National Transportation Safety Board
Washington, D.C. 20594

Office of Railroad, Pipeline and Hazardous Materials Investigations

Survival Factors - Group Chairman's Factual Report of the Investigation

– Emergency Preparedness / Emergency Response[1]

Natural Gas Distribution Pipeline Leak and Resulting Multi-Story Structures Explosion, East Harlem neighborhood, Borough of Manhattan, City of New York, NY, on March 12, 2014

Report Date: December 10, 2014

A. **Accident**

NTSB Accident Number:	DCA 14 MP 002
Jurisdictional Location:	Borough of Manhattan (East Harlem neighborhood), City of New York, NY
Date / Time:	March 12, 2014 / 9:30 a.m., EDT[2]
Type of Accident:	natural gas release, and multi-story building explosion caused by accumulated natural gas
Property Location(s):	two adjacent structures at 1644 and 1646 Park Avenue, near the intersection of East 116th Street

[1] The Survival Factors investigation exclusively addresses the emergency preparedness and emergency response, and injury causation elements of the accident.
[2] Eastern Daylight Time

Table of Contents

Note – photographs compiled during the investigation by the Survival Factors Technical Working Group will be forthcoming as separate Survival Factors factual report documentation.

Abbreviations and acronym nomenclature used in this report

~	approximate, or approximately
API	American Petroleum Institute
BTU	British Thermal Unit [a measure of the heat content of a given quantity of fuel]
CFR	Code of Federal Regulations
Con Edison	Consolidated Edison Company of New York, Inc.
EDT	Eastern Daylight Time
FD	fire department (generic)
FDNY	Fire Department of the City of New York
F	Fahrenheit [temperature scale]
ft	feet [dimension]
fps	feet/second [speed]
OPS	Office of Pipeline Safety, within the PHMSA
NYPD	New York City Police Department
NYSPSC	New York State Public Service Commission
PHMSA	U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration
psi	pounds per square inch [pressure]
ref	reference
SF	Survival Factors [investigation]

B. Event Synopsis [3]

On March 12, 2014, at 9:30:42 a.m., EDT, an explosion caused by accumulated natural gas destroyed two adjacent structures located near the intersection of Park Avenue and East 116th Street, in the East Harlem neighborhood of the Borough of Manhattan, in New York City, New York. The explosion site was comprised of two, five-story, brick construction, mixed-use buildings (i.e., commercial / clerical / residential occupancies), which were located at 1646 and 1644 Park Avenue, respectively.

To stop the flow of natural gas that was burning in the two collapsed structures, at about 10:45 a.m., Con Edison technical personnel initiated excavations of the street pavement at three locations near the explosion site, which was completed at 1:44 p.m. The fire of the collapsed debris subsequently subsided, in which the debris fire was subsequently extinguished by FDNY resources. FDNY resources performed victim rescue and recovery, which continued throughout the day and on subsequent days and concluded on March 18 at 5:41 p.m.

The investigation by FDNY identified eight fatalities had occurred and a total of 46 civilians were transported to five local hospitals for medical examination and/or treatment. Fifteen minor injuries to emergency responders were reported. The recorded weather at the time of the accident was about 49 degrees F., under clear skies. Parties to the investigation include NTSB, the City of New York, the Pipeline and Hazardous Materials Safety Administration (PHMSA), Consolidated Edison of New York, Inc., and State of New York - Public Service Commission.

C. Survival Factors (SF) – Technical Working Group Participants

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Commander, Bureau of Fire Investigation, Special Operation Command
Fire Department of the City of New York (FDNY)

Lt. Steve Russell
Commanding Officer, Arson & Explosion Squad
New York City Police Department (NYPD)

[3] draft, subject to revision

D. **Details of the Investigation**

1.0 Relevant Background Factors

1.1 Locality of the Accident / Civil Jurisdiction

The accident occurred on private property in two adjacent structures, which were located at 1644 and 1646 Park Avenue, respectively, in the East Harlem neighborhood of the Borough of Manhattan, in the City of New York, New York.

1.2 Site Characterization – Pre-Event

The area of accident site, at the northern end of the Borough of Manhattan, is a densely populated, urban neighborhood, generally consisting of multiple-occupancy residential structures and small retail establishments.

1.2.1 Overall Physical Configuration [4]

The two subject structures of the accident (ref § 1.1, above), both of which were destroyed in the explosion and subsequent fire, were located as the third and fourth buildings, respectively, to the north of the intersection of East 116th Street and Park Avenue. Both buildings were comprised of two similarly constructed, mixed-use occupancy structures (i.e., commercial / clerical / residential), of a conventional brick (masonry) and wood construction, with a masonry façade (facing the street). The buildings were separately built, circa 1898, five-story, "walk-up" (no elevator) structures. Each structure measured about 25 ft in width (front / street dimension), by about 80 ft in depth (front to rear dimension), by about 55 ft in height (as measured from the prevailing street pavement surface).[5]

1.2.2 Structures Interior Configuration [6]

The property located at 1644 Park Avenue was comprised of a basement level, an ecclesiastical facility (a church sanctuary) on the first floor (street level), a mezzanine containing the church sanctuary balcony and a church office on the second floor, and two residential apartment units on each floor [above the second floor level] on the third through fifth floors, totaling six apartments.

The property located at 1646 Park Avenue was comprised of a basement level, a retail establishment (a piano sales / rental / repair shop) on the first floor [street level], and two residential apartment units on each of the second through fifth floors [above the street level], totaling eight residential apartment units, inclusive.

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[4] ref, and for further information, see [Internet] http://a810-bisweb.nyc.gov/bisweb/PropertyProfileOverviewServlet?boro=1&houseno=1646&street=Park Ave&requestid=0&s=A03C41B885B461E4F46BD08866A7430E [containing Certificates of Occupancy documentation for the subject properties (see § 1.2.2, for further information)], and as otherwise indicated.

[5] ref, and for further information; see [Internet] http://maps.nyc.gov/taxmap/map.htm; researched data comprising property references located at block 1622 lot 35, and block 1622 lot 36, for 1644 and 1646 Park Ave., respectively.

[6] ref Certificates of Occupancy, as Issued by City of New York, Department of Buildings, for the subject properties.

1.2.3 Roadway Arrangement

Generally described, the Park Avenue street infrastructure in this area consisted of a paved roadway that is substantially oriented in a north/south direction, in which the two subject structures were located on the west side of the street between East 116th Street and East 117th Street. Public utility infrastructure, which includes pipelines (buried to various depths in the roadway in front [to the East] of the respective subject structures), were located beneath the pavement (asphalt roadway) surface on the west side of Park Avenue, between the block intersections of 116th and 117th Streets, included:

- a natural gas main, which supplied gas service to several buildings (customers) along Park Avenue, was located approximately parallel, and in close proximity to the water main pipeline, which had a depth of cover of about 3 to 4 ft (see § 1.3.3 for further information),
- a water main, which provided domestic water service to customers, was located approximately parallel, and in close proximity to the gas main pipeline, which had a depth of cover of about 4 to 5 ft,
- a sewer main, which provided sewage removal service to customers, was located about 15 feet beneath the street surface (as measured at the northern end of the block, at East 117th Street), which was fire-brick lined and oval in shape, and measured about 32 inches wide by about 48 inch in height, and
- electrical conduits, which provided electric service to customers.

See the Operations Group Factual Report for additional information.

1.2.4 Adjacent Significant Properties

A property located at 1652 Park Avenue, situated immediately to the north of the 1646 Park Avenue address, was comprised of residential apartment units, which was the site in which a witness (a resident on the second floor of the building) had placed a telephone call to the gas utility supplier preceding the explosion (see § 4.1, for further information).

A structural steel viaduct [7], which contained four parallel railroad tracks of the Metro-North Railroad on its surface deck, was located in the center of Park Ave. the two subject structures (ref § 1.1, above). The viaduct measured about 54 ft wide, by about 20 ft in height (i.e., distance from ground level to the top of the side-support girder), which was separated from the front of the two subject structures by about 40 ft.

1.3 Pipeline Owner / Operator

Consolidated Edison Company of New York, Inc. (Con Edison in this report) supplied natural gas to the two all of the structures that used natural gas in the community, including at the accident site.

[7] which is referred to locally [various media reports] as the “Park Avenue Viaduct”.

1.3.1 Basic Description of the Company [8]

Con Edison, a "subsidiary" of Consolidated Edison, Inc.[9], has its main business offices located in the Borough of Manhattan. It also supplies natural gas to the Boroughs of Queens and the Bronx in New York City, and to parts of Westchester County (to the immediate north of New York City). Con Edison's customer-base totals about 1.1 million customers, which utilizes about 4,351 miles of gas distribution "mains" and about 367,500 "service" lines in the delivery of its product, comprising almost 7,200 total miles of gas pipe. Con Edison further supplies electricity service to customers in New York City (except for a small area of the Borough of Queens) and Westchester County, and supplies live-steam service to customers in the Borough of Manhattan.

1.3.2 Natural Gas Operations - Definitions [10]

Distribution refers to "the delivery of natural gas through pipeline systems to an end-user". Main pipelines (also referred to as a "gas main") are "pipes used to carry gas in large volume for general or collective use from one point to another. A service pipeline (also referred to as a "service line") is "the pipe that carries gas from the main to the customer's meter". A curb valve is "the isolation valve located in the service line between the main and the building" (which can be used to turn-off the flow of natural gas product to the customer). An odorant is "any material added to natural or LP gas in small concentrations to impart a distinctive odor".

1.3.3 Product Delivery Operations at the Accident Site

A "gas main" pipeline, comprised of a length of cast iron pipe installed in the late 1800s and a length of polyethylene (plastic) pipe that was installed in 2011 to repair a section of the cast iron pipe, both measuring about 8 inches in diameter [11], was located beneath the roadway pavement on the west side of Park Avenue, between the block intersections of East 116th and East 117th Streets. This gas main, which had a depth of cover of about 3 to 4 ft, was connected to the Con Edison natural gas distribution system at both ends of the block. A series of individual "service" pipelines, which connected with the gas main at a "service tee" connection (either a mechanical fitting or a saddle fusion joint [12] connection), extended from the "service tee" connection to the gas customers' meter (which were located inside the buildings along the west side of Park Ave.). Isolation devices called "curb valves" were located in the service lines that extend from the gas main "service tee" connection to the customers' meter, which would normally be available to turn-off the flow of natural gas to the customers' meter.

See the Operations Group Factual Report for additional information.

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[8] ref, and for further information; see [Internet] http://www.coned.com/, and as otherwise indicated.
[9] ref, and for further information; see [Internet] http://www.coned.com/
[10] ref, and for further information; see [Internet] http://www.coned.com/newsroom/resources_glossary_gas.asp
[11] as described by the company, "Con Edison's 8" gas pipe has the following diameters: cast iron pipe (9.05 inches outside diameter / 8.15 inches inside diameter); SDR-11 HDPE (8.625 inches outside diameter / 7.057 inches inside diameter)."
[12] ref, and for further information; see [Internet] https://plasticpipe.org/pdf/chapter09.pdf ("Handbook of PE Pipe, 2nd Ed.", Chapter 9; a publication of The Plastics Pipe Institute Inc.).

1.3.4 Natural Gas Product Delivered [13]

The principal constituent of the natural gas product that is delivered to Con Edison customers is methane.[14] Natural gas moves through the Con Edison pipeline system at an average speed of about 22 fps, in which the local low-pressure gas mains are typically pressurized to about eight inches of water column (i.e., ~ 0.3 psi). An odorant, consisting of methyl mercaptan, is added to the natural gas as a safety measure, to render it readily detectable by individuals with a normal sense of smell if a leak occurs.[15]

A Material Safety Data Sheet (MSDS) for natural gas [16] provides information on the physical data, toxicity, health effects, first aid, reactivity, storage, disposal, protective equipment, and [unintended / uncontrolled] release-handling procedures of the product [17], as might be needed by emergency responders and any individual who might be exposed. MSDS documentation for natural gas is available to all Con Edison employees through its corporate intranet website [18].

1.4 Regulation Applicable to Emergency Preparedness / Emergency Response [19]

1.4.1 Federal [20]

The federal government establishes minimum pipeline safety standards under the U.S. Code of Federal Regulations (CFR), Title 49 "Transportation", Parts 190 - 199. Regulation that addresses pipeline shipment of natural gas is addressed in 49 CFR Part 192. The Office of Pipeline Safety (OPS), within the U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration (PHMSA), has overall regulatory responsibility for hazardous liquid and gas pipelines under its jurisdiction in the United States. The OPS enforces pipeline safety regulations for interstate gas and hazardous liquid pipeline operators in New York State, based on the inspections performed by the state. [21]

Specific regulation to address prospective Survival Factors issues (emergency preparedness / emergency response) is addressed under the following sections of the Part 192 Regulation:

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[13] ref, and for further information; see [Internet] http://www.coned.com/newsroom/information_facts.asp, and as otherwise indicated.
[14] ref, and for further information; see [Internet] http://www.coned.com/newsroom/resources_glossary_gas.asp.
[15] ref, and for further information; see [Internet] http://www.coned.com/publicissues/mercaptan.asp
[16] ref, and for further information; see [Internet] http://www.aga.org/SiteCollectionDocuments/KnowledgeCenter /OpsEng/SOS/2010/1001MSDSALTAGAS.pdf.
[17] the creation, publication, and use of MSDS documentation are governed by the Hazard Communication Standard (HCS) that is promulgated by the Occupational Safety and Health Administration (OSHA) of the U.S. Department of Labor.
[18] as further described by the company (relative to emergency response product handling), “Similar information is also found in the U.S. Department of Transportation’s (USDOT’s) 2012 Emergency Response Guidebook, copies of which are [also] included as standard equipment in Con Edison emergency response vehicles.”
[19] as might be specifically applicable to prospective Survival Factors issues
[20] ref, and for further information; see [Internet] http://phmsa.dot.gov/pipeline
[21] ref, and for further information; see [Internet] http://primis.phmsa.dot.gov/comm/FactSheets/States/NY_State_PL\ _Safety_Regulatory_Fact_Sheet.htm

49 CFR 192.605	Procedural manual for operations, maintenance, and emergencies [22]
49 CFR 192.615	Emergency plans [23]
49 CFR 192.616	Public awareness [24]
49 CFR 192 Subpart P	Gas Distribution Pipeline Integrity Management [25]

1.4.2 State [26]

The PHMSA / OPS enforces pipeline safety regulations for interstate gas and hazardous liquid pipeline operators in New York State, based on the inspections performed by the state. By signed agreement with OPS, the state inspects interstate gas and hazardous liquid pipeline operators in New York State. Through certification by OPS, the state inspects and enforces the pipeline safety regulations for intrastate gas and hazardous liquid pipeline operators in New York. The State of New York has developed its own pipeline standard(s), in which State pipeline standards may be more stringent, but cannot be less stringent, than Federal regulations.

The New York State Public Service Commission (NYSPSC) is the designated agency of the State of New York to perform inspections of natural gas pipeline operators in New York State, and to enforce the pipeline safety regulations for intrastate gas and hazardous liquid pipeline operators in New York State. [27]

1.5 Industry Standards

A Recommended Practice (RP) document was developed, and is promulgated by the American Petroleum Institute (API) [28], to "provide guidance to be used by natural gas pipeline operators, to develop and actively manage their Public Awareness programs", as required under 49 CFR 192.616 (ref § 1.4.1, above), as follows.

API - RP 1162	Public Awareness Programs for Pipeline Operators [29]

The most recent revision of this document is the second edition, dated December 2010. However, the first edition, dated December 2003, is applicable to the circumstances of this investigation.[30]

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[22] ref. [Internet] http://www.ecfr.gov/cgi-bin/text-idx?SID=bfcd0369491cb31ec126db7971c3b0c3&node=se49.3.192_1605&rgn=div8

[23] ref. [Internet] http://www.ecfr.gov/cgi-bin/text- idx?SID=bfcd0369491cb31ec126db7971c3b0c3&node=se49.3.192_1615&rgn=div8

[24] ref. [Internet] http://www.ecfr.gov/cgi-bin/text- idx?SID=bfcd0369491cb31ec126db7971c3b0c3&node=se49.3.192_1616&rgn=div8

[25] ref. [Internet] http://www.ecfr.gov/cgi-bin/retrieveECFR?gp=&SID=bfcd0369491cb31ec126db7971c3b0c3&n=sp49.3.192.o&r=SUBPART&ty=HTML

[26] ref, and for further information; see [Internet] http://www.dps.ny.gov/, and as otherwise indicated.

[27] ref, and for further information; see [Internet] http://www3.dps.ny.gov/W/PSCWeb.nsf/All/4B7F05F8C01754AC85257687006F388C?OpenDocument

[28] as described in the "Mission" of the organization, the API is "to influence public policy in support of a strong, viable U.S. oil and natural gas industry" where the API "Engages in federal and state legislative and regulatory advocacy", as further described in [Internet] http://www.api.org/globalitems/globalheaderpages/about-api/industry-mission.

[29] available, as a "non-printable copy", at [Internet] http://www.techstreet.com/api/products/1757546

Although the term "recommended practice" potentially suggests 'voluntary compliance', conformity to this recommended practice is effectively a regulatory requirement, pursuant to Final Rule [31] action, issued in May 2005 by the PHMSA-OPS, in which (mandatory) compliance with RP 1162 was "incorporated by reference".

1.6 Meteorological Factors [32]

About 9:51 a.m. EDT, the weather station at Central Park, in New York City, recorded that the environmental conditions were daylight, clear skies, light winds (6 mph), a temperature of 49 degrees F, with visibility of 7 miles.[33]

2.0 Accident Site Damage Characterization

2.1 Damage Description

2.1.1 Residential Dwellings / Commercial Facilities

As a result of the explosion, a catastrophic collapse occurred in the structures located at 1644 and 1646 Park Avenue, in which fire also erupted in debris of the two structures. The flow of natural gas in the main supplying the two structures was shut-off by Con Edison at 1:44 p.m., in which the fire [of the collapsed debris] was successfully extinguished shortly thereafter (by about 2:00 p.m.). The debris of the two collapsed five-story buildings had compressed approximately to a two- to three-story elevation (above the street level). Most of the rear (masonry) wall of the 1646 Park Avenue building remained standing, displaying substantial obvious blast-impact damage, and was determined to be unstable by FDNY firefighters. Debris from the two structures also fell onto the sidewalk and into the street in front of the two addresses.

Debris that fell on the sidewalk (in front of the two structures) covered access to the underground curb valves [of the natural gas service pipelines] for the two structures, necessitating that the natural gas main supplying gas to the building in the vicinity, including the two structures be isolated from the Con Edison gas supply system (see § 1.3.2, § 1.3.3, § 3.6.5, and § 5.3.5 / Exhibit 1 Event Chronology ("Timeline"), for further information).

Other structures located adjacent to the collapsed structures at 1644 and 1646 Park Avenue (e.g., 1642 Park Avenue, 1652 Park Avenue, and 95 E. 116th Street) sustained significant structural damage as a result of the explosion, so were subsequently determined to be "Unsafe" [for

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[30] review of the subject regulation identified that the second edition of this [Recommended Practice] document has not been accepted in the federal regulation.

[31] as described in the Federal Register, Vol. 70, No. 96, May 19, 2005, page 28833, at [Internet] http://www.gpo.gov/fdsys/pkg/FR-2005-05-19/html/05-9464.htm

[32] source: supporting research of NWS data archive (Local Climatological Data - Hourly Observations Table, as cited in [Internet] http://cdo.ncdc.noaa.gov/qclcd/QCLCD) for the Central Park ASOS weather station, in the City of New York, NY (located about 2 mi south of the accident site).

[33] the accident occurred at 9:30 am EDT; NWS data (which is logged on hourly intervals) was recorded at 9:51 am EDT (8:51 am Standard time), about 21 minutes after the accident.

occupancy] [34] by the City of New York / Department of Buildings. Additional structures located on the opposite side of Park Avenue, about 125 feet away, sustained broken window damage.

2.1.2 Pipeline Infrastructure – Brief Summarization

Emergency responders observed a void in the street pavement in front of one of the burning structures, which enlarged over the course of time (during fire suppression operations) to become an obvious cavity, the action which was characterized in a statement [35] of the on-scene battalion chief, BC12, as follows.

> "… [A]t some point during [fire suppression] operations a hole in the street had opened up just in front of 1642 Park Ave. [BC12] further stated that this hole eventually opened up to a rectangle shaped hole measuring about 2 foot by 4 foot. [BC12] stated that at this time there was water coming up from the hole in the ground. At approximately 2:00 pm, there was an explosion emanating from this hole in the street. The explosion consisted of a loud bang and an orange flame approximately 3 feet wide that shot up into the air approximately 25 feet. The flame then retreated back into the hole in the street. Units then operated a Hoseline into the void."

Concern about vehicles (heavy excavation equipment used in the fire suppression and debris removal effort) potentially dropping into undermined areas near the cavity, resulted in a delay in victim recovery efforts until the void was temporarily filled-in with gravel and covered with a steel plate about 10 p.m. the night of the incident. Subsequent excavation of the cavity the following day identified that a fracture had occurred in a 12-inch diameter, cast iron water main at that location.

See the Operations Group Factual Report for additional information.

2.1.3 Other Damage Sustained

A number of vehicles that were situated on the street at the time of the explosion (proximate to the structures located at 1644 and 1646 Park Avenue), sustained debris impact damage, in which also a number of vehicle occupants were identified to have sustained corresponding injury. Individuals that were in the vicinity of the two structures sustained injury as a result of being struck by explosion debris.

Explosion debris came to rest on the railroad tracks of the Metro-North Railroad viaduct. As a result, Metro-North suspended service on the tracks for about 7½ hours, during which time the explosion debris was cleared from the tracks and the tracks were inspected for damage. Upon service resumption, trains were operated at reduced speeds through the accident site area to "… protect nearby employees and reduce vibrations as rescue and recovery work continues". [36]

[34] "unsafe" as identified by the red placards that were affixed on/near the entrances of the individual structures.
[35] ref FDNY "Interview Sheet, Bureau of Fire Investigation", BFI Job Number 10257 2014 MAN, dated 04/03/2014
[36] ref, http://www.mta.info/news/2014/03/12/metro-north-service-notice

2.2 Quantity of Pipeline Product Released [37]

Calculation by the investigation determined that an average of about 17,100 SCF (standard cubic feet) of natural gas was released subsequent to the explosion (i.e., the time interval between when the explosion occurred [at 9:30 AM] and when closure of the 3 gas mains occurred [at 1:44 PM]).

2.3 Air Quality Monitoring

In a release of an explosive product from a ruptured pipeline, an integral element of an emergency response and evacuation process is the monitoring of air quality [data] for the area proximate to the accident site. The monitoring information is then made available for contemporaneous dissemination to Incident Command (staff) and the jurisdictional air quality monitoring agency, such to allow informed decisions to be made as support to the execution of the emergency response to the incident.

Air Quality Monitoring was conducted at the scene by the City of New York / Department of Environmental Protection (DEP), which compiled documentation as received by the investigation, a copy of which is anticipated to be available in the NTSB public docket.

2.4 Accident Site Map

A schematic map depicting the accident site infrastructure was obtained by the investigation.

2.5 Identification of the Time of the Event

Timestamp data of images from security cameras of facilities located near the accident site identified that the explosion, which caused the collapse of the two structures, occurred at 09:30:41 a.m.[38]

As a confirmation of this, the Lamont-Doherty Cooperative Seismographic Network (L-DCSN) was contacted by the investigation, which indicated that recorded seismic data of their system equipment was observed, which was consistent with characteristics of an explosion that was observed at 09:30:41 a.m. The L-DCSN data indicated that the event occurred at a GPS-based location that was consistent with the site of the two structures located at 1644 and 1646 Park Avenue, in the Borough of Manhattan. [39]

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[37] source: calculations performed by NTSB / RPH-20 staff, described in a document titled “Estimate the Leakage from Open Service Lines to 1644 and 1646 following the explosion”, a copy of which is anticipated to be available in the NTSB public docket, in which data of the first page of that document is utilized in this SF Factual report.

[38] timestamp data of various security cameras situated near the accident site were examined, in which discrepancies in the timestamps of the equipment were observed, relative to an official, US Government-sourced, recognized time standard (e.g., http://www.nist.gov/pml/div688/grp40/index.cfm). Accordingly, an independent timestamp source, traceable to a US Government-sourced, recognized time standard, was identified and utilized, as described.

[39] seismic signals recorded at two seismograph stations, located in the City of New York, of the Lamont-Doherty Cooperative Seismographic Network (L-DCSN), which were evaluated by technical staff of the L-DCSN and indicated as consistent with an explosion event that occurred at the identified accident location and time cited, ref

3.0 Jurisdictional Emergency Services Agencies and Pipeline Operator – Background and Emergency Preparedness Measures

3.1 Jurisdictional Fire / Rescue Agency - FDNY

The accident occurred on private property within the jurisdiction [fire protection district] of the Fire Department of the City of New York (FDNY). No mutual aid fire department resources (from neighboring jurisdictions) were requested to respond to this event.

3.1.1 Background [40]

The FDNY is the principal emergency services agency responsible for responding to fire suppression and emergency rescue responses, and first-responder emergency medical assistance, for the City of New York. Telephone requests for fire department emergency services in the City of New York are placed via the City of New York 911 system, which also provides primary service radio dispatching of FDNY resources (see § 3.2, for further information).

Emergency medical [ambulance] service (EMS) for the City of New York is also provided by the FDNY Bureau of EMS, which is an operational unit of the FDNY (see § 3.3, for further information).

The FDNY, which serves a City of New York population [41] of 8,175,133, encompassing a land area of about 322 sq. mi., is essentially a fully-paid emergency services agency, although volunteer fire and ambulance service supplement FDNY services in certain local communities within New York City (i.e., Gerritsen Beach, Hamilton Beach and within Staten Island, to which there are also volunteer ambulance corps in certain communities within Brooklyn). Based on CY 2013 data, the FDNY:

- is comprised of 10,241 Firefighters and Fire Officers, and 5,577 other professional staff (i.e., Fire Marshals, Fire Inspectors, Dispatchers, civilian Administrative Personnel [technologists, professionals, etc.], including 3,621 Emergency Medical Technicians (EMTs), Paramedics and EMS Officers, totaling 15,678 personnel (salary and hourly) [42], and
- operates out of 218 fire stations and 34 EMS stations, and maintained roster of 363 response and support apparatus (fire trucks, etc.) and
- rosters three marine fire / rescue vessels (fire boats, etc.), to which FDNY Marine Operations staffs three full time (24/7/365) vessels plus three seasonal vessels from May thru October, which operate from 0700 to 2400 daily; the vessels range in size and capacity, and
- operationally[43], responded to 25,097 structural fires, 14,568 non-structural fires, 222,879 medical emergencies, and 19,346 malicious false alarms.

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email(s) from L-DCSN, dated 7/28/2014, et seq. Also, the timestamp of the L-DCSN seismic data equipment was determined accurate relative to an official, US Government-sourced, recognized time standard.

[40] ref, and for further information, see [Internet] http://www.nyc.gov/html/fdny/html/general/mission.shtml, and as otherwise indicated.

[41] ref US Census data of 2010; see [Internet] http://quickfacts.census.gov/qfd/states/36/3651000.html

[42] ref, and for further information, see [Internet] http://www.nyc.gov/html/fdny/html/general/vital_statistics.shtml

[43] ref, and for further information, see [Internet] http://www.nyc.gov/html/fdny/html/stats/citywide.shtml

FDNY maintains a formal / documented Mutual-Aid Agreement with several constituent municipal / jurisdictional emergency response agencies proximate to the City of New York, and also provides commensurate mutual aid support to neighboring jurisdictions.

3.1.2 Preparedness Plans / Measures

The FDNY utilizes a preparedness response plan, titled the "All Hazards Emergency Operations Plan", as compiled by the City of New York - Office of Emergency Management (see § 3.4.2, for further information).

FDNY also had compiled training and operational guidance documentation that contains information on the technical elements and best practices of addressing "natural gas emergencies", as follows.

- Probationary Firefighters Manual, Chapter 12 "Engine Company Operations" and Chapter 16 "Ladder Company Operations, which contains guidance on conducting "evacuation" processes. [44]
- Probationary Firefighters Manual, Chapter 17, [titled] "Emergencies", which, in Section 4, contains generalized guidance on the elements of responding to "natural gas emergencies". [45]
- Training Bulletin Emergencies 2 [dated] Dec. 18, 2008, [titled] "Natural Gas Emergencies and Fires", which contains detailed technical guidance on the elements of responding to this type of event.
- Training Bulletin Emergencies 2 [dated] Dec. 18, 2008, [titled] "MSA Altair Digital Gas Meter", which contains detailed technical guidance on the operational and usage elements of the MSA Altair Digital Gas Meter, which has the capability of identifying the limits [levels] of methane combustible gas.

3.1.3 Pipeline Operations Familiarization Training / Drill Exercises Conducted Prior to the Accident

Con Edison provided documentation to the Investigation that identified in the year preceding the accident, Con Edison had conducted at least 38 formal training activities and/or drill exercises with various emergency services agencies of the City of New York (e.g., FDNY, NYPD, OEM, etc.), which were specific to gas pipeline operations familiarization (see § 3.6.3, for further information).

FDNY training documentation contains information on the technical elements and best practices of addressing "natural gas emergencies" [46], and on conducting "evacuation" processes. [47]

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[44] Ref [Internet] http://www.nyc.gov/html/fdny/html/units/training/proby_manual.shtml.
[45] ref, pages 13-17; see [Internet] http://www.nyc.gov/html/fdny/html/units/training/proby_manual.shtml.
[46] ref, FDNY Probationary Firefighters Manual, Chapter 17 [titled] "Emergencies", pages 13-17 (~ four pages); see [Internet] http://www.nyc.gov/html/fdny/html/units/training/proby_manual.shtml.
[47] ref, FDNY Probationary Firefighters Manual, information cited in Chapters 12 "Engine Company Operations" and Chapter 16 "Ladder Company Operations"; see [Internet] http://www.nyc.gov/html/fdny/html/units/training

3.2 Emergency Services – 911 Call Processing / Dispatch Services [48]

The City of New York maintains a "911 emergency call PSAP system" [49], which is referred to as the New York City 911 System, which provided 911 emergency telephone call processing and fire / rescue and emergency medical dispatch services to public safety incidents.

3.2.1 Background [50]

This organization is operated by the NYPD Communications Division, with the support of the FDNY, and the FDNY Bureau of Communications, in which coordination between the emergency response agencies is handled by the Office of Citywide Emergency Communications (OCEC). [51, 52] The operation was first launched in 1968, which currently processes more than 11 million incoming calls [requests for service] per year, and is located at the MetroTech Center in the Borough of Brooklyn.

3.2.2 Preparedness Plans / Measures

The New York City 911 System utilizes a preparedness response plan, titled the "All Hazards Emergency Operations Plan", as compiled by the City of New York - Office of Emergency Management (see § 3.4.2, for further information).

3.2.3 Pipeline Operations Familiarization Training / Drill Exercises Conducted Prior to the Accident

Con Edison provided documentation to the Investigation that identified, in the year preceding the accident, Con Edison had conducted at least 38 formal training activities and/or drill exercises with various emergency services agencies of the City of New York which were specific to gas pipeline operations familiarization (see § 3.6.3, for further information).

3.3 Emergency Medical Services (EMS) / Ambulance [53]

EMS / ambulance services conducted by the City of New York, as dispatched under the New York City 911 System, are operated by the FDNY Bureau of EMS, which responded personnel and resources to the accident scene. Other ambulance services operating out of the [what's referred to as] "voluntary hospitals" (i.e., "911 Participating hospitals") are dispatched by the

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/proby_manual.shtml.

[48] ref, and for further information, see [Internet] http://www.nyc.gov/html/911reporting/html/anatomy/call.shtml, and as otherwise indicated.

[49] such a facility / operation is also referred to as a Public Safety Answering Point (PSAP), as further described in [Internet] http://www.nena.org/

[50] ref, and for further information, see [Internet] http://www.nyc.gov/html/911reporting/html/home/home.shtml

[51] ref, and for further information, see [Internet] http://www.nyc.gov/html/nypd/html/home/home.shtml

[52] the City of New York noted to the investigation "This agency may have been operating at the time of the incident but is no longer an active agency."

[53] ref, and for further information, see [Internet] http://www.nyc.gov/html/fdny/html/community/ems_ overview _042607.shtml, and as otherwise indicated.

911 System. Mutual aid ambulances are not dispatched by the 911 System. Additional EMS / ambulance services are operated by a number of private ambulance service operators, which are principally based out of a number of privately operated hospitals located in New York City.

3.3.1 Background [54]

The FDNY Bureau of EMS is comprised of about 3,600 Emergency Medical Technicians (EMT's), Paramedics and EMS Officers, which operate about 234 apparatus [55] in the mornings and evenings and about 146 apparatus overnight, which are stationed in 34 EMS [fire] stations within the City of New York. In 2013, FDNY / EMS units responded to about 1.31 million "Total EMS Incidents, which included 218,779 "Medical Emergency Incidents (Fire)" [response actions].

3.3.2 Preparedness Plans / Measures

The FDNY Bureau of EMS utilizes a preparedness response plan, titled the "All Hazards Emergency Operations Plan", as compiled by the City of New York - Office of Emergency Management (see § 3.4.2, for further information). The FDNY Bureau of EMS has customized plans for different events and circumstances, additional data of which is available from the agency. [56]

3.3.3 Pipeline Operations Familiarization Training / Drill Exercises Conducted Prior to the Accident

Con Edison provided documentation to the Investigation that identified, in the year preceding the accident, Con Edison had conducted at least 38 formal training activities and/or drill exercises with various emergency services agencies of the City of New York ~~(i.e., FDNY, NYPD, OEM, etc.),~~ which were specific to gas pipeline operations familiarization (see § 3.6.3, for further information).

3.4 Jurisdictional Emergency Management Agency - OEM [57]

The City of New York maintains the New York City Office of Emergency Management (OEM), which responded personnel and resources to the accident scene. This agency is a Department of the City of New York, and is located in the in the Borough of Brooklyn.

3.4.1 Background

According to the agency's Mission Statement,

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[54] ref FDNY Annual Report 2012-2013; see [Internet] http://www.nyc.gov/html/fdny/html/publications/index.shtml
[55] ambulances, or medical response-related vehicles
[56] for further information, see [Internet] http://www.nyc.gov/html/fdny/html/community/ems_ overview _042607.shtml, and as otherwise indicated.
[57] ref, and for further information, see [Internet] http://www.nyc.gov/html/oem/html/home/home.shtml, and as otherwise indicated.

> "Established in 1996, the New York City Office of Emergency Management (OEM) plans and prepares for emergencies, educates the public about preparedness, coordinates emergency response and recovery, and collects and disseminates emergency information. To accomplish this mission, OEM maintains a disciplined unit of emergency management personnel, including responders, planners, watch commanders, and administrative and support staff, to identify and respond to various hazards." [58]

The OEM oversees emergency preparedness and provides emergency response management and logistics support in the event of natural hazards / weather severity, environmental hazards emergency [chemical / nuclear], [major] transportation accident, [widespread] utility service failure, acts of terrorism, [major] public health or epidemic hazards, or special events. The OEM also has the responsibility of compiling and maintaining a formal / documented emergency preparedness and response action plan (as described below), and is a resource available to provide on-scene, or off-scene, logistics and technical resources support in the event of a civil emergency or mass casualty incident.

Asset resources of the OEMHS include, for example:

- an Emergency Operations Center (EOC), which is a fixed-base, self-functioning, secure facility that is available for immediate, dedicated use by the City of New York emergency services agencies in an emergency event.
- multiple mobile Command Vehicles, which are available for exigent dispatch to the scene of an emergency event.

3.4.2 Preparedness Plans / Measures [59]

As a preparedness mechanism for use by all emergency services agencies of City of New York, and local industrial / transportation entities, the City of New York OEM, compiled and employs a document titled "All Hazards Emergency Operations Plan (EOP)". The EOP is a document that serves to support the integration of emergency management, health, and medical systems into a coordinated response to mass casualty incidents caused by any hazard. The OEM also maintains other 'hazard-specific' preparedness plans and programs (e.g., Natural Hazards Plans, Man-Made Hazards Plans, and a Continuity of Operations Program). The OEM also participates in the Regional Catastrophic Planning Team (to coordinate emergency response, mitigation, and recovery efforts involving select jurisdictions of NJ, CT, and PA).

In addition to, and supportive to the above EOP, the OEM compiled and employed a document titled "2009 Final Hazard Mitigation Plan" [60], which is a document that addresses the hazards mitigation phase of the emergency management process. [61]

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[58] ref, and for further information, see [Internet] http://www.nyc.gov/html/oem/html/about/about.shtml
[59] ref, and for further information, see [Internet] http://www.nyc.gov/html/oem/html/planning_response/planning.shtml
[60] the current revision of the Hazard Mitigation Plan is dated April 2014, as "approved" subsequent to the accident.
[61] see, for further information, [Internet] http://www.nyc.gov/html/oem/html/planning_response/planning_hazard_mitigation_2014.shtml

Review of the OEM EOP indicates that it contains procedures (referred to as a "Hazard Specific Annex") for addressing emergency events involving severe weather, large scale fires, mass transportation accidents (principally highway-related), disease (epidemic) and biological threats, hazardous materials (release), utility disruptions, earthquakes, among other specific hazards. The OEM EOP hazard specific Annex for addressing "utility disruptions" contains a segment that addresses "Gas Supply Disruptions", wherein it references measures to address a "natural gas leak".[62]

3.4.3 Pipeline Operations Familiarization Training / Drill Exercises Conducted Prior to the Accident

Con Edison provided documentation to the Investigation that identified, in the year preceding the accident, Con Edison had conducted at least 38 formal training activities and/or drill exercises with various emergency services agencies of the City of New York which were specific to gas pipeline operations familiarization (see § 3.6.3 for further information).

Also, a statement of the City of New York OEM indicated "With the help of local, state, and federal partners, OEM conducts citywide preparedness exercises. These drills test plans, reinforce response and management techniques, identify areas for improvement, and promote better interagency coordination. In addition, OEM's Training unit develops classroom and online courses and other resources for OEM employees and local partners to improve the City's capability to effectively respond to emergencies." [63]

3.5 Jurisdictional Law Enforcement (Police) - NYPD [64]

The City of New York Police Department, which is also referred to as the New York City Police Department (NYPD), is the primary law enforcement agency responsible for responding to criminal activity complaints, civil disorder, or other law enforcement-relevant emergency events in the City of New York. The NYPD responded personnel resources to the accident scene, which included support of NYPD Housing Authority Police, Traffic Enforcement, and the NYPD Auxiliary Police.

3.5.1 Background

According to the agency's Mission Statement,

> "The MISSION of the New York City Police Department is to enhance the quality of life in our City by working in partnership with the community and in accordance with constitutional rights to enforce the laws, preserve the peace, reduce fear, and provide for a safe environment". [65]

[62] ref, and for further information, see [Internet] http://www.nyc.gov/html/oem/html/hazards/utilities_gas.shtml
[63] ref, and for further information, see [Internet] http://www.nyc.gov/html/oem/html/hazards/utilities_gas.shtml
[64] ref, and for further information, see [Internet] http://www.nyc.gov/html/nypd/html/home/home.shtml, and as otherwise indicated.
[65] ref, and for further information, see [Internet] http://www.nyc.gov/html/nypd/html/administration/mission.shtml

The NYPD is principally [66] a fully-paid law enforcement agency, which is comprised of about 34,500 uniformed police officers, and operates out of 77 precinct stations.[67]

3.5.2 Preparedness / Response Execution Plans

The NYPD utilizes a preparedness response plan, titled the "All Hazards Emergency Operations Plan", as compiled by the City of New York - Office of Emergency Management (see § 3.4.2 for further information).

3.5.3 Pipeline Operations Familiarization Training / Drill Exercises Conducted Prior to the Accident

Con Edison provided documentation to the Investigation that identified, in the year preceding the accident, Con Edison had conducted at least 38 formal training activities and/or drill exercises with various emergency services agencies of the City of New York which were specific to gas pipeline operations familiarization (see § 3.6.3, for further information).

3.6 Pipeline Owner / Operator – Con Edison

3.6.1 Resources of Con Edison to Address a Gas Leak and Other Gas Safety Issues

Con Edison resources used to address a natural gas leak (or an electrical power, or a live-steam safety issue, as well), or some other adverse event or action involving natural gas include the following functional departments, operational procedures, and resources of the company.

Generally described, at the time of the accident, as a procedure established by Con Edison, it was recommended that individuals (customers and members of the public) who identified natural gas leaks within Con Edison's gas service territory, should place a notification telephone call to the Con Edison Customer Service Call Center [68], as further described below.

a. Customer Service Call Center

Con Edison maintained a "Customer Service Call Center" [69], which is staffed by trained personnel, which are referred to as Customer Service Representatives (CSRs), to receive and process various inquiries and requests, including notifications by telephone of a natural gas leak from the public (i.e., a gas service customer, or other individuals) who are within the Con Edison gas service territory. Customer calls regarding gas leaks are generally routed (via automated telephone prompt) to the Gas Skills Group, which is comprised of trained CSRs who handle incoming gas emergency calls on an around-the-clock basis (i.e., 24 hours-a-day/7 days-a-

[66] uniformed officers of the NYPD Auxiliary Police (totaling about 4,500 personnel) are voluntary, see [Internet] http://www.nyc.gov/html/nypd/html/careers/auxiliary_police.shtml
[67] ref, and for further information, see [Internet] http://www.nyc.gov/html/nypd/html/faq/faq_police.shtml
[68] ref, and for further information, see [Internet] http://www.coned.com/customercentral/contactus.asp#gas
[69] having a listed telephone number of 1-800-752-6633, which the company also publicizes as "1-800-75-CONED".

week/365 days-a-year). The customer call from 1652 Park Avenue (see § 1.2.4, for further information) on the day of the accident was handled by a CSR in the Gas Skills Group. CSR personnel of the Customer Service Call Center also receive and process customer billing questions and related actions, gas service initiation requests (turning-on gas service [flow] for a new customer) and gas service termination requests (turning-off gas service of an existing customer), and other business activities of the company.

When CSRs receive gas leak calls, they obtain from the caller the site address, specific location of the odor (inside or outside a building), magnitude of the odor (e.g., strong, weak or other), and the contact information of the person making the report. This information is contemporaneously typed into the Call Center Computer System by the CSR. The gas leak report [data] is then electronically conveyed to the Gas Emergency Response Center (GERC) computer system for further responsive action (see § 3.6.1.b, for further information). The CSR then initiates [places] a follow-up telephone call to the GERC to verify that the gas leak report [data] has been correctly received.

The action of a CSR who receives a notification by telephone of a "gas leak and enters the information into the computer system, is referred to [internally, using Con Edison terminology] as initiating a "call ticket" (which is also referred to as an "emergency ticket"). To further define this activity, if the caller identified to the CSR that the odor of gas originated *inside* a building then it would be referred to as an "inside call ticket", and conversely, if the odor of gas originated *outside* a building then it would be referred to as an "outside call ticket".

Also, as characterized by Con Edison,

> "In circumstances in which the Customer Service Call Center computer system is unavailable for extended periods of time (e.g., prolonged outages due to planned computer system maintenance, hardware problems, functionality issues, etc.), and CSRs are unable to process tickets electronically, the CSRs follow an established procedure, as a 'back-up process', where they utilize printed forms or notepads to manually record the information, which is then relayed verbally (via phone) to the GERC for responsive action." [70]

Additional information on the above aspects of the investigation is provided in a transcript of an NTSB interview as conducted with the CSR that received the notification by telephone of a gas odor that occurred near the accident site, a copy of which is available in the NTSB public docket.

b. Gas Emergency Response Center

Con Edison maintains a facility, referred to as the Gas Emergency Response Center (GERC), which is staffed by trained personnel, which are referred to as "Trouble Shooter / Dispatchers" (TS/Ds), which receives the information [data] of a notification by telephone of a natural gas leak, as initially received by the Customer Service Call Center, or as reported to Con Edison by a local emergency services agency (e.g., FDNY, NYPD). The GERC also subsequently handles the dispatch / coordination of " GDS Gas Service Mechanics" (see § 3.6.1.c, for further

[70] ref, email from Con Edison - Party to the investigation representative, dated 12/09/2014 3:23 PM

information), and other personnel as might be needed, who are situated at various locations within the Con Edison gas service territory, and who are sent to investigate and address reported natural gas leaks.

As a functional description of the GERC operations, as described in the Gas Operations Emergency Response Plan (see § 3.6.2, for further information) [71],

- The Gas Emergency Response Center (GERC) is responsible for the safe and reliable operation of the company's gas distribution system. Activities include dispatching and directing gas crews in response to gas odor complaints and other gas system problems, and monitoring excavation activities in the vicinity of gas transmission mains and identifying/initiating contingency plans. The GERC coordinates emergency response efforts associated with incidents on the gas distribution system and implements the incident command system. GERC is responsible for notifying and receiving information from appropriate federal, state, or local agencies, including first responders, regarding gas distribution system status. The GERC maintains the Emergency Contact and Notification list for Gas Operations and first responders. The Gas Operations Situation Room may be located at the GERC during Serious or greater level Incidents. The GERC receives notifications of incoming calls from the public to the Call Center. The Call Center follows an approved protocol for fielding the calls and providing safety information while determining the nature of the incoming call. The Call Center is capable of handling up to 30,000 calls per hour, and,
- The GERC will initiate a multiple resource response event ([which the company refers to as a] Code MuRRE) for events that require an escalated leak response. The response includes assistance from additional company resources and the local fire department as outlined in Gas Specification G-11845, "Gas Emergency Liaison, Training and Response with External Public Safety Agencies."

Procedurally, as a generalized description, the received gas leak report [data], as electronically conveyed from the Customer Service Call Center computer system, is displayed on the GERC computer system (display monitors). As occurred with the Customer Service Call Center CSR personnel (as identified in the investigation), Con Edison procedure prescribed that the CSR contact (place a call to) TS/D personnel at the GERC to help assure that the gas leak report [data] had been correctly received.

The TS/D at the GERC contacts the closest available GDS Mechanic via radio, describes the gas leak report, and instructs the GDS Mechanic to proceed to the location. The TS/D receives voice confirmation from the GDS Mechanic (by company service radio). Con Edison procedure prescribed that it is the GDS Mechanic who is situated the closest to the gas leak report site that should be dispatched to that gas leak report site (i.e., the shortest distance, given prevailing local traffic or other travel considerations). As facilitation of this, the Con Edison field service vehicles that are assigned to GDS Mechanics have a GPS-based telemetry system [72] that allows

[71] ref "Gas Operations Emergency Response Plan EMP-200", as cited in a copy provided to the investigation; see also [Internet] http://www.documents.dps.ny.gov/public/Common/ViewDoc.aspx? DocRefIdF576BC55-96C7-4AA8-A8FA-5C2A9D8177D2

[72] ref, "Global Positioning System, is a U.S.-owned utility that provides users with positioning, navigation, and timing (PNT) services …", to which, using satellite transmission radio signals and [in this application] ground-based transmitting / receiving devices, the physical location of a specific transmitting / receiving device can be identified

the physical location of the service vehicle to be instantly identified to the GERC, for the purpose of supporting the identification of appropriate GDS Mechanics who might be located closest to the site of the gas leak report. The TS/D then electronically dispatches the gas leak report [data] to a computer system (display monitor) in the GDS Mechanic's vehicle.

In circumstances in which the GERC computer system is unavailable, as a 'back-up process', the GERC TS/D staff utilize printed forms to manually record the information, which is then verbally relayed via radio to the closest GDS Mechanic (in their Con Edison field service vehicles) who is assigned to respond.

Additional information on the above aspects of the investigation is provided in a transcript of an NTSB interview as conducted with Con Edison's GERC Operations Manager, a copy of which is available in the NTSB public docket.

c. Gas Distribution Services Mechanics

Con Edison utilizes trained personnel, referred to as "Gas Distribution Services Mechanics (GDS Mechanics), or 'gas mechanics', as a resource to respond to natural gas leak reports and other gas emergencies in the Con Edison gas service territory. GDS Mechanics normally address routine mechanical services of Con Edison's gas operations, such as a 'service initiation' (turning-on gas service for a new customer), a 'service termination' (turning-off gas service of an existing customer), "safety checks" involving gas meter and related piping inspection, among other duties. GDS personnel are assigned to, and also drive GDS vehicles [service van] outfitted with appropriate equipment (i.e., tools and supplies) to address routine mechanical service activities of Con Edison's gas service territory, as well as to address gas emergencies as might be identified to the GDS Mechanic. GDS Mechanics are equipped and trained to address both an "Inside Gas Leak" and an "Outside Gas Leak", as might be needed during a natural gas leak report and other unintentional gas release emergencies.

In the event that a report of a natural gas leak is identified to the GDS Mechanic (see § 3.6.1.b, for further information), as depicted in the computer system (display monitor) that is fitted to the driver's cab of the GDS Mechanic's field service vehicle, Con Edison procedure prescribed that the GDS Mechanic is to immediately and directly respond to the location of the gas leak report. The GDS manually records (writes down) the gas leak report information (e.g., ticket number, location, time of arrival, time the job is completed, and may include remarks) that's received from the display monitor into a "doc sheet" [73] as a procedural element [of the response routine] for timekeeping purposes. Con Edison procedure also prescribed that TS/D personnel are required to dialog (via company service radio) with the GDS Mechanic upon being notified of a gas leak, to help assure that the gas leak dispatch information had been correctly received, and that the GDS Mechanic is enroute to the designated report site.

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by its global longitudinal / latitudinal coordinates (to a relatively precise degree of accuracy) and reported to an inquiring entity [i.e., Con Edison, in this context], as described in, and see also [Internet] http://www.gps.gov/

[73] as described in interview testimony by the Con Edison GDS Mechanic that responded to the accident site, in which background research identified that 'field technicians' sometimes informally refer to this as a 'dispatch log', which is recorded as a personal notation of the destination address.

3.6.2 Emergency Preparedness and Response - Plans / Measures

Supportive to the Customer Service Call Center and GERC / Gas Mechanic operations, Con Edison has developed and maintains preparedness plan and technical specification documentation as follows (copies of which were obtained by the investigation).

Plan / Specification Identification Ref.	Title	Revision Date
EMP-200	Gas Operations Emergency Response Plan	Feb. 2014
CI-490-2	Customer Care Emergency Response Plan	Dec. 2011
G-11809-28b	Procedure for Outside Gas Leak Reporting, Classification, Surveillance, Repair and Repair Follow-Up Inspection	Aug. 2010
G-11837-25	Investigation of an Inside Gas Leak or Odor Call and Issuance of a Warning Tag	Jan. 2014
G-11845-5	Gas Emergency Liaison, Training and Response with External Public Safety Agencies	Oct. 2012
G-11848-1	Emergency Communication	Oct. 2013
G-11850-14	Reporting Natural Gas Incidents, Evacuations, Major Service Interruptions, Exceeded MAOP, and Carbon Monoxide Incidents	Dec. 2013
G-11851-3	Reporting of Unscheduled Interruptions of Gas Services	Feb. 2013
G-11876-0	Dispatching Emergency and Non-Emergency Work by the Gas Emergency Response Center	Mar. 2011

3.6.3 Gas Pipeline Operations Familiarization Training / Drill Exercises Conducted Prior to the Accident

The Investigation identified that, in the year preceding the accident, Con Edison provided documentation to the investigation describing that:

- Con Edison had conducted at least 38 formal training activities and/or drill exercises with various emergency services agencies of the City of New York-which were specific to gas pipeline operations familiarization / addressing gas emergencies [74], and
- at least one (internal) "Unannounced Communications Drill" activity was conducted [on 10/27/2013] of its Gas Emergency Response Center ("GERC"), involving a "test of the ICON radio operability in both the GERC as well as the field forces in all regions" [as cited in the above described documentation].

[74] ref, email from the Con Edison SF Group participant, dated 12/03/2014, containing updated data on spreadsheet documentation titled "Con Edison - Log of Gas Emergency Response Training and Drills Conducted with Emergency Officials" for the years 2013 and 2014, in which the specific cited training was individually identified.

3.6.4 Specialized Emergency Response Protocol Documentation Distributed to Local Emergency Services Agencies

As described to the investigation by Con Edison[75]:

> In partnership with the FDNY, Con Edison produced an instructional video (DVD) entitled "1040 Code 1," which explains gas leak response procedures and the Code MuRRE process. It is Con Edison's understanding that this instructional video has been distributed internally by the FDNY. Con Edison has also provided copies of this instructional video to the NYPD, Westchester County Department of Emergency Services (WCDES), and local Westchester fire departments. Local Westchester fire departments, including the Edgewater Park Volunteer FD, City of Yonkers FD, and the Mt. Vernon PD, have also received natural gas "scratch-and-sniff" cards to augment the instructional video. Con Edison has also conducted in-person Gas Hazard Awareness training sessions with municipal fire departments. Con Edison has also provided several hundred manhole hooks and curb valve keys to the FDNY. Additional information is also provided in § 6.9 in the Public Awareness Program Factual Report.

3.6.5 Gas Flow Control Devices on the Low Pressure Distribution System [76]

Con Edison historically installed main valves throughout its high pressure distribution system, and installed such valves on its low pressure system on a limited basis. These valves allow segments of the gas system to be isolated during scheduled maintenance and repair activities. Beginning in 2001, Con Edison initiated a program to install main isolation valves on its low pressure distribution system during installation of new and/or replacement gas mains. Con Edison is continuing to install main isolation valves on its low pressure distribution system and currently installs more than 1,000 of these valves per year on average. To date, more than 16,250 main isolation valves have been installed on Con Edison's low pressure distribution system.

In addition to main isolation valves, Con Edison utilizes other methods to isolate segments of its low pressure distribution system, when required. These include use of curb valves installed on individual gas service lines, "squeeze off" tools that can compress certain types of plastic and steel pipe to stop the flow of gas, and excavation at specific locations to allow for the insertion of stoppers."

4.0 Con Edison Activities Immediately Preceding the Explosion, and Supplementary Relevant Supportive Information

[75] ref, email from the Con Edison - Party to the investigation spokesperson, dated 10/20/2014, containing Con Edison's comments on the Survival Factors (Emergency Response) Draft Factual Report.

[76] ref, email from the Con Edison SF Group participant, dated 12/03/2014, containing Con Edison's observations, quoted essentially verbatim, to address the discussion-point of Con Edison's ability to stop the flow of natural gas in its pipeline(s) in situations when access to a curb valve is not available (as occurred in this accident).

4.1 Con Edison Activities Immediately Preceding the Explosion

Activities involving Con Edison, as occurred between when a call was received by the Customer Service Call Center to report an odor of gas at 1652 Park Avenue (at 09:06:23), and when the explosion occurred at two structures located at 1644 and 1646 Park Avenue (at 09:30:41) on the day of the accident (March 12), are described in the Event Chronology ("Timeline") narrative, as provided in Exhibit 1 of this report (see § 5.1 for further information).

4.2 Supplementary Relevant Supportive Information

The investigation identified that, on March 12, 2014, the CSR who received the gas odor call from the 1652 Park Avenue address, experienced a functionality issue (i.e., a computer system "freeze-up", as described by the CSR in interview testimony) and was unable to enter (type-in) the gas leak report [data] into the Call Center Computer System. As explained by Con Edison, "the "freeze-up" experienced by the CSR was caused by a buildup of transactions (data requests) that temporarily slowed the system down and did not require any restarts or resets, or result in the loss of any data". [77]

Additional information on this aspect of the investigation is provided in a transcript of an NTSB interview as conducted with the CSR that received the notification by telephone of a gas odor that occurred near the accident site, a copy of which is available in the NTSB public docket.

Con Edison further identified to the investigation that:

- the transient communications issue experienced [by the CSR] on March 12th was not of sufficient duration to trigger the contingency plan (i.e., use of printed forms or notepads)" [78], as described in § 3.6.1.a, of this report, and

- based on historical data of the company [79]:
  - 10 other computer system "freeze-up" events (i.e., which are, as characterized by Con Edison, "transient communications issues" that occur between the application and data storage environments) were reported to have occurred with the Customer Service Call Center computer system between January and April 2014, inclusive, in which, to monitor and remedy the issue, as characterized by Con Edison, "[Con Edison maintains a data] storage environment [that] processes over 36 million data requests every business hour" [80], and "[m]ultiple system performance measures were implemented by Con

[77] ref, email from Con Edison - Party to the investigation representative, dated 12/09/2014 3:23 PM
[78] ref, email from Con Edison - Party to the investigation representative, dated 12/09/2014 3:23 PM
[79] ref, email from Con Edison - Party to the investigation representative, dated 8/20/2014 10:23 AM
[80] Con Edison's computer storage environment (shared by systems, such as Human Resources Payroll, Financial, etc.) is monitored by a product called EMC Analyzer, which continuously records throughput and response time of storage requests.

Edison from January through April 2014, and there has been no recurrence of these "transient communications issues" since then.[81] ", and

- for the 13-month time interval between March, 2013 and March, 2014, the average duration of a "gas emergency" notification by telephone (i.e., a natural gas leak), as received by the Customer Service Call Center, was 159.5 seconds (i.e., ~ 2 minutes 40 seconds).

5.0 The Emergency Response

5.1 Event Chronology ("Timeline")

An event chronology ("Timeline") was constructed to identify the sequencing facts of the emergency response to the event, and to examine the execution of the emergency response effort (e.g., fire suppression / search and rescue). In support of this, the natural gas utility company involved (Con Edison), and the principal responding emergency services agencies (FDNY, NYPD) were requested to provide incident response data and communications information (relevant to this event). NTSB staff also conducted individual formal interviews of gas utility company employees (and other witnesses to the event), and initiated investigation dialog with key personnel of the emergency services agencies and the natural gas utility involved, to identify the facts as cited in the Timeline narrative.

The Event Chronology ("Timeline") narrative compiled during the investigation is presented in Exhibit 1.

5.2 Notifications of the Event / Dispatch of Initial Resources [82]

Supportive to the following, data of the investigation identified that an explosion occurred at 09:30:41 a.m., at the two structures located at 1644 and 1646 Park Avenue, in Manhattan (see § 2.5 for further information).

5.2.1 Emergency Services - 911 Call Processing / Dispatch Services

At 09:31:17 a.m., the New York City 911 Communication Center received an initial notification call of the event from what appeared to be a witness located proximate to the accident site; data of the call was immediately forwarded to the FDNY / Manhattan Fire Dispatcher System (Manhattan FDS), and the NYPD.

5.2.2 Jurisdictional (Local) Fire / Rescue – FDNY

At 09:31:48 a.m., the FDNY / Manhattan FDS was notified by the 911 Communication Center of the explosion, which initiated a process of a dispatch of fire department resources to the site, as

[81] The performance measures implemented by Con Edison included moving data from higher utilized storage units to other lower utilized storage units; capping growth on storage pools; and tuning to optimize storage cache effectiveness.

[82] ref, agency notifications data as cited in FDNY Incident Report, incident # 1-0180-0, [dated] 08/18/2014.

further described. Initially, FDNY Engine Company 58 (E-58) and Ladder Company 26 (L-26) units, along with Battalion Chief 12 (BC12), were dispatched to the scene, which were followed by the dispatch of additional units.

Supplemental to the above, at 09:30 a.m., firefighters of the FDNY fire station located at 1367 - 5th Avenue and 113th St., in East Harlem, which houses E-58 and L-26, heard a loud explosion and observed a plume of smoke that appeared in the direction of East 114th Street and Park Avenue, upon which a verbal alarm was transmitted to the Manhattan FDS. As the two Companies were departing the fire station / enroute to the scene to investigate what had occurred, Manhattan FDS was receiving the initial calls reporting an explosion and structural fire at East 118th Street and Park Avenue. Both responding FDNY Companies then received a notification from Manhattan Fire Dispatch to respond to the reported scene, which was actually located on Park Avenue between East 116th Street and East 117th Street.

5.2.3 Emergency Medical Services (EMS) / Ambulance

As EMS is a function of FDNY operations, EMS received notification of the event (i.e., a request to response) approximately simultaneous to the FDNY (see § 5.2.2 for further information).

5.2.4 Law Enforcement (Police) – NYPD

At 09:31:48 a.m., the NYPD was notified by the 911 Communication Center of the explosion, which initiated a process of a dispatch of law enforcement resources to the scene.

5.3 Execution of the Emergency Response

5.3.1 Jurisdictional (Local) Fire / Rescue – FDNY [83]

Activities involving the FDNY, as occurred on the day of the accident, between when a call was received by the Con Edison Customer Service Call Center to report an odor of gas at 1652 Park Avenue, and when the explosion occurred at two structures located at 1644 and 1646 Park Avenue, as well as FDNY activities that occurred subsequent to the explosion, are described in the Event Chronology narrative, as provided in Exhibit 1 of this report (see § 5.1 for further information).

Supplemental to the above:

- On the first day of the response to the accident, FDNY responded 45 Engine Companies, 37 Ladder Companies, and 15 Battalion Chiefs, which all totaled, comprised several hundred FDNY personnel.

- The FDNY initially responding command officer at the scene (BC12) compiled a detailed report, titled “Fire Department New York Incident Report”, which described FDNY operations in the event, a copy of which is provided in Exhibit 2.

[83] ref, agency response data as cited in FDNY Incident Report, incident # 1-0180-0, [dated] 08/18/2014, and as otherwise noted.

5.3.2 Emergency Medical Services (EMS) / Ambulance

FDNY/ EMS activities that occurred in response to the accident are described in the Event Chronology narrative, as provided in Exhibit 1 of this report (see also § 5.1 for further information).

5.3.3 Jurisdictional Emergency Management Agency

City of New York / Office of Emergency Management activities that occurred in response to the accident are described in the Event Chronology ("Timeline") narrative, as provided in Exhibit 1 of this report (see also § 5.1 for further information).

5.3.4 Law Enforcement (Police) – NYPD [84]

NYPD activities that occurred in response to the accident are described in the Event Chronology ("Timeline") narrative, as provided in Exhibit 1 of this report (see also § 5.1 for further information).

Supplemental to the above:

- Investigation documentation compiled by NYPD included Informational Reports [of the Investigation] [85] that described injuries sustained by individuals of various structures at the scene, "911 callers", local residents displaced by the explosion, as well as eye-witnesses by-standers who witnessed the event, and evidence recovered at the scene.

- Briefly summarized, on the first day of the response to the event (March 12), NYPD responded what was estimated to be at least 100 patrol officers to the accident scene, to provide evacuation support, site security, and traffic control. NYPD officers further responded to the site on the subsequent days as a continuation of the site security and traffic control support, although the daily personnel counts were substantially less than that of the first day of the response. [86]

- NYPD additionally responded 50-60 detectives, 15 sergeants, 10 lieutenants, and three Captains to address investigational aspects of the event. Resources of the NYPD Arson and explosion Division also responded to the event. NYPD detectives also conducted documented interviews of aided individuals and other witnesses to the event. [87]

5.3.5 Pipeline Owner / Operator – Con Edison

[84] ref, FDNY Chronology Log of Significant Events [report]
[85] ref, NYPD, Command 25th Precinct, Complaint Number 2014-025-01628, Case Number 2014-43, of various report dates.
[86] ref informal debriefing discussions conducted by NTSB with principal(s) of the noted agency / organization (during the on-scene phase of the investigation).
[87] ref NYPD document received (and reviewed by the SF Group Chairperson, during the on-scene phase of the investigation) titled "March 12 Building Explosion, NYPD Preliminary Time Line".

Activities involving Con Edison, as occurred subsequent to the explosion at two structures located at 1644 and 1646 Park Avenue on the day of the accident, are described in the Event Chronology narrative, as provided in Exhibit 1 of this report (see also § 5.1 for further information).

5.4 Medical Facilities Utilized in the Response to the Accident

Medical facilities that received patients transported from the accident site, all of which were located in the Borough of Manhattan, are listed below.[88]

New York Presbyterian/Weill Cornell Medical Center

Mount Sinai St. Luke's Hospital

Harlem Hospital Center

Mount Sinai Hospital

Metropolitan Hospital Center

5.5 Post-Event Critique / Debriefing Reports of the Responding Emergency Services Agencies and Pipeline Owner / Operator

The FDNY initially responding command officer at the scene (BC12) compiled a detailed report describing FDNY operations in the event, a copy of which is provided in Exhibit 2.

The FDNY IMT compiled an Executive Summary report describing FDNY IMT operations in the event, a copy of which is provided in Exhibit 3.

Con Edison prepared a document [89] titled "Unique Challenges During the Response [to] the Incident", a copy of which is provided in Exhibit 4.

6.0 Medical and/or Pathology Data

6.1 Civilian Injuries / Fatalities

Based upon data of the investigation, relative to the injury criteria cited in 49 CFR 830.2: [90]

- 44 civilians sustained injuries that were characterized as "minor", in which the individuals were indicated in the documentation as "treated and released" by a local medical facility, where many of the injuries (21 of the 44) were described as attributable to "smoke

[88] ref data received from NTSB Transportation Disaster Assistance (TDA) staff, as sourced from the local emergency response agencies.
[89] submitted [as a supporting document to the SF Group Field Notes] during the on-scene phone of the investigation.
[90] i.e., the SF investigation utilizes summarized injury data as directly obtained from the injured individuals, or professional medical staff (of the local hospital), by the NTSB Transportation Disaster Assistance (TDA) staff during the course of the investigation, and data as identified in autopsy reports as issued by the local medical examiner [i.e., City of New York / Office of the Chief Medical Examiner (OCME)]

inhalation" or a similar condition, with the other injuries described to include minor pain, minor lacerations, and minor burn injury,

- two civilians sustained injuries that were characterized as "serious", in which the individuals were indicated in the documentation as "admitted" by a local medical facility,
- eight civilian individuals sustained fatal injuries, all of which were characterized as having been subjected to non-survivable "blunt impact" trauma, and/or "thermal exposure".

6.2 Emergency Responder / Response Support Contractor Injuries

6.2.1 Fire / Rescue

Two firefighters were identified as injured in the event; one was admitted to a hospital and one was treated at a hospital and released.

One employee of a contractor hired by the City of New York (performing debris excavation / removal [truck transport] from the site to a temporary holding area) sustained what was described as a minor injury.

6.2.2 Law Enforcement

Twelve police officers were identified as injured in the event; all were treated at a hospital and released.

6.3 Pipeline Owner / Operator Injuries

None identified.

6.4 Injury Criteria Tabulation – 49 CFR 830.2

From the data obtained in the investigation (ref § 6.1, et seq., of this report) [91], a tabulation was compiled, which is based on injury criteria of the International Civil Aviation Organization (ICAO), in which also the National Transportation Safety Board uses in accident reports for all transportation modes, as described under 49 CFR 830.2.[92] The data is compiled from the (TDA sourced) summarized injury description / medical examiner pathological data of persons who were reported as injured in this accident, which is summarized in the following table.

[91] ibid

[92] Title 49 CFR 830.2 defines a fatal injury as: any injury that results in death within 30 days of the accident. A serious injury as: an injury which requires hospitalization for more than 48 hours commencing within seven days from the date the injury was received; results in a fracture of any bone (except simple fractures of the fingers, toes, or nose); causes severe hemorrhages, nerve, muscle, or tendon damage; involves any internal organ; or involves second or third degree burns, or any burns affecting more than 5 percent of the body surface.

Injuries	Civilians	Emergency Responders / Support Contractor(s)	Pipeline Operator	Total
Fatal	8	0	0	8
Serious	2	0	0	2
Minor	44	15 (see note [93])	0	59
None	-- [94]	--	--	--
Total	54	15	0	69

7.0 Actions Implemented Subsequent to the Accident by Party to the Investigation Participants

An opportunity was afforded to the Party to the Investigation participants to provide relevant data on this investigative topic for summarization in this report section. Documented response(s) received are as follows.

7.1 Con Edison

The following was received from this Party to the Investigation.[95]

"Below are summary descriptions of new Con Edison initiatives.

- Fire Department Response Protocol Initiative:

  In April 2014, Con Edison began partnering with stakeholders from across the New York City-metro region, including the FDNY, WCDES, and NYC's 911 Call Center to advance a new initiative to leverage the existing 911 system. The overall goal of this initiative is to increase public safety by reducing response times and improving coordination among stakeholders.

  To date, the stakeholders have made significant progress on a new protocol for gas leaks initially called into 911. Under this protocol, beginning in December 2014, when gas leak calls are reported by the public through 911, the fire department would respond immediately and Con Edison would be notified of a potential gas leak by the fire department after they initially receive the call. Con Edison would dispatch appropriate personnel to assist in the emergency response and perform a leak investigation.

[93] no 'degree of injury' characterization was pursued for one individual in this category due to privacy considerations, which resulted in a brief hospitalization for 'precautionary' reasons (thus suggesting the injury was of a 'minor' character).
[94] data of this injury category cannot be quantified due to what's essentially an 'infinite population' of individuals that were proximate to the explosion site that were not injured in the event.
[95] ref, email from the Con Edison - Party to the investigation spokesperson, dated 10/20/2014 7:14 PM, containing Con Edison's comments (quoted verbatim) on the Survival Factors (Emergency Response) Draft Factual Report.

In New York City, the location of fire houses, coupled with the FDNY's ability to utilize lights and sirens to move quickly through traffic while responding to emergencies, enables them to arrive at gas leak locations typically within five to eight minutes of being dispatched. Upon arrival, fire department responders can provide valuable assistance in, for example, turning off gas services with guidance from the GERC and evacuating buildings. However, fire department emergency responders are not qualified under federal and state regulations to perform gas leak investigations, which Con Edison gas mechanics routinely perform. For this reason, Con Edison plays a critical role in the gas emergency response process and must be notified of potential leaks.

As an initial step, the stakeholders have developed: enhanced gas leak training and leak reporting protocols for FDNY personnel; standardized terminology used by Con Edison to communicate with FDNY; improved criteria to trigger FDNY response either prior to or after arrival of gas utility crews; and enhancements to the FDNY dispatch operations call center scripts. The stakeholders are continuing to work through the details of the new protocol.

Con Edison recognizes that, in some situations, people may prefer or find it easier to call 911.
However, the new protocol will not preclude members of the public from calling Con Edison directly to report gas leaks at 1-800-75-CONED.

- <u>New York City Department of Environmental Protection/Con Edison Infrastructure Replacement Program</u>

  Con Edison is collaborating with the New York City Department of Environmental Protection (NYCDEP) to develop a program to coordinate the replacement of gas and water mains. A primary objective of this program is to reduce public safety risks associated with aging infrastructure. This pilot program, which is currently in the planning stages, will improve coordination between Con Edison's gas main replacement jobs and NYCDEP's small capital water main replacement projects.

  Potential benefits from the program include:

- Minimizing public safety risk by replacing aging infrastructure;
- Reducing neighborhood disruption; and
- Lowering project costs for New York City and Con Edison.

  Con Edison and NYCDEP are currently working to identify pilot projects for joint infrastructure replacement that can be completed before the end of 2014.

- <u>Street Depression Notification Protocol:</u>

  Con Edison is working with the New York City Department of Transportation (NYCDOT) and the NYCDEP to evaluate the feasibility of implementing a notification and repair protocol to investigate and address street depressions. The primary objective of this initiative is to work with the City to investigate street depressions early, identify subsurface conditions, and prevent them from causing

incidents involving compromised infrastructure. Con Edison and the City envision a process through which each will be notified of significant street depressions that may be indicative of a serious underground condition. These notifications will provide early opportunities to assess potential impacts to utility infrastructure, determine the root cause of the problem, and correct the condition.

- Enhanced Leak Survey Program:

  In addition to Con Edison's annual distribution main surveys, it has developed a program to substantially increase the number of leakage surveys performed each year. Effective October 1, 2014, Con Edison implemented a program to conduct monthly "high speed" surveys of its entire gas system, thus increasing the frequency of annual distribution main surveys from once a year to thirteen times a year. See Con Edison Integrity Management Factual Notes, dated September 22, 2014 for more information on Con Edison's Leak Survey Program."

E. **Authorship**

Compiled by: // s // Date Dec. 18, 2014
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-- End of this Report Section --

List of Exhibits

1. Event Chronology ("Timeline")
2. Fire Department New York Incident Report
3. FDNY IMT Executive Summary, Park Avenue Collapse [report]
4. "Unique Challenges During the Response [to] the Incident" document of Con Edison