulatory obligation and to inform U.S. DOT, to the extent possible, of the cause and circumstances surrounding the incident.

B. Overview of the Incident

On the evening of July 23, 2002, eleven of the twelve residents of the four apartments at 65 Main Street, Hopkinton retired before midnight.[3] Two members of the Webster Family, residents of the first floor, and Mr. Maijs, a single resident on the upper level, awoke to a loud sound coming from the basement (Exhs. 2a; 2b; 2c; 2d). In an interview with a Department investigator ("DTE Investigator"), Ms. Janet Webster described the sound as a loud motor which she initially thought was a car outside, but then thought sounded as if it came from the basement (Exh. 2a). She said the sound woke her about five minutes before she called 911 on her cell

---

[3] This information was taken from the statements submitted to the Hopkinton Police by many of the adult residents of the building (Exh. 2).

phone (id.). Ms. Webster noticed a strong odor of gas in the first floor hallway by the basement door (Exh. 2b). On the second floor, Mr. Maijs smelled a strong odor of gas near the pipe entering his bathroom floor (Exh. 2c). In addition, those residents who were awake prior to the explosion described the sound as "similar to the malfunctioning sump pump" (Exh. 2b); "like a tea kettle ready to burst" (Exh. 2d); "like the house was alive … vibration going through the house … like someone was in the basement in a car and had the gas pinned to the floor" (Exh. 2e). The Webster Family fled to their car and parked it across the street (Exh. 2b). Ms. Webster dialed 911 and while talking with the Hopkinton Fire Department ("Fire Department") by cell phone, the house exploded (id.). The time was approximately 1:41 a.m. (Exh. 1).

Most residents were able to work their way out of the collapsed building; however, the entire Carey Family, who resided on the second floor, was trapped. Mr. Carey extracted himself and his wife, but they were unable to free their children, two girls ages four and five (Exh. 2f). Rescue personnel recovered one of the Carey children and transported her to the hospital, where she was later pronounced dead (Exh. 3). The second Carey child was pronounced dead by a paramedic who entered the rubble (Exh. 4). The removal of the deceased victim required cutting and removal of rubble which could not immediately be accomplished given that gas was entering the dwelling from a broken gas line (id.). The Hopkinton Fire Chief ordered the evacuation of all emergency personnel until NSTAR could shut down the gas line (id.). At 5:07 a.m., NSTAR stopped the gas flow to the building, and the emergency personnel completed recovery of the remaining victim at 6:13 a.m. (id.).

C. Eliminating the Hazard

The following chronology was taken from NSTAR's Chronological Summary of Events (Exh. 5). On July 24, 2002, at 1:49 a.m., NSTAR dispatch office received a call regarding an explosion and building collapse at 65 Main Street, Hopkinton. At 2:12 a.m., an NSTAR service representative and a distribution technician arrived at 65 Main Street. Upon their arrival, the Fire Department ordered the NSTAR personnel to shut off the service line[4] to the damaged structure. Between 2:35 a.m. and 2:55 a.m., NSTAR shut off the gas service to 63, 66, 67, and 70 Main Street. NSTAR checked these buildings for evidence of gas. No gas was detected in any of these buildings. Between 3:05 a.m. and 3:30 a.m., NSTAR leak surveyed the area sewer lines and catch basins for the presence of gas. All readings were negative. NSTAR also barholed[5] the street, and at 3:30 a.m. determined that there was no gas underlying the street surface in the vicinity of the distribution lines.

Since a section of the collapsed structure overlay the service line value ("curb valve"),[6] the valve was inaccessible and NSTAR was unable to immediately shut off the gas flowing into the collapsed structure. The NSTAR personnel summoned additional help to the scene to assist

---

4 *"Service line* means a distribution line that transports gas from a common source of supply to (1) a customer meter or the connection to a customer's piping, whichever is farther downstream, or (2) the connection to a customer's piping if there is no customer meter. A customer meter is the meter that measures the transfer of gas from an operator to a consumer." 49 C.F.R. § 192.3.

5 "Barholing" is the act of driving holes into the ground or street surface over a pipeline followed by insertion of a probe attached to a combustible gas indicator to detect or measure gas concentrations below the ground.

6 "Curb valve" is a valve inserted into a service line, below grade, and is used to stem the flow of gas to the customer.

with locating and closing valves on the distribution main.[7] At approximately 3:20 a.m., an NSTAR distribution crew arrived and began locating the valves on the distribution main. The crew also began excavating two points along the main, east and west of the service line entry to the structure, approximately 86 feet apart. They intended to isolate the 86-foot main segment and the service line, squeeze off[8] the plastic main, and then cut it and cap the ends. The squeeze off was effected at 5:07 a.m., stopping the flow of gas to the structure (Exh. 6 (photo)).

II. BACKGROUND

The incident occurred in a two and one-half story structure at 65 Main Street, Hopkinton. This section of Main Street consists of residential and small commercial buildings, one to three stories. The service line entered the basement of the structure through its north wall, approximately 4½ feet from the building's west wall. In response to the Department's inquiry, NSTAR provided a map indicating a three-inch plastic gas main, installed in 1979, underlay Main Street (Exh. 7). The main had 3½ feet of cover as measured by a DTE Investigator. The operating pressure of the main was 57 pounds per square inch gauge ("psig") (Exh. 8).

The original service line was a one-inch steel line installed in 1947 (Exh. 9). In 1974, a ½-inch plastic service line was installed by its insertion into the steel service line from the curb valve to the interior of the basement (Exh. 10a). The remaining section of the service line was a 1979 direct buried installation of a ½-inch plastic segment which replaced the original steel

---

7 *"Main* means a distribution line that serves as a common source of supply for more than one service line." 49 C.F.R. § 192.3.

8 "Squeezing Off" is the process of collapsing the distribution main with a mechanical device to stem the flow of gas.

service line segment from the main to the curb valve (Exh. 10b).

A review of the NSTAR records indicates that there is no document demonstrating NSTAR tested for maximum operating pressure either the 1974 or the 1979 service line segments prior to placing them into service **(**Exhs. 11, 12**)**. Forty-nine C.F.R. Part 192 sets operating limits on pipelines placed into service after August 19, 1970, through the establishment of a maximum allowable operating pressure ("MAOP"):

> "(a) Except as provided in paragraph (c) of this section, no person may operate a segment of steel or plastic pipeline at a pressure that exceeds the lowest of the following:
> . . . .
> (2) The pressure obtained by dividing the pressure to which the segment was tested after construction as follows:
> (i) For plastic pipe in all locations, the test pressure is divided by a factor of 1.5."

49 C.F.R. § 192.619.

NSTAR has no records demonstrating that it had established an MAOP on either of the service line segments, as required by the General Provisions of 49 C.F.R. Part 192, Subpart L, Operations:

> "(a) No person may operate a segment of pipeline unless it is operated in accordance with this subpart.
> (b) Each operator shall keep records necessary to administer the procedures established under §192.605."

49 C.F.R. § 192.603(a)-(b).

The procedure that is set forth in 49 C.F.R. § 192.605 is:

> "(b) *Maintenance and normal operations*. The manual required by paragraph (a) of this section must include procedures for the following, if applicable, to provide safety during maintenance and operations.
> . . . .
> (1) Operating, maintaining, and repairing the pipeline in accordance with each of the requirements of this subpart and Subpart M of this part."

49 C.F.R. § 192.605(b). Because NSTAR was unable to produce documents demonstrating compliance with 49 C.F.R. § 192.619, which documents an operator is required to maintain pursuant to 49 C.F.R. § 192.603, the Department has reason to believe NSTAR may be in violation of 49 C.F.R. §§ 192.619 and 192.603.

III. THE INVESTIGATION

A. Description of the Scene

Upon arriving at the scene at 6:20 a.m. on July 24, 2002 (Exh. 13), two DTE Investigators observed a two and one-half story residential structure, partially collapsed. The north section of the structure's two lower levels had been completely destroyed. The top half story of the structure had collapsed onto the sidewalk and street (Exh. 14). The DTE Investigators observed windows blown out of the structures to the east and west of 65 Main Street. The explosion had blown debris from the first two stories of the structure at 65 Main Street onto the street (Exh.15). There were two excavations in the street that NSTAR had used to squeeze off the main.

The State Fire Marshal ("SFM") investigators removed debris to gain access to the basement (Exh. 16). Assisted by an excavator with a demolition claw, the SFM investigators eventually gained access to the basement where they recovered and took custody of natural gas appliances, meters,[9] regulator,[10] and interior piping (id.). Once the evidence and debris had been removed from the structure and basement, the foundation was filled in with gravel.

B. Pressure Testing of the Main and Service Line

---

9 "Meter" is a device used to measure the flow of natural gas to a customer.

10 "Regulator" is a device used to regulate the pressure of gas to a customer.

To determine any failure point in the distribution system, NSTAR prepared to isolate and pressure test the distribution system in proximity to 65 Main Street. The Department witnesses these tests in a post-incident environment. On July 24, 2002, at approximately 6:47 p.m. (Exh. 5), the SFM allowed NSTAR to excavate the service line to 65 Main Street. NSTAR also enlarged the two excavations at the main where the squeeze-off devices had been installed. This allowed NSTAR to cut out two sections of the main inside the squeeze-off points and install end caps on the termini of the 86-foot main segment. NSTAR also cut out a 39-inch section of the service line[11] where it entered the basement, turning over this evidence to the SFM (Exh. 17). NSTAR then capped off the end of the service line outside the foundation. The upstream end of the service line was still attached to the 86-foot section of the isolated main segment.

Between 7:30 p.m. and 9:50 p.m., NSTAR prepared to pressure test the isolated segment of the distribution system (Exh. 5). This included the 86 feet of three-inch plastic main, the service line to 65 Main Street, and the service line to 66 Main Street, where an air compressor was tied into the service riser to infuse air into the isolated piping segment (id.). After the DTE Investigators reviewed the pressure test configuration, the DTE Investigators observed while NSTAR pressurized the disconnected line segment to 58 psig (Exhs. 18; 19). The DTE Investigators witnessed that the line pressure held stable from 10:15 p.m. to 11:20 p.m. (Exh. 5). Therefore, the pressure test eliminated the 86-foot main segment and the two service line segments as possible sources of gas leakage. The jurisdictional piping inside the structure was

---

[11] This 39-inch segment is listed by Massachusetts Materials Research, Inc. as Items 17 and 18 in MMR Table I.

not tested at this time nor was the non-jurisdictional piping downstream of the meter.[12] The DTE Investigators then directed their attention to the piping inside the foundation of 65 Main Street.

C. Service Calls to 65 Main Street

The Department reviewed documentation regarding NSTAR service visits to 65 Main Street, from June 1, 2001 to June 5, 2002, and identified the following[13]:

1. On June 1, 2001, there was a faint gas odor at the dryer in the Carey apartment (Exh. 20a). NSTAR repaired a leak in the flex hose on the dryer. In addition, the work order indicates that the service person red-tagged[14] the appliance due to an illegal dryer vent (Exh. 20b).
2. On February 22, 2002, NSTAR visited 65 Main Street for a seven-year meter replacement[15] for apartment 3, the DeFreitas' apartment (Exh. 20c).
3. On March 6, 2002, NSTAR performed a seven-year meter replacement for one of the Carey meters[16] (Exh. 20d). A short time later that day, the Careys reported a

---

12 The Department has jurisdiction over operator-owned piping. The customer-owned recovered materials are not jurisdictional to the Department and were not tested as part of this investigation.

13 Table I, below, summarizes the NSTAR work orders (Exh. 20).

14 In general, red-tagging means that the operator shall shut off service to a customer or close off a valve to an appliance until an unsafe condition is corrected.

15 "Each meter for measuring gas … shall, not later than seven years from the date of installation or replacement, be removed by the company … and replaced by it with such a meter which has been newly tested, sealed and stamped in accordance with law." G.L. c. 164, § 115A.

16 The Careys' apartment was served by two meters.

gas odor in the front of the house (Exh. 20e). No leak was found inside or outside the dwelling (Exh 20f).

4. On March 12, 2002, NSTAR performed a seven-year meter replacement for the Webster apartment (Exh 20g).

5. On May 23, 2002, NSTAR visited 65 Main Street once, completing seven-year meter replacements for Maijs (Exh. 20h) and the Careys (Exh. 20i).

6. On May 24, 2002, NSTAR returned to 65 Main Street to turn on the Maijs' gas and relight the Careys' appliances (Exhs. 20j; 20k).

7. On June 4, 2002, NSTAR visited 65 Main Street to shut off one of the Carey meters for non-payment (Exh. 20m).

8. NSTAR returned on June 5, 2002, to turn on the previously shut off Carey meter (Exh. 20n). NSTAR returned later that day to relight the Carey water heater (Exh. 20o).

In 2002, between February 22 and June 5, NSTAR entered 65 Main Street a total of nine times. The purpose of one of those visits was to investigate a reported gas odor which resulted in a negative gas finding. The remaining visits were statutorily required meter changes, and relights, one meter shut-off, and one meter turn-on. NSTAR personnel reported no leakage or odor in their comments while performing the work.

Table I

Visit Number	Date	Time	Work Order	Description of visit
1	06/01/2001	9:20pm-9:35pm	0102-72545	Repair leak on flex connector at dryer.
2	02/22/2002	2:10pm-2:40pm	0202-96521	7 year meter change out and relit appliances.
3	03/06/2002	2:45pm-3:15pm	0203-55159	7 year meter change out.
4	03/06/2002	4:30pm-5:00pm	0203-55717	Investigate odor complaint, no leak found.
5	03/12/2002	12:40pm-1:10pm	0203-82806	7 year meter change out.
6	05/23/2002	11:20am-11:45am	0207-53676	7 year meter change out.
	05/23/2002	11:45am-12:15pm	0207-53683	7 year meter change out.
7	05/24/2002	12:45pm-1:00pm	0207-58312	Relit appliances after meter change out.
	05/24/2002	1:00pm-1:15pm	0207-59243	Relit appliances after meter change out.
8	06/04/2002	7:50am-8:00am	0208-44930	Shut off meter for nonpayment.
9	06/05/2002	3:35pm-4:05pm	0208-44930	Turn on meter after shut off for nonpayment.
10	06/05/2002	8:00pm-8:25pm	0208-54895	Relit water heater after shut off for nonpayment.

D. Leakage Surveys

NSTAR performed a winter leakage survey in January 2002. This survey is in accordance with its Operating and Maintenance Plan ("O&M Plan"). The following is to be used as a guide for conducting additional leak surveys as frequently as experience and technology indicate necessary: "(1) Surveys during winter months when frost heave could result in leakage." O&M Plan OM-60g. A review of the leakage surveys of 65 Main Street, Hopkinton, revealed

there were no leaks observed in the walking or mobile surveys[17] conducted in January 2002. On January 10, 2002, the NSTAR leakage surveyor detected a non-hazardous leak on the service line to 74 Main Street, Hopkinton (Exh. 21). This was the only leak detected on the service lines located between 2 and 106 Main Street (id.). On July 2, 2002, NSTAR conducted a mobile survey of the distribution system underlying the roadway of Main Street, finding no leaks (Exh. 22). NSTAR also performed a business district leakage survey on July 15, 2002. On this date, NSTAR recorded that it leak surveyed sections of Main Street, and it leak surveyed meters in commercial buildings and buildings of assembly (Exh. 23). This record makes no reference to entry into any residence or building in which resided a gas meter (id.).

Forty-nine C.F.R. Part 192 requires that operators leak survey the distribution system periodically. The regulation defines intervals of frequency for leakage survey as stated below:

> "(a) Each operator of a distribution system shall conduct periodic leakage surveys in accordance with this section.
> (b) The type and scope of the leakage control program must be determined by the nature of the operations and the local conditions, but it must meet the following minimum requirements:
> (1) A leakage survey with leak detector equipment must be conducted in **business districts**, including tests of the atmosphere in gas, electric, telephone, sewer, and water system manholes, at cracks in pavement and sidewalks, and at other locations providing an opportunity for finding gas leaks, at intervals not exceeding 15 months, but at least once each calendar year."

49 C.F.R.§ 192.723(a) and (b)(1) (emphasis added). NSTAR's O&M Plan defines the following terms with respect to leakage survey.

> "a. **Building**: Any structure which is normally or occasionally entered by humans for

---

[17] Leakage surveys are conducted using vehicle-mounted gas detectors to locate leaks underlying the street (mobile survey) or with hand-held units to survey the service lines running from the street to the meter (walking survey).

> business, residential or other purposes, and in which gas could accumulate.
> . . . .
> c. **Business District:** Areas with wall-to-wall paving and/or where the principal commercial activity of the city or town takes place.
> . . . .
> 1. **Leak Survey:** A search for possible gas leakage **in any area where gas facilities exist**, or where a gas leak is reported or suspected."

O&M Plan OM-60, at 1-2 (emphasis added). NSTAR conducted its leakage survey of the Hopkinton business district through its mobile survey on July 2, 2002, and its walking survey on July 15, 2002. There is no reference to any leakage survey performed on the interior service line piping of 65 Main Street during the July 15 walking survey.

In its O&M Plan, NSTAR requires leakage surveys to be performed where gas facilities exist. This encompasses any building housing NSTAR facilities, including residential structures, as stated by NSTAR, above. This provision of the O&M Plan is consistent with the applicable federal regulations. See 49 C.F.R. § 192.723(a) and (b)(1). Because NSTAR did not perform a leakage survey on the interior service line piping of 65 Main Street during its July 15 walking survey, the Department has reason to believe NSTAR may be in violation of 49 C.F.R. § 192.723(a) and (b)(1).

E. Odorant Levels

As part of any incident investigation, the Department requires an operator to verify that the odorant level of the gas meets the regulatory requirements. On the day of the incident, NSTAR took odorometer[18] readings to determine the intensity of the odorant in the natural gas

---

[18] An odorometer is an instrument which mixes gas and air to measurable concentrations. The tester increases the gas-air ratio to a point where he smells a change in the odor of the mixture (threshold reading) and increases the gas-air ratio until he smells a gas odor in the

(continued...)

flowing through Main Street. The Hopkinton Police Station and the Hopkinton Fire Station were chosen as representative sample points to conduct the tests because of their close proximity to 65 Main Street. Two NSTAR representatives performed the tests. At the Police Station, the readings at which the individuals detected a distinct gas odor were 0.05% and 0.10% gas in air (Exh. 24a). At the Fire Station, the readings by the same two individuals were 0.04% and 0.10% gas in air (id.). State regulation states, in relevant part:

> "A combustion gas in a distribution line shall have a distinctive odor of sufficient intensity so that a concentration of 0.15% gas in the air is readily perceptible to the normal or average olfactory senses of a person coming from fresh uncontaminated air into a closed room containing one part of the gas in 666 parts of air."

220 C.M.R. § 101.06(20)(a). Both NSTAR test personnel detected gas at much lower concentrations than the 0.15% gas-air mixture required in the above regulation. Given the detectability of gas at the lower gas-air concentrations, the odorant levels met the regulatory requirement.

In a review of the 2002 weekly odorant levels throughout the area surrounding Hopkinton, the record indicates that NSTAR met the regulatory requirements (Exh. 24b). Thus, gas odorant levels do not appear to have contributed to the incident.

F. Recovered Material

In the aftermath of the incident, the DTE Investigators worked with the SFM investigators to recover material in an effort to determine the cause and origin of this incident. The recovered material is divided into two categories. The first category is customer-owned equipment, such as

---

[18] (...continued)

appliances in the apartments, water heaters in the basement, and any piping emanating from the meters or piping feeding appliances. The second category is operator-owned piping, including the service line entry through the building wall, the regulator and associated vent line, the meters, and any piping or fittings connecting such. The separation point between the two categories is the outlet of each gas meter. Any equipment downstream, i.e., on the customer side of the meter, is external to the operator's distribution system and not jurisdictional to the Department pursuant to federal pipeline safety regulations. See 49 C.F.R. §§ 192.1(a) and 192.3.

Since the SFM could not rule out criminal activity as a cause of the incident,[19] that office took custody of all material recovered from the site to continue its criminal investigation. On November 15, 2002, the SFM shared physical custody of the operator-owned material with the Department, so that the Department could proceed with the metallurgical examination of the evidence. In accordance with 49 C.F.R. § 192.617, NSTAR selected Massachusetts Materials Research, Inc. ("MMR") of West Boylston, Massachusetts to conduct the testing of the Department jurisdictional piping and appurtenances ("recovered material").

G. Meter Readings and Gas Usage

The Department reviewed the post-incident meter readings and the meter reading records of the five meters at 65 Main Street. This analysis was performed to determine if any meter displayed excessive gas flow which could indicate a leak downstream of the gas meter. The Department Investigators compared the records for March through July of 2002 with the records

---

[19] Ms. Janet Webster stated to a DTE Investigator that when she investigated the loud sound from the basement prior to leaving the house on the morning of July 24, 2002, she noticed the basement door, located on a side porch, was open (Exh. 2a). She was certain that she had locked it prior to retiring (id.).

for the same time period in 2001 for all of the meters at 65 Main Street. (See Table II, below). The meter readings do not indicate anomalies that would indicate a massive volume of gas passing through a meter into a "failed" segment of house piping indicative of a gas leak prior to the incident.

TABLE II

USAGE MARCH-JULY, 2002

CUSTOMER	MARCH	APRIL	MAY	JUNE	JULY
Webster	7 ccf, 31 days, (A)	6 ccf, 30 days, (A)	5 ccf, 29 days, (A)	4 ccf, 32 days, (A)	2 ccf, 16 days, (L)
Maijs	21 ccf, 31 days, (A)	12 ccf, 30 days, (A)	6 ccf, 30 days, (E)	8 ccf, 62 days, (E)	1 ccf, 15 days, (L)
Carey (Heating)	347 ccf, 61 days, (A)	83 ccf, 30 days, (A)	52 ccf, 21 days, (F)	36 ccf, 33 days, (A)	13 ccf, 16 days, (L)
Carey	3 ccf, 31 days, (A)	2 ccf, 30 days, (A)	0 ccf, 29 days, (A)	5 ccf, 62 days, (E)	0 ccf, 9 days, (L)
DeFreitas	21 ccf, 31 days, (A)	21 ccf, 30 days, (A)	19 ccf, 29 days, (A)	22 ccf, 32 days, (A)	7 ccf, 16 days, (L)

USAGE MARCH-JULY, 2001

CUSTOMER	MARCH	APRIL	MAY	JUNE	JULY
Webster	6 ccf, 28 days, (A)	7 ccf, 31 days, (A)	8 ccf, 29 days, (A)	5 ccf, 32 days, (A)	5 ccf, 29 days, (A)
Maijs	22 ccf, 28 days, (A)	4 ccf, 31 days, (A)	4 ccf, 29 days, (A)	3 ccf, 32 days, (A)	4 ccf, 29 days, (A)
Carey (Heating)	136 ccf, 28 days, (A)	75 ccf, 31 days, (A)	62 ccf, 29 days, (A)	33 ccf, 32 days, (A)	31ccf, 29 days, (A)
Carey	2 ccf, 28 days, (A)	3 ccf, 31 days, (A)	0 ccf, 32 days, (E)	0 ccf, 30 days, (E)	3 ccf, 29 days, (E)
DeFreitas	25 ccf, 28 days, (A)	27 ccf, 31 days, (A)	16 ccf, 29 days, (A)	9 ccf, 32 days, (A)	8 ccf, 29 days, (A)

NOTES:

1. ccf: hundred cubic feet of gas
2. (A): Actual Meter Reading from a remote read meter
3. (E): Estimated gas usage
4. (F): Final, shut off or read/out
5. (L): Based on the meter reading on 7/24/02

H. Distribution Line Valves

Two NSTAR personnel arrived at 65 Main Street, Hopkinton at 2:12 a.m. on July 24, 2002, 22 minutes after the NSTAR Dispatcher received notice of the incident (Exh. 5). At 3:10 a.m., the two NSTAR personnel were trying to locate the curb valve to shut off the gas flowing into the wreckage of the house, where it was known that one deceased victim still lay (Exh. 25). The curb valve lay under the house wreckage, and NSTAR could not gain access to it to shut off the flow of gas to the house (id.). At 3:30 a.m., a distribution crew arrived at the scene and began to excavate with the intent to squeeze off the main and to locate the distribution valves needed to shut down gas flow to the system near the collapsed house (id.). At 4:03 a.m., the NSTAR Distribution Manager arrived at the site with the maps indicating the locations of the valves needed to isolate the system (Exh. 5). At 4:09, an NSTAR supervisor was informed of the valve locations and prepared to shut down the valves on the main to isolate the system (id.). At 4:28 a.m., the Distribution Manager notified the Department of the incident (id.).[20]

At 4:34 a.m., an NSTAR supervisor reported that he was unable to shut off one of the essential distribution line valves necessary to isolate the area (Exh. 25). This specific valve was located at the intersection of Hayden Rowe Street and Main Street (id.). The valve box was not centered over the valve, denying access to NSTAR (id.). NSTAR's map indicates that at least six distribution valves would have to be closed to isolate 65 Main Street (Exh. 26). Going from west to east along Main Street, the valves are identified and numbered as follows:

---

[20] In an annual letter to all operators, the Director of the Pipeline Engineering and Safety Division requests that operators inform the Department of any incident promptly, but no more than two hours after discovery of an incident.

Valve #	Location
083	Main Street just west of the Mt. Auburn Street intersection.
020	Grove Street on the northern intersection of Main Street.
052	Grove Street on the southern intersection of Main Street.
146	Walcott Street on the northern intersection of Main Street.
024	Church Street on the southern intersection with Main Street.
079	Main Street just east of Church Street; or
080	Main Street just west of Hayden Rowe Street.

For complete isolation, access to the first five valves and at least one of the last two valves was necessary (id.).

Forty-nine C.F.R. Part 192 requires that operators install valves on high pressure distribution systems to enable the operator to shut down the system in an emergency.

> "Each high-pressure distribution system[21] must have valves spaced so as to reduce the time to shut down a section of main in an emergency. The valve spacing is determined by the operating pressure, the size of the mains, and the local physical conditions."

49 C.F.R. § 192.181(a). A review of the distribution map indicates NSTAR has valves strategically located to enable isolation of any section of Main Street.

The design and installation regulation contained in 49 C.F.R. Part 192 also requires that a valve on a main be in a readily accessible location and the operating mechanism be accessible.

> "(c) Each valve on a main installed for operating or emergency purposes must comply with the following:
> (1) The valve must be placed in a readily accessible location so as to facilitate its

---

[21] *"High pressure distribution system* means a distribution system in which the gas pressure in the main is higher than the pressure provided to the customer." 49 C.F.R. § 192.3.

> operation in an emergency.
> (2) The operating stem or mechanism must be readily accessible."

49 C.F.R. § 192.181(c)(1)-(2).

Conversely, there is no requirement in 49 C.F.R. § 192.605 for an operator to have a maintenance program to preserve the accessibility of all distribution line valves. This is underscored in a September 12, 2003 Opinion Letter, issued by the U.S. DOT Office of Pipeline Safety (Exh. 27).

> "Section § 192.181(c)(1) is in Subpart D, *Design of Pipeline Components*. It addresses minimum requirements for the design and installation of pipeline components. It does not require an operator to maintain all valves in accordance with § 192.747."

Although one of NSTAR's valves was not accessible, there is no violation of 49 C.F.R. Part 192 because it does not require an operator to maintain the accessibility of distribution valves.[22]

IV. METALLURGICAL TESTING

A. General

On December 4, 2002, after NSTAR publicly noticed the prospective metallurgical testing, the Department and MMR held a procedural conference to announce the protocol for the testing of the recovered material subject to Department jurisdiction (Exh. 28). Because the customer-owned material is not jurisdictional to the Department, it was not included in the protocol (Exh. 29). See 49 C.F.R. §§ 192.1(a) and 192.3. The customer-owned material

---

[22] The following state statute became effective April 1, 2003: "[w]henever the commonwealth or a city or town undertakes the repair of streets, roads or sidewalks the appropriate gas company shall provide for the maintenance and improvements of its gate boxes located in the streets, roads or sidewalks to be repaired, so that the gate boxes are more easily and immediately accessible." G.L. c. 164, § 116B. Because the incident predates the effective date of this statute, there is no violation.

recovered from the site remains in the sole custody of the SFM. The Department allowed all interested persons the opportunity to comment on the testing protocol, suggest alternative testing, or suggest additional testing[23] (at the requestor's expense) as well as observe the testing (Exh. 30). The metallurgical testing began on January 6, 2003. MMR submitted a report on August 8, 2003 ("MMR Report").[24]

B. Non-Destructive Testing

MMR examined all piping and appurtenances recovered from the basement from the point of entry to the outlet of the meters. These items are listed in the December 4, 2002 MMR letter to the "Department" as items 6, 7, 8, 11, 12, 14, 15, 17, and 18 (Exh. 29). All the recovered material was examined visually, measured, photographed, leak tested, and analyzed for fractures.

Radiographic analysis of all metallic recovered material showed that none of the threaded fittings contained anomalies and were not the cause of the incident.[25] Leak testing under Protocol item 3 showed insignificant leaks in the system that were located in regions which would have been susceptible to damage in the incident.[26] Pressure/flow testing conducted on the service

---

[23] A revised Protocol was prepared on December 31, 2002 in response to the comments submitted by interested persons. An interested person did contract with MMR for the performance of a supplemental pull test of an exemplar fitting. MMR Report at 17.

[24] Copies of this report are available from MMR.

[25] MMR Report at 11.

[26] MMR Report at 13.

regulator confirmed that there was no malfunction in its operating mode.[27]

MMR conducted fracture analysis by microscopic examination of all metallic gas-carrying recovered materials. MMR determined that five fractures should be reviewed more closely with a scanning electron microscope to determine the cause of separation. Upon such review, MMR concluded the following:

> MMR #6 Fracture Surface - "This type of fracture feature is consistent with damage incurred during the incident under the single application of a force that exceeded the capability of the material. No features were observed that would indicate material defects."[28]
>
> MMR #9 Fracture Surface - "This piece possesses fracture features consistent with being caused by the incident. No features were observed that would indicate material defects."[29]
>
> MMR #10 (Male Thread End) - "This type of fracture is consistent with being caused by the incident. No features were observed that would indicate material defects."[30]
>
> MMR #11 (Meter #4231 outlet) - "The fracture features seen on this specimen are consistent with being caused by the event. No features were observed that would indicate material defects."[31]
>
> MMR #11 (Regulator relief pipe) - "[T]his fracture is consistent with having been caused by the incident. No features were observed that would indicate material defects."[32]

In summary, the MMR non-destructive testing concluded that the fractures were not the cause of

---

27 MMR Report at 13.

28 MMR Report at 40.

29 MMR Report at 41.

30 MMR Report at 42.

31 MMR Report at 43.

32 MMR Report at 44.

the incident.[33]

C. Transition Fitting

The MMR fracture analysis of recovered material indicates that the fractures occurred during the collapse of the building. A transition fitting[34] was located on the high pressure section of the service line.[35] The transition fitting was located just inside the basement wall prior to the explosion. It was found in two sections by SFM and DTE Investigators and documented by MMR as #18 (upstream segment) and #11 (downstream segment).[36] The fractured transition fitting is an adaptor (sometimes called a "basement adaptor") for PE tubing of ¾-inch FPT x 1-inch MPT x ½-inch CTS, manufactured by Inner-Tite Corporation (Exhs. 31; 32).

Although the noise heard by witnesses in the moments prior to the incident was not determined to have originated from a failure in the high pressure segment of the service line, the noise, accompanied by the odor of gas, warranted investigation of the only fractured high pressure service line segment. Because the witnesses who had been awake in the early morning of July 24, 2002 described a loud noise, accompanied by the odor of gas, prior to the explosion, MMR focused on the transition fitting. During the visual inspection, MMR noted that the:

---

33 MMR Report at 50.

34 A transition fitting is a fitting which joins a plastic pipe to a steel pipe. In the MMR Report, it is sometimes referred to as a basement adaptor.

35 The service regulator outlet is the dividing line between the high and low pressure segments of the service line. Any point on the service line before or upstream of the regulator outlet is on the high pressure segment of the service line.

36 MMR Report at 1-2.

> "Photographs of the foundation sleeve [also called a service sleeve][37] show a heavily corroded pipe with a portion of its wall missing at the six o'clock position (as installed in-service). Water seeping into the basement along this foundation sleeve and collecting to drip from the bottom (or 6 o'clock position) would produce this missing type of wall pattern through corrosion and gradual material wastage over time. This is also consistent with the corroded appearance of both transition fitting pieces and the "T" assembly to which they were in contact during service. Incoming water would have a much more difficult time running upwards onto a vertical basement riser pipe; however, and the piping and meters on the rest of MMR # 11 show markedly less corrosion than the transition fitting and other items near the gas inlet that were oriented in a horizontal way during service."[38]

The transition fitting displayed heavy corrosion around its outer surface. MMR describes this as "a friable[39] layer of corrosion."[40] One of the water heaters in the basement displayed heavy corrosion around its base. The fieldstone foundation and dirt floor basement of the structure contained a sump pump. These conditions led MMR to state in its report "that the basement was a humid, and at times wet, environment."[41] MMR states that the corrosion may have been the result of aggressive chlorine attack since the orientation and amounts of chlorine were consistent with soil runoff as opposed to human handling and water residue from the fire fighting effort.[42]

---

37 In this configuration, the plastic service line had been inserted into the original steel service line. The original steel service line was threaded into the upstream female transition fitting segment. The plastic pipe, housed inside the steel service line passed through the innards of the upstream and downstream segments of the transition fitting, held into place by a ferrule, a steel washer and a rubber gasket and compression.

38 MMR Report at 11.

39 *Friable* means "readily crumbled; brittle." American Heritage College Dictionary.

40 MMR Report at 10.

41 MMR Report at 11.

42 MMR Report at 23, 25.

The transition fitting was found in two sections in the incident site debris, one of which was a part of MMR #11, and the other part of MMR #18. MMR conducted leak testing of the transition fitting in two stages. The downstream segment, MMR #11, was adapted for pressure testing at 57 psig. The test indicated only minuscule leakage on the valve attached to the transition fitting, but not on the transition fitting segment itself. MMR next inserted item #18 into item #11 as described in the MMR Report.[43] The threaded mechanical attachment between the upstream and downstream sections had degraded to a point where the two pieces were not fastened. MMR attempted to determine if the operating pressure would cause separation of the joined transition fitting parts. The pressure test revealed that the line pressure would not force the two segments of the transition fitting apart.[44] In conclusion, MMR states that the transition fitting came apart as the result of either the explosion/and or collapse of the house, or the application of an unknown external force or forces (not necessarily directly applied to the jurisdictional piping) prior to the event.[45]

V. CORROSION REGULATORY REQUIREMENTS

A. Introduction

The MMR Report attributes the corroded state of the transition fitting to water contact. Although MMR did not determine that the failure of the transition fitting occurred prior to the explosion, DTE has reason to believe its corroded state presented a situation that should have

---

43 MMR Report at 29.

44 MMR Report at 51.

45 MMR Report at 51.

been addressed by NSTAR. As evidenced from the photos (Exhs. 31; 32), the visual appearance of the transition fitting warranted examination by NSTAR with appropriate remedial action, if required.

B. Initial Evaluation

Forty-nine C.F.R. Part 192 requires each operator of a natural gas distribution system to make an initial evaluation of any operator-owned piping exposed to the atmosphere for environments conducive to atmospheric corrosion. Specifically, it states:

> "*Pipelines installed after July 31, 1971.* Each aboveground pipeline or portion of a pipeline installed after July 31, 1971 that is exposed to the atmosphere must be cleaned and either coated or jacketed with a material suitable for the prevention of atmospheric corrosion. An operator need not comply with this paragraph, if the operator can demonstrate by test, investigation, or experience in the area of application, that a corrosive atmosphere does not exist."

49 C.F.R. § 192.479(a). NSTAR has no record of having made an initial evaluation in 1974 when it installed the transition fitting in the basement of 65 Main Street, Hopkinton. However, the federal code does not mandate retention of such a record for greater than five years. See 49 C.F.R. § 192.491(c). Therefore, the lack of a record of any initial evaluation does not constitute a violation.

C. Reevaluation and Remedial Action

Pursuant to 49 C.F.R. Part 192, operators must monitor pipelines for the presence of atmospheric corrosion and take appropriate action when necessary. Forty-nine C.F.R. § 192.481 states:

> "After meeting the requirements of § 192.479 (a) and (b), each operator shall, at intervals not exceeding 3 years for onshore pipelines … reevaluate each pipeline that is exposed to the atmosphere and take remedial action whenever necessary to maintain protection

against atmospheric corrosion."

49 C.F.R. § 192.481.

NSTAR has produced no record demonstrating that had met the reevaluation requirements of 49 C.F.R. § 192.481 with reference to the jurisdictional metal piping in the basement of the structure. Although MMR did not specifically identify the corrosion of the transition fitting as atmospheric corrosion, NSTAR's maintenance records for the interior piping at 65 Main Street omit any reference to compliance with 49 C.F.R. § 192.481. In response to a Division request (Exh.11) for the corrosion records of 65 Main Street, NSTAR responded that it was not required to retain corrosion records because the steel main and service had been renewed with plastic (Exh.12). NSTAR is correct in its interpretation of the regulation in that replacement of all underground piping for 65 Main Street with plastic relieved NSTAR of the burden of corrosion monitoring and protection. NSTAR is incorrect in its interpretation of the regulation with respect to the portion of the service line located inside the basement of 65 Main Street, which was steel pipe exposed to the atmosphere. NSTAR's response also implies that it was not required to monitor the remaining steel section of the service line. NSTAR produced no record that it had performed any monitoring of the interior metal piping exposed to the atmosphere within the three-year interval specified in the regulation.

The federal regulations further require that certain corrosion control records be maintained. 49 C.F.R. § 192.491. The reevaluation required by 49 C.F.R. § 192.481 must be maintained as described below:

> "Each operator shall maintain a record of each test, survey, or inspection required by this subpart in sufficient detail to demonstrate the adequacy of corrosion control measures or

> that a corrosive condition does not exist. These records must be retained for at least 5 years, except that records related to §§ 192.465 (a) and (e)[46] and 192.475(b)[47] must be retained for as long as the pipeline remains in service."

49 C.F.R. § 192.491(c). NSTAR produced no documentation to demonstrate that it had reevaluated the metal segment of the service line inside 65 Main Street, Hopkinton within the last five years. Even if NSTAR had performed the reevaluation, the corroded metal pipe segment reveals that no remedial action had been taken to maintain protection as required by 49 C.F.R. § 192.481. Because of the presence of visible friable corrosion, some type of remedial action as provided by 49 C.F.R. §§ 192.479(a) and 192.481 was required. Therefore, the Department has reason to believe NSTAR may be in violation of 49 C.F.R. §§ 192.481 and 192.491.

D. <u>O&M Plan</u>

Forty-nine C.F.R. Part 192 also requires operators of gas distribution systems to follow a manual of written procedures in operations, maintenance and emergency response.

> **"**(a) *General*. Each operator shall prepare and follow for each pipeline, a manual of written procedures for conducting operations and maintenance activities and for emergency response."
> . . . .
> "(b*) Maintenance and normal operations.* The manual required by paragraph (a) of this section must include procedures for the following, if applicable, to provide safety during maintenance and operations.
> (1) Operating, maintaining, and repairing the pipeline in accordance with each of the requirements of this subpart and subpart M of this part.
> (2) Controlling corrosion in accordance with the operations and maintenance requirements of subpart I of this part."

---

[46] Forty-nine C.F.R. § 192.465 refers to monitoring of external corrosion controls of underground piping.

[47] Forty-nine C.F.R. § 192.475 refers to internal corrosion.

49 C.F.R. § 192.605 (b)(1) and (2).

Corrosion control is a function specified in 49 C.F.R. § 192.605(b)(2). The NSTAR O&M Plan is the written manual of procedures that NSTAR employs in meeting the requirements of 49 C.F.R. § 192.605(a). In its O&M Plan, NSTAR states the following with reference to atmospheric corrosion:

> "4. Remedial Measures for Corroded Pipe
>
> General
> Pipelines installed after July 31, 1971, that are or have any ponion [sic] exposed to the atmosphere will be cleaned and either coated or jacketed with a material suitable for the prevention of atmospheric corrosion. Although operator need not comply with this requirement if he can demonstrate by test, investigation or experience in the area of application, that a corrosive atmosphere does not exist, it is suggested that coating be undertaken.
>
> For pipelines installed after August 1, 1971, that are or have any portion exposed to the atmosphere, the operator must determine the areas of atmospheric corrosion on the pipeline. If atmospheric corrosion is found, apply remedial measure. These areas of atmospheric corrosion on the pipeline must be cleaned to bright metal, and coated or jacketed with a material suitable for the prevention of atmospheric corrosion.
>
> Monitoring
> After meeting the requirements of(kn~r~1 [sic] above, the operator shall, at intervals not exceeding three (3) years for onshore pipelines, reevaluate each pipeline that is exposed to the atmosphere and take remedial action whenever necessary to maintain protection against atmospheric corrosion."

O&M Plan OM-66.

As stated above, 49 C.F.R. § 192.491(c) specifies that the record retention period for the General and Monitoring requirements, as stated in the NSTAR O&M Plan, is five years. Within that five-year period set forth in 49 C.F.R. 192.491(c), there should have been at least one record in which NSTAR monitored the condition of the interior service line piping located in the basement of 65 Main Street, Hopkinton. There is no record of any such inspection, nor has

NSTAR stated that it had met the requirement (Exh.12). Therefore, the Department has reason to believe NSTAR may not be in compliance with its O&M Plan which may be a violation of 49 C.F.R. § 192.605(a).

VI. FINDINGS AND CONCLUSIONS

A. Findings

1. Historical

a. On June 30, 1947, a one-inch bare steel service line was installed to 65 Main Street, Hopkinton.
b. On October 8, 1974, a ½-inch plastic service line was inserted into the one-inch steel service line from the curb valve into the basement of 65 Main Street, Hopkinton.
c. On October 8, 1974, an Inner-Tite transition fitting (basement adaptor) was installed in the basement of 65 Main Street, Hopkinton.
d. In October of 1979, a three-inch plastic main was installed in front of 65 Main Street, Hopkinton.
e. On October 25, 1979, a ½-inch plastic service line was installed connecting the three-inch plastic main to the curb valve on the service line to 65 Main Street, Hopkinton.
f. There are no records to demonstrate that NSTAR tested the sections of service line installed on October 8, 1974 and on October 25, 1979 to establish an MAOP.
g. NSTAR's business district leakage survey did not include entry into 65 Main Street, Hopkinton on July 15, 2002.
h. Between January 2002 and July 2002, NSTAR entered 65 Main Street, Hopkinton nine times.
i. The odorant levels within the Main Street, Hopkinton distribution piping met the state and federal detection levels in the months prior to and including July 24, 2002.

2. The Incident

a. In the early morning of July 24, 2002, several residents of 65 Main Street heard a loud, unidentifiable noise.
b. In the early morning of July 24, 2002, several residents of 65 Main Street detected the odor of natural gas.
c. At approximately 1:41 a.m. on July 24, 2002, approximately ten minutes after the loud noises woke some residents, the structure at 65 Main Street, Hopkinton, exploded.
d. Most of the residents escaped from the remains of the demolished structure with the exception of the two Carey children.
e. Shortly after their arrival, rescue personnel were able to retrieve one seriously injured

victim from the debris and determine that the remaining victim was deceased.
f. NSTAR arrived at the site of the explosion at 2:12 a.m., July 24, 2002.
g. The service line curb valve could not be closed because the debris of the house lay over it.
h. NSTAR shut off the service lines to the neighboring houses by 2:55 a.m.
i. None of the neighboring houses measured positive for the presence of gas.
j. By 3:30 a.m., NSTAR had completed its gas surveys in the drainage and sewer lines and the ground beneath the street for gas with no positive readings.
k. NSTAR could not shut off the flow of gas to the incident site because at least one valve was inaccessible.
l. NSTAR notified the Department of the incident at 4:28 a.m.
m. NSTAR squeezed off the flow of gas to the demolished structure at 5:07 a.m.
n. The incident resulted in two fatalities.

3. Post-Incident

a. Emergency personnel recovered the last deceased victim at 6:13 a.m.
b. The distribution system, external to the foundation of 65 Main Street, sustained line pressure of 58 psig for 65 minutes, ruling out any distribution line leakage in proximity to the structure.
c. The SFM took custody of all recovered appliances, piping, and appurtenances.
d. NSTAR selected MMR as the laboratory to perform the testing to meet the requirements of 49 C.F.R. § 192.617.
e. As part of the Department investigation, MMR restricted its testing to those segments of recovered materials that were owned and operated by NSTAR and jurisdictional to the Department.
f. MMR observed no material defects in the fractured segments of recovered material and concluded through its non-destructive testing that some fractures in the recovered material had occurred as a result of the event.
g. MMR found only one failure on the service line on the high pressure side of the service regulator.
h. MMR found the transition fitting to be heavily corroded on its outer surface.
i. MMR concluded that the transition fitting would not have failed under line pressure without the application of external forces.
j. MMR concluded that the transition fitting came apart as the result of either the explosion/and or collapse of the house, or the application of an unknown external force or forces (not necessarily directly applied to the jurisdictional piping) prior to the event.
l. NSTAR had no records to demonstrate that it had monitored the interior piping of 65 Main Street, Hopkinton for atmospheric corrosion within the last five years.

B. Conclusions

1. NSTAR has no records to demonstrate that the service line segments, installed in 1974 and 1979, were tested to establish an MAOP. NSTAR should have tested each service line segment to 1.5 times the MAOP. Therefore, the Department has reason to believe that NSTAR may be in violation of 49 C.F.R. Part 192:

> "(a) Except as provided in paragraph (c) of this section, no person may operate a segment of steel or plastic pipeline at a pressure that exceeds the lowest of the following:
> . . . .
> (2) The pressure obtained by dividing the pressure to which the segment was tested after construction as follows:
> (I) For plastic pipe in all locations, the test pressure is divided by a factor of 1.5."

49 C.F.R. § 192.619(a)(2)(i).

2. In failing to meet the requirements of Subpart L, the Department has reason to believe that NSTAR may be in violation of 49 C.F.R. § 109.603(a), which states: "(a) No person may operate a segment of pipeline unless it is operated in accordance with this subpart." 49 C.F.R. § 192.603(a).

3. NSTAR did not monitor the steel service line in the basement of 65 Main Street, Hopkinton for atmospheric corrosion in the five-year period prior to July 24, 2002. Therefore, the Department has reason to believe NSTAR may be in violation of 49 C.F.R. Part 192:

> "After meeting the requirements of § 192.479 (a) and (b), each operator shall, at intervals not exceeding 3 years for onshore pipelines … reevaluate each pipeline that is exposed to the atmosphere and take remedial action whenever necessary to maintain protection against atmospheric corrosion."

49 C.F.R. § 192.481.

4. NSTAR failed to perform leakage surveys of its service lines located inside 65 Main Street, Hopkinton, as required by 49 C.F.R. Part 192:

> "(a) Each operator of a distribution system shall conduct periodic leakage surveys in accordance with this section.
>
> (b) The type and scope of the leakage control program must be determined by the nature of the operations and the local conditions, but it must meet the following minimum requirements:
> (1) A leakage survey with leak detector equipment must be conducted in business districts, including tests of the atmosphere in gas, electric, telephone, sewer, and water system manholes, at cracks in pavement and sidewalks, and at other locations providing an opportunity for finding gas leaks, at intervals not exceeding 15 months, but at least once each calendar year."

49 C.F.R. § 192.723. Therefore, the Department has reason to believe NSTAR may be in violation of 49 C.F.R. § 192.723.

5. In failing to follow its written procedures in 1, 2, 3, and 4 above, the Department has reason to believe NSTAR may be in violation of 49 C.F.R. Part 192:

> "(a) *General*. Each operator shall prepare and follow for each pipeline, a manual of written procedures for conducting operations and maintenance activities and for emergency response."

49 C.F.R. § 192.605(a).