NATIONAL TRANSPORTATION SAFETY BOARD
Office of Railroad, Pipeline, and Hazardous Materials Investigations
Washington, D.C. 20594

Survival Factors

Group Chairman's Factual Report of the Investigation / Exhibits

– Emergency Preparedness / Emergency Response[1] –

Report Date: September 29, 2020

A. Accident

Location (accident reference):	Danville, Kentucky
NTSB Accident Number:	PLD19FR002
Physical Location:	Lincoln County, KY
Date:	August 1, 2019
Time (approximate):	1:23 a.m. EDT[2]
Accident site:	In an open field, about 1,680 feet northwest of the intersection of U.S. Route 127 and Camp Road, in Lincoln County, KY, which was also about 7 miles [direct distance] to the approximate south of the central business district of the City of Danville, KY

B. Synopsis of the Accident

See Survival Factors - Group Chairman's Factual Report.

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

[2] Eastern Daylight Time; all times cited herein are local time, unless otherwise noted.

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Exhibit 1. Annotated Segment of USGS Topographic (Survey) Map, Proximate to Accident Site [1, 2]

[1] Excerpt from United States Geological Survey (USGS) topographic survey map, [map ref] Junction City, KY, Quadrangle, [dated] 2019 (7.5 Minute Series, original scale 1:24,000) ; ref, and for further information, see [Internet] https://www.usgs.gov/.

[2] Annotation by NTSB (SF Group Chairperson) to describe approximate accident site location.

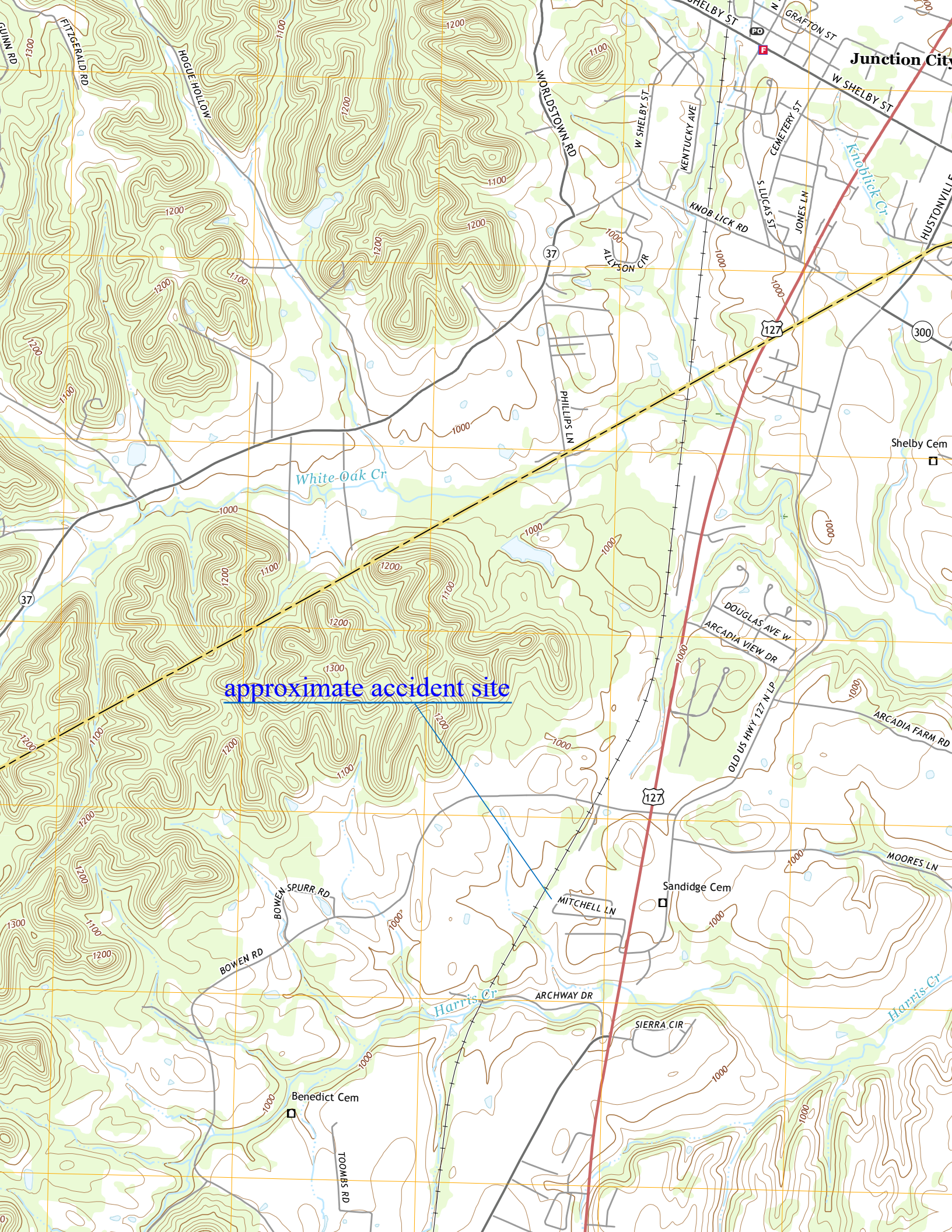

approximate accident site
Junction City
W SHELBY ST
GRAFTON ST
WORLDSTOWN RD
KENTUCKY AVE
CEMETERY ST
KNOB LICK RD
S LUCAS ST
JONES LN
HUSTONVILLE
Knoblick Cr
ALLYSON CIR
PHILLIPS LN
Shelby Cem
White Oak Cr
DOUGLAS AVE W
ARCADIA VIEW DR
OLD US HWY 127 N LP
ARCADIA FARM RD
MOORES LN
Sandidge Cem
MITCHELL LN
BOWEN SPURR RD
BOWEN RD
Harris Cr
ARCHWAY DR
SIERRA CIR
Benedict Cem
TOOMBS RD
FITZGERALD RD
HOGUE HOLLOW
GUINN RD
37
127
300
PO
F

Exhibit 2. Enbridge Line 15 Natural Gas Transmission Pipeline System Map

The map document illustrates the Enbridge / TETLP, 30" (diameter), Line 15, natural gas transmission pipeline system.

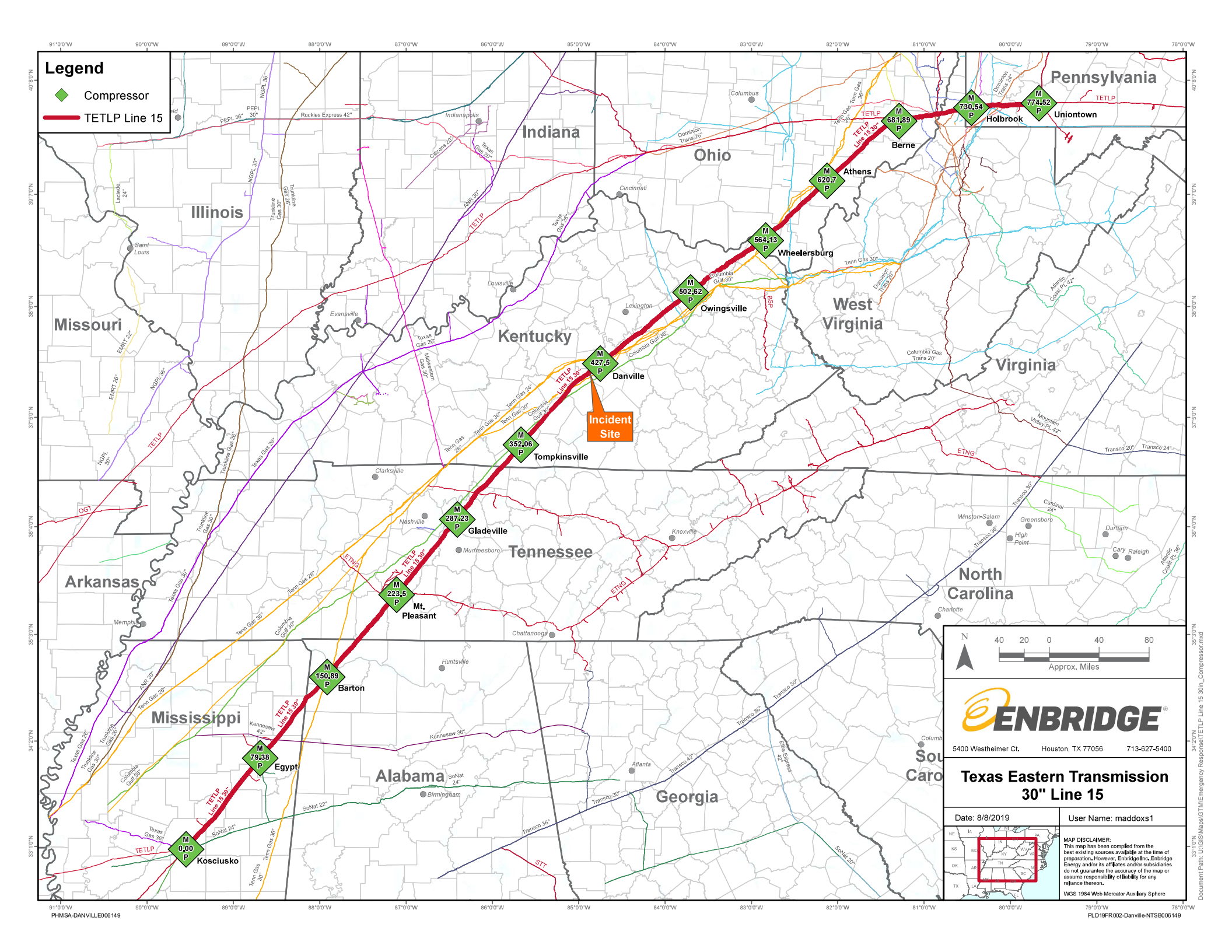
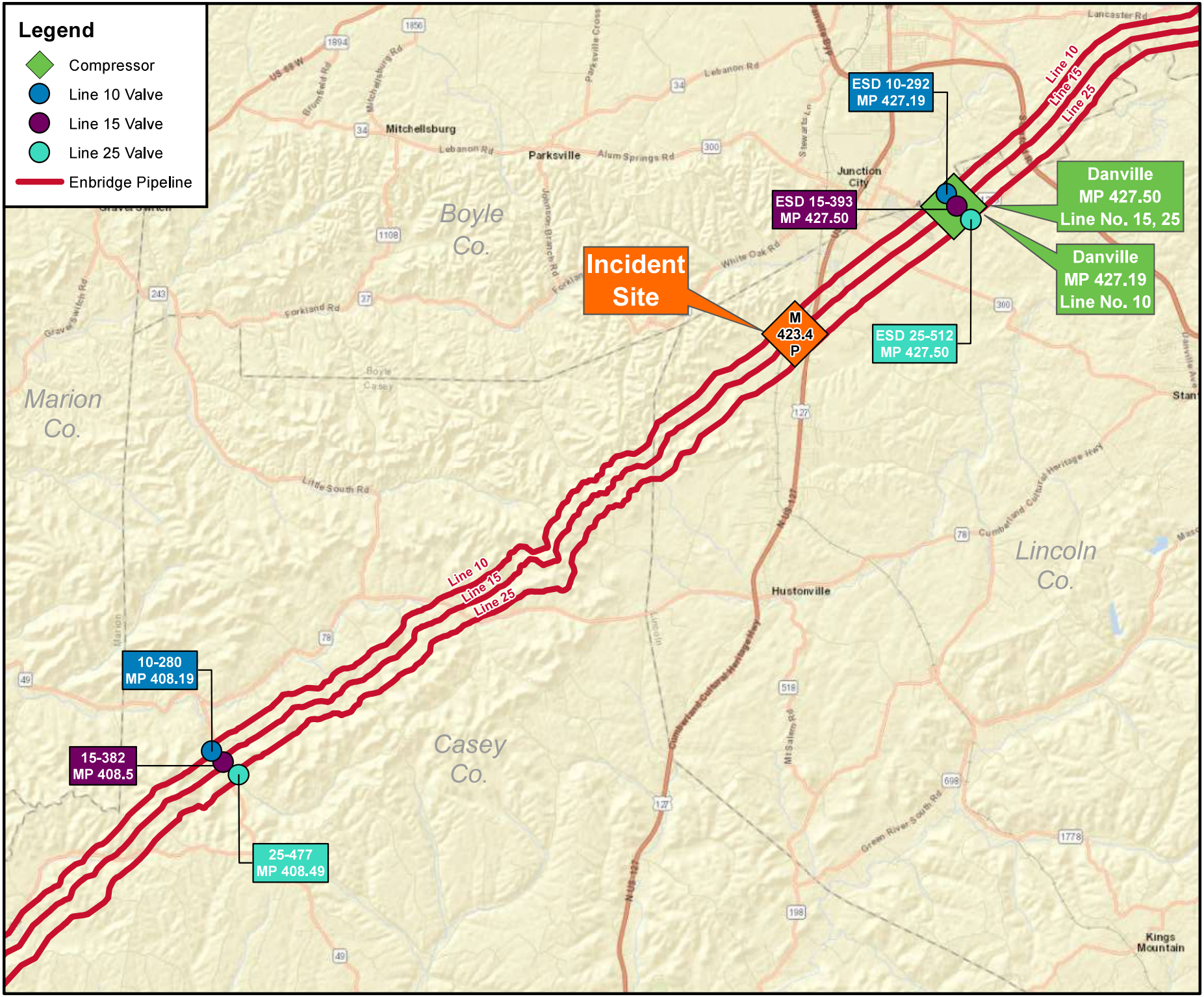
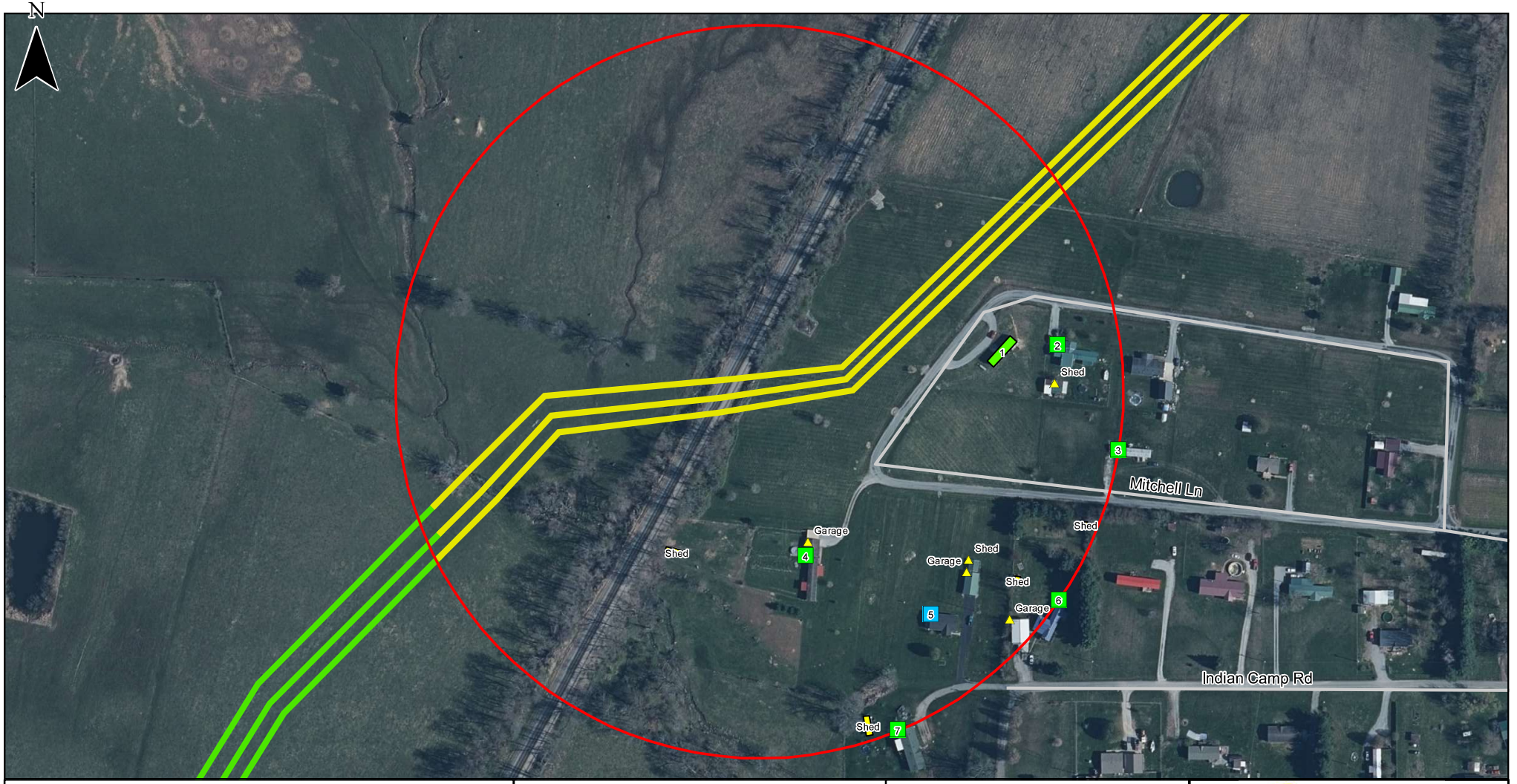

Legend
Compressor
TETLP Line 15
M 0.00 P Kosciusko
M 79.38 P Egypt
M 150.89 P Barton
M 223.5 P Mt. Pleasant
M 287.23 P Gladeville
M 352.06 P Tompkinsville
M 427.5 P Danville
Incident Site
M 502.62 P Owingsville
M 564.13 P Wheelersburg
M 620.7 P Athens
M 681.89 P Berne
M 730.54 P Holbrook
M 774.52 P Uniontown
Pennsylvania
Ohio
Indiana
Illinois
Missouri
Kentucky
West Virginia
Virginia
Tennessee
North Carolina
Arkansas
Mississippi
Alabama
Georgia
N
40 20 0 40 80
Approx. Miles
ENBRIDGE
5400 Westheimer Ct. Houston, TX 77056 713-627-5400
Texas Eastern Transmission
30" Line 15
Date: 8/8/2019
User Name: maddoxs1
MAP DISCLAIMER:
This map has been compiled from the best existing sources available at the time of preparation. However, Enbridge Inc., Enbridge Energy and/or its affiliates and/or subsidiaries do not guarantee the accuracy of the map or assume responsibility of liability for any reliance thereon.
WGS 1984 Web Mercator Auxiliary Sphere
PHMSA-DANVILLE006149
PLD19FR002-Danville-NTSB006149
Document Path: U:\GIS\Maps\GTM\Emergency Response\TETLP Line 15 30in_Compressor.mxd

Exhibit 3. Enbridge Map Documentation, Describing the Accident Site, and Other Aspects of the Line 15 Transmission Pipeline Prior to the Accident

The map document (i.e., the first illustration) describes the Line 15 transmission pipeline system, and the two adjacently located transmission pipeline systems (Line 10, and Line 25), in the area generally proximate to the accident site (i.e., to include the 'valve stations' that were situated on either side of the accident site), with the second illustration describing the area immediately proximate to the accident site.


Legend
Compressor
Line 10 Valve
Line 15 Valve
Line 25 Valve
Enbridge Pipeline
ESD 10-292
MP 427.19
ESD 15-393
MP 427.50
ESD 25-512
MP 427.50
Danville
MP 427.50
Line No. 15, 25
Danville
MP 427.19
Line No. 10
Incident
Site
M
423.4
P
10-280
MP 408.19
15-382
MP 408.5
25-477
MP 408.49
Line 10
Line 15
Line 25
Boyle
Co.
Marion
Co.
Casey
Co.
Lincoln
Co.
Mitchellsburg
Parksville
Junction
City
Hustonville
Kings
Mountain



Legend

Structures	Class
Non-DOT	Class 1
Single Family Dwelling	Class 2
Trailer	Class 3
	Class 4

ENBRIDGE

Scale = 1:2,000

PHMSA-DANVILLE003227

PLD19FR002-Danville-NTSB003227

Date: 8/4/2019

Exhibit 4. Pre-event Product Flow Conditions at the Enbridge Compressor Stations

The documentation includes volumetric flowrate data, as made available to the investigation by Enbridge, for the individual operational compressors that were located at the Danville Compressor Station (i.e., pages 2-4, inclusive), and the Tompkinsville Compressor Station (i.e., pages 5-8, inclusive,), respectively, as occurred at the time of the accident.

Notations on deciphering the volumetric flowrate data, as made available to the investigation by Enbridge[1], are as follows.

"The Solar technical specification for the C65 compressor you sent is a max rating for the compressor, but it is not representative how a unit is staged or the flow capability of the staging. The specification sheet actually blanks out the performance curve section because it is dependent on that staging. Attached are the compressor performance curves for the staging of the units in question. Reading the flow rates, particularly from the centrifugal curves (turbines), is not a straight forward effort. A brief description of this process is noted below. These calculations are complex and then the individual has to intersect the calculated points on a curve that has large ranges. Said differently, this is not a precise exercise, and we don't believe it will provide the granular view of flow data that you are seeking. Due to these complexities, we have taken the operating conditions at the moment the rupture occurred, run the calculations, and used these performance curves to determine the maximum flowrate for each unit in actual cubic feet per minute (acfm). The results are also noted below.

- Danville 1T – 11,000 acfm
- Danville 2T – 10,500 acfm
- Danville 3T – 9,000 acfm
- Danville 9R – 1380 acfm
- Tompkinsville 3E – 13,000 acfm

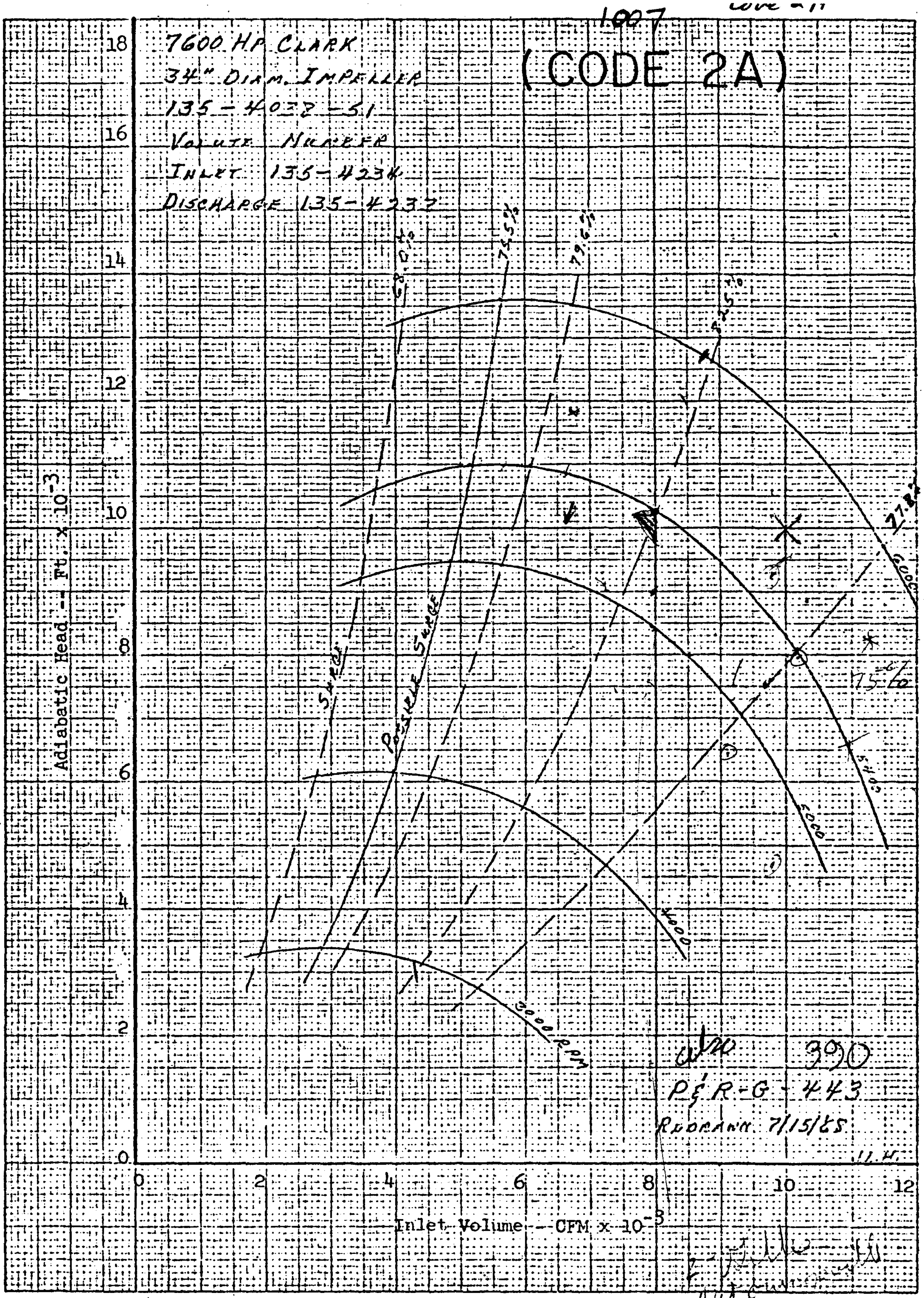
To determine flow for the centrifugal compressors:

- Use the suction & discharge pressure & temperature conditions to calculate compressor head.
- Use these head calculations to read ACF from the compressor curves.

To determine flow for the reciprocating compressor:

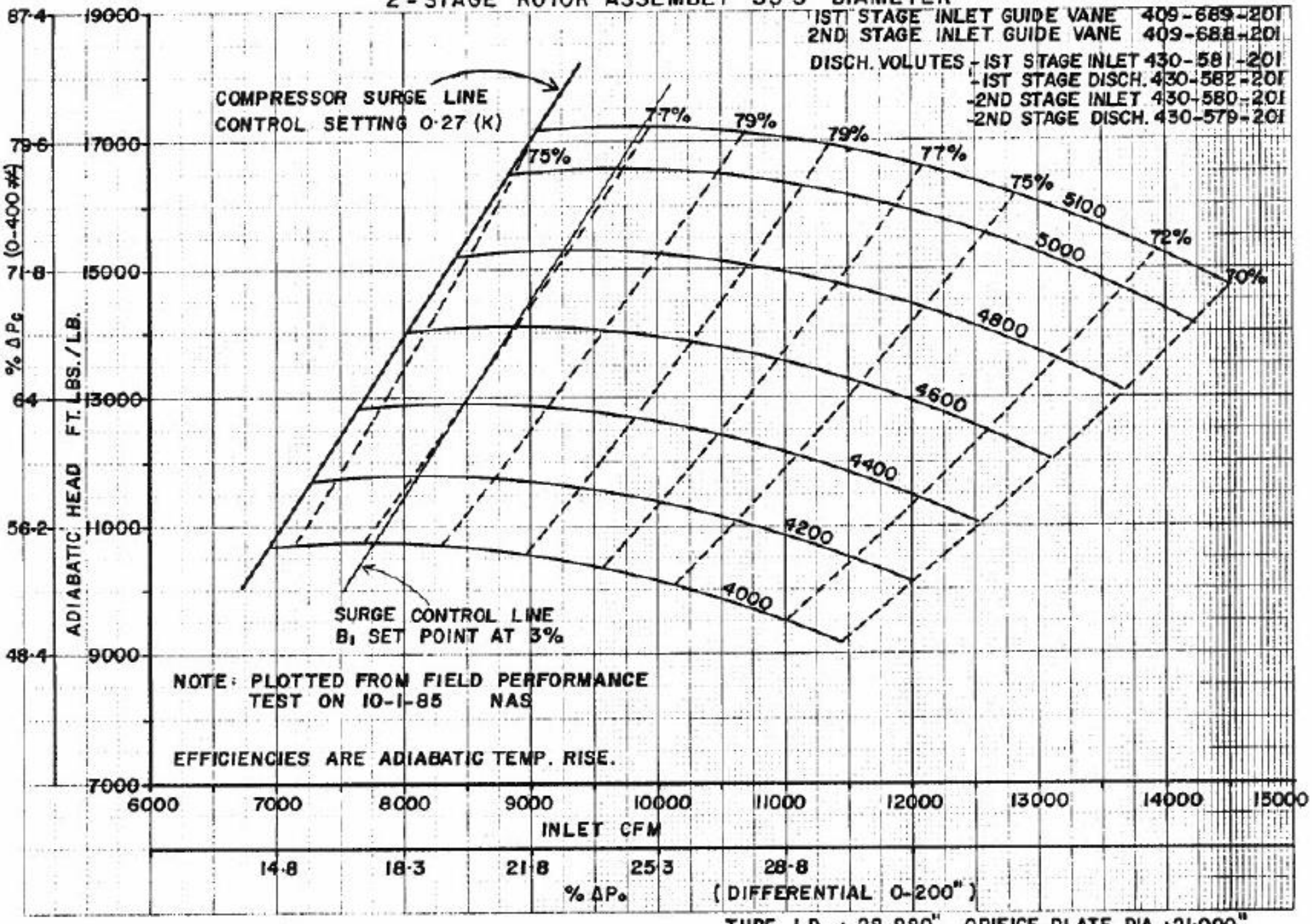
- Use suction & discharge pressure conditions to look up the MMSCFD flow through the compressor.
- Then convert the SCF to ACF."

[1] Ref email from the Enbridge Party - SF Group participant, to the SF Group Chair, dated 04/09/2020, to which the 'notations' are quoted verbatim.



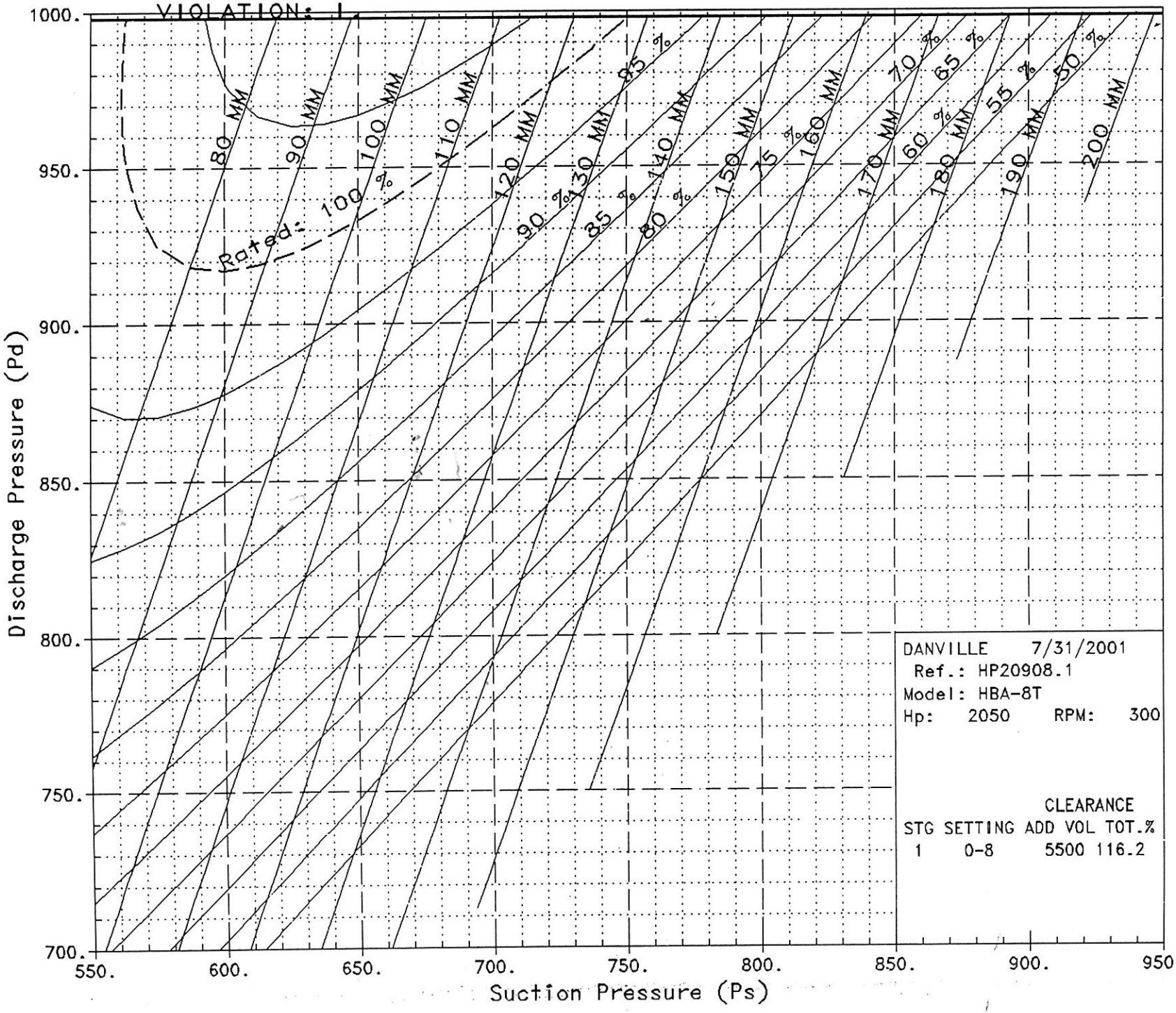
CLARK AERO ASSEMBLY (18,500-19,800 H.P.) CODE "4.1"

2-STAGE ROTOR ASSEMBLY 33.5" DIAMETER



TUBE I.D. : 28.880" ORIFICE PLATE DIA.: 21.000"

0-8


VIOLATION: 1
1000.
950.
900.
850.
800.
750.
700.
550.
600.
650.
700.
750.
800.
850.
900.
950.
Discharge Pressure (Pd)
Suction Pressure (Ps)
80 MM
90 MM
100 MM
110 MM
120 MM
130 MM
140 MM
150 MM
160 MM
170 MM
180 MM
190 MM
200 MM
Rated: 100 %
90 %
85 %
80 %
75 %
70 %
65 %
60 %
55 %
50 %
DANVILLE 7/31/2001
Ref.: HP20908.1
Model: HBA-8T
Hp: 2050 RPM: 300
CLEARANCE
STG SETTING ADD VOL TOT.%
1 0-8 5500 116.2

0-8

Solar® Turbines

A Caterpillar Company

C65

Pipeline Gas Compressors

Oil & Gas Applications

The Solar® C65 family of gas compressors is designed for applications with the *Mars*® 90, *Mars* 100 and *Titan*™ 130 gas turbines. These compressors combine high efficiency and wide flow range with a robust design and ease of restaging.

The C65 gas compressors have the latest state-of-the-art technology combined with the experience and reliability that comes with building and installing over 5000 compressors. These compressors are designed in compliance with API 617, a requirement for the severe environments and operating conditions this equipment may encounter.

dsc65_001

C65 Gas Compressor

dsc65_002

Typical C65 Rotor

Typical Weights and Dimensions

Length	2.0 - 2.3 m (6' 5" - 7' 8")
Height	2.3 m (7' 5")
Width	2.5 m (8' 4")
Weight	28 350 - 34 473 kg (62,500 - 76,000 lb)

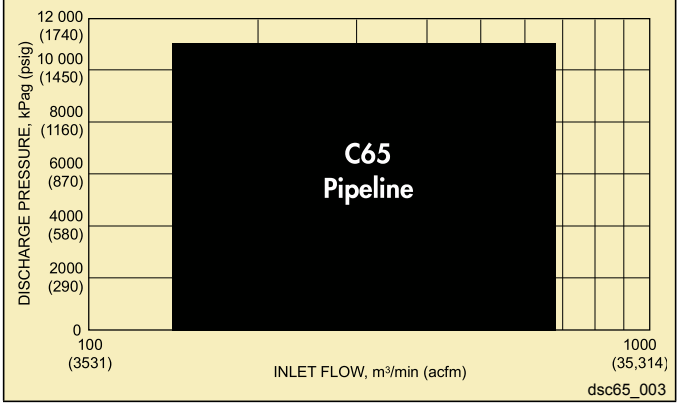
Key Features

Number of Stages	1 - 2
Seals	Tandem dry gas
Bearings	Journal: Tilting-pad Thrust: Self-equalizing, tilting-pad
Inlet/Discharge Flanges	30/30 in. Class 900
Efficiency	> 89% isentropic
Maximum Speed	10,500 rpm
Maximum Flow	680 m^3/min (24,000 acfm)
Maximum Total Head	108 kJ/kg (36,000 ft-lb_f/lb_m)
Maximum Casing Press.	11 030 kPag (1600 psig)
Maximum Torque	23 725 Nm (210,000 lb_f-in.)
Instrumentation	Fully instrumented with vibration, temperature, and pressure monitoring per API 617
Vibration Limits	Within API 617

Materials

Impeller	15-5PH
Casing	ASTM A216 GR WCC
Diaphragm/Guide Vane	ASTM A36/ASTM A516 Gr 70
Rotor Spacer	AISI 410
Stub Shafts	AISI 4140
Labyrinth Seals	Steel-backed Babbitt

Operation Range (Pressure vs. Flow)



dsc65_003

Solar Turbines Incorporated
P.O. Box 85376
San Diego, CA 92186-5376 U.S.A.

DSC65PL/1109/EO

For More Information

Telephone: (+1) 619-544-5352
Internet: www.solarturbines.com

ISO 9001
DNV
CERTIFICATED FIRM

GCASE REV 3.9.10: DB240.40

ESTIMATED COMPRESSOR PERFORMANCE

C65-2

[605] D4F C2R

HFHR = 0.500

SG	K50	K300	PCP	PCT
0.6065	1.299	1.229	680.8	366.1

SUCTION TEMPERATURE 76.0 F

SUCTION PRESSURE 669.20 PSIA

Solar® Turbines
A Caterpillar Company

CONTROL NO.
I-37042 SHT.1

ISSUE DATE
25 SEP. 2015

ENGINEER
J. LOTTON

SPECTRA

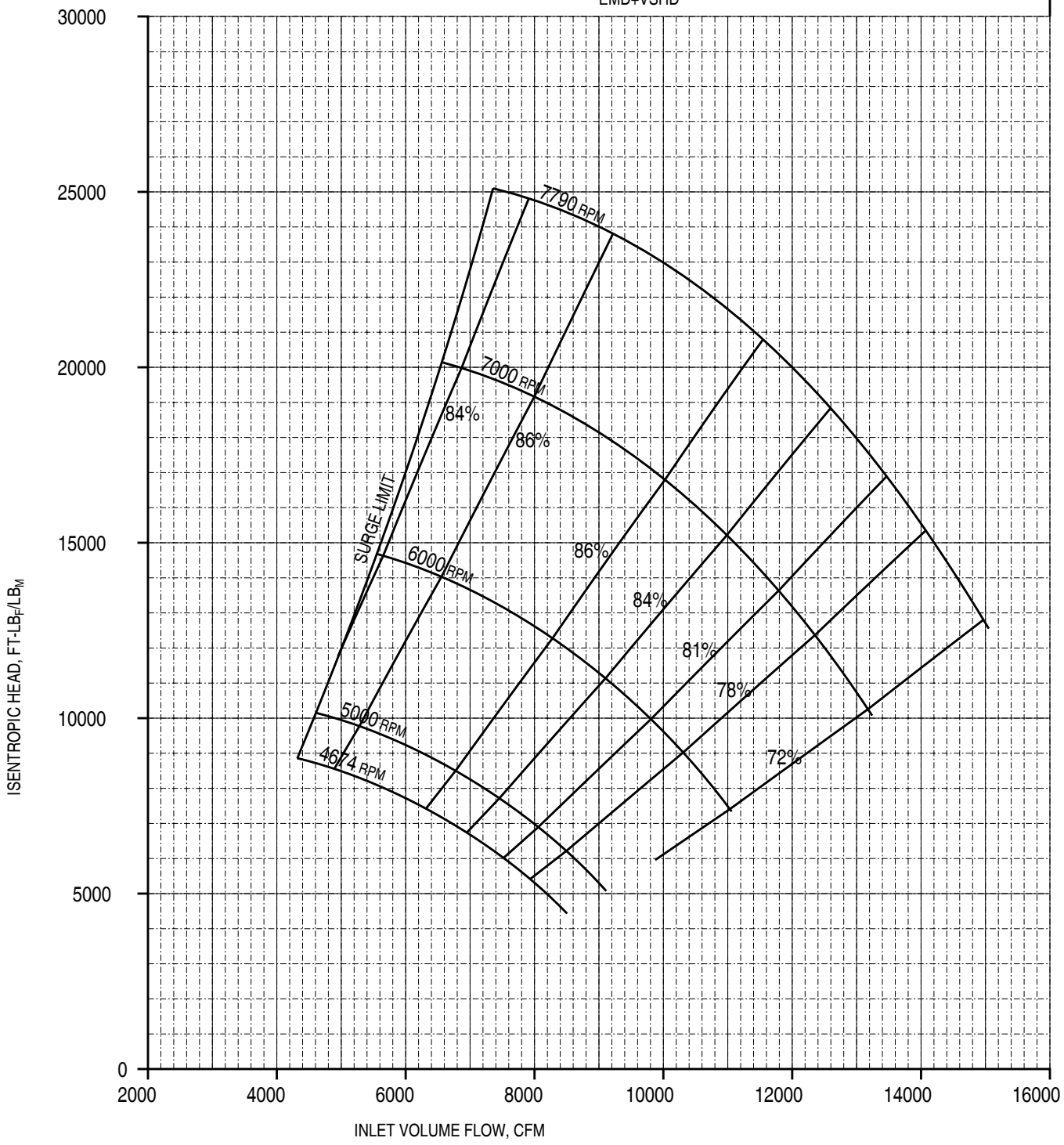
LEBANON WEST PROJECT

TOMKINSVILLE CS

HO14-0127

SPEED RANGE FROM VOITH S21501075

EMD+VSHD



GCASE REV 3.9.10: DB240.40

ESTIMATED COMPRESSOR PERFORMANCE

C65-2

[605] D4F C2R

HFHR = 0.500

SG	K50	K300	PCP	PCT
0.6065	1.299	1.229	680.8	366.1

SUCTION TEMPERATURE 76.0 F

SUCTION PRESSURE 669.20 PSIA

Solar® Turbines
A Caterpillar Company

CONTROL NO.	I-37042 SHT.2
ISSUE DATE	25 SEP. 2015
ENGINEER	J. LOTTON

SPECTRA

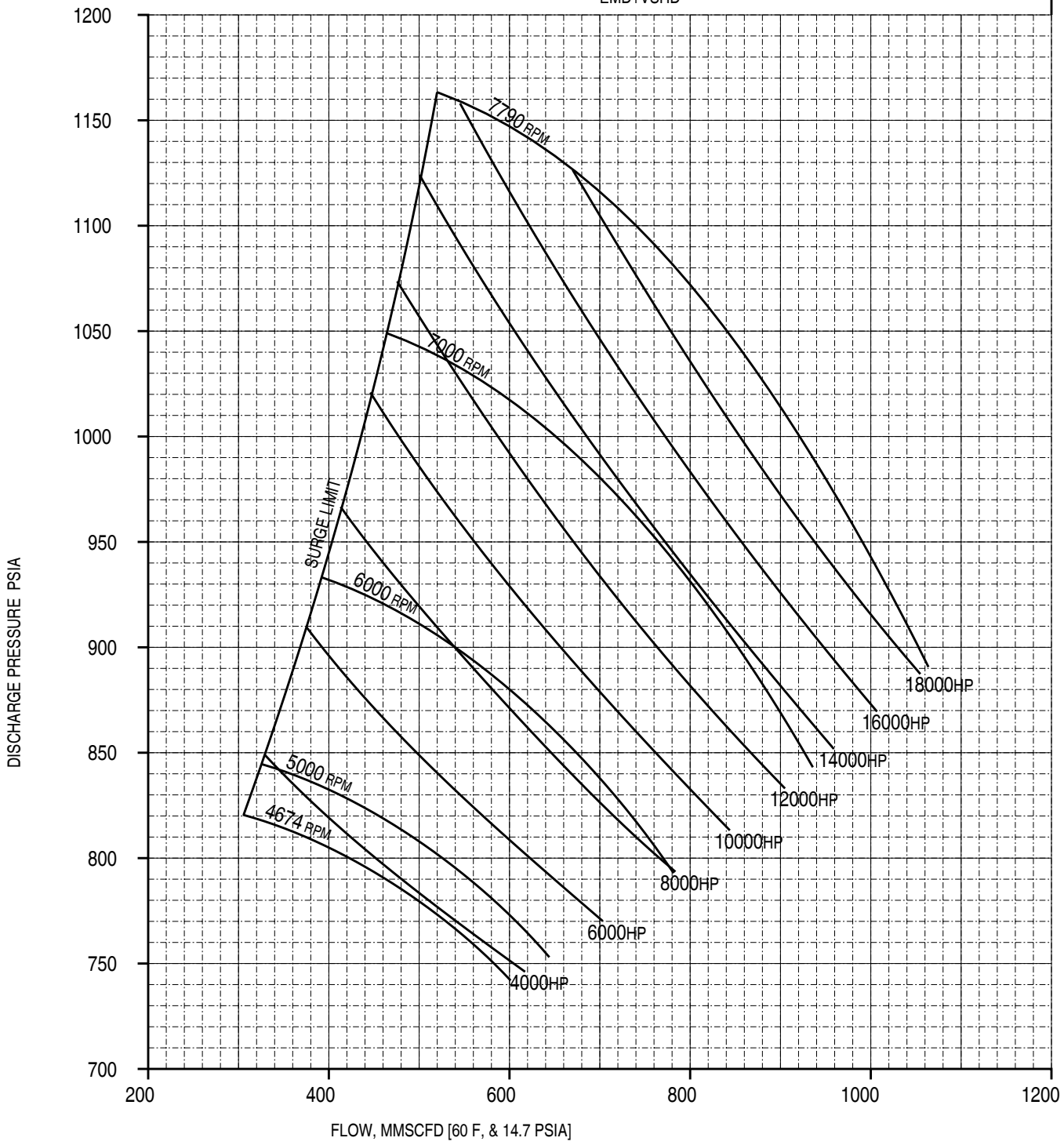
LEBANON WEST PROJECT

TOMKINSVILLE CS

HO14-0127

SPEED RANGE FROM VOITH S21501075

EMD+VSHD



GCASE REV 3.9.10: DB240.40

ESTIMATED COMPRESSOR PERFORMANCE

C65-2

[605] D4F C2R

Solar® Turbines
A Caterpillar Company

CONTROL NO.
I-37042 SHT.3
ISSUE DATE
25 SEP. 2015
ENGINEER
J. LOTTON

HFHR = 0.500

SG	K50	K300	PCP	PCT
0.6065	1.299	1.229	680.8	366.1

SUCTION TEMPERATURE 76.0 F

SUCTION PRESSURE 669.20 PSIA

SPECTRA

LEBANON WEST PROJECT

TOMKINSVILLE CS

HO14-0127

SPEED RANGE FROM VOITH S21501075

EMD+VSHD

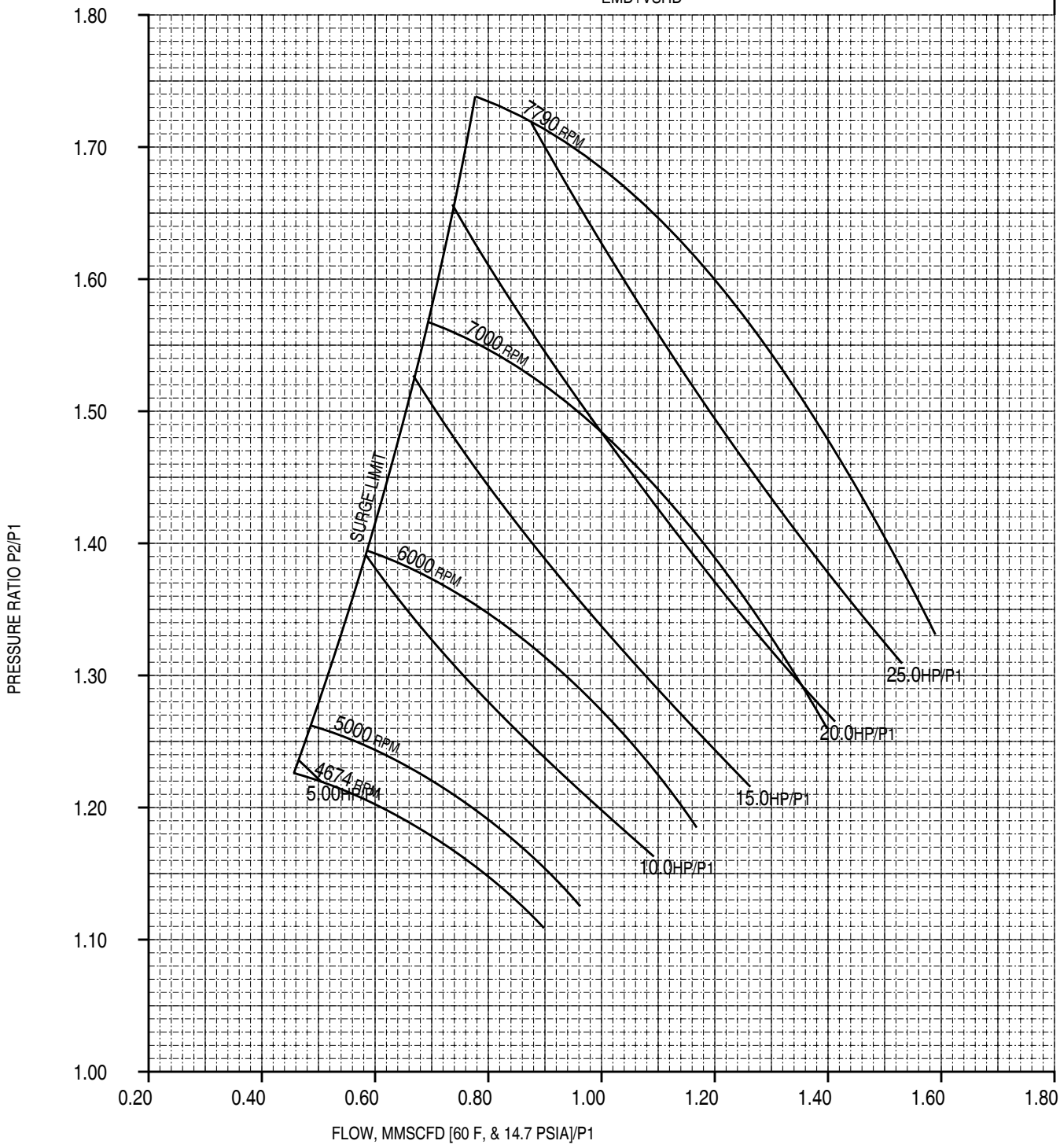


Exhibit 5. Enbridge SDS Document Utilized in United States Markets at the Time of the Accident

Natural Gas

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Date of issue: 04/25/2016 Version: 1.0

SECTION 1: Identification

1.1. Identification

Product form : Mixture

Product name : Natural Gas

Synonyms : Methane, Sweet Gas, Fuel Gas, Pipeline Spec Gas, Sales Gas, Dry Natural Gas, Compressed Gas

1.2. Relevant identified uses of the substance or mixture and uses advised against

Use of the substance/mixture : Fuels

1.3. Details of the supplier of the safety data sheet

Spectra Energy
P.O. Box 1642
Houston, TX 77251 - United States
T 713-627-5400

1.4. Emergency telephone number

Emergency number : 800-535-5053 (US) 888-444-6677 (Canada)

SECTION 2: Hazard(s) identification

2.1. Classification of the substance or mixture

GHS-US classification

Flam. Gas 1	H220 -	Extremely flammable gas
Compressed gas	H280 -	Contains gas under pressure; may explode if heated

Full text of H statements : see section 16

2.2. Label elements

GHS-US labeling

Hazard pictograms (GHS-US) :

GHS02 GHS04

Signal word (GHS-US) : Danger

Hazard statements (GHS-US) : H220 - Extremely flammable gas
H280 - Contains gas under pressure; may explode if heated

Precautionary statements (GHS-US) : P210 - Keep away from heat/sparks/open flames/hot surfaces. - No smoking
P377 - Leaking gas fire: Do not extinguish, unless leak can be stopped safely
P381 - Eliminate all ignition sources if safe to do so
P403 - Store in a well-ventilated place
P410+P403 - Protect from sunlight. Store in a well-ventilated place

2.3. Other hazards

Other hazards not contributing to the classification : None.

2.4. Unknown acute toxicity (GHS US)

Not applicable

SECTION 3: Composition/Information on ingredients

3.1. Substance

Not applicable

3.2. Mixture

Name	Product identifier	%	GHS-US classification
Natural gas, dried	(CAS No) 68410-63-9	100	Simple Asphy, H380 Flam. Gas 1, H220 Compressed gas, H280

Full text of H-phrases: see section 16

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures general : If you feel unwell, seek medical advice (show the label where possible).

First-aid measures after inhalation : Remove person to fresh air and keep comfortable for breathing.

First-aid measures after skin contact : Wash skin with plenty of water.

First-aid measures after eye contact : Rinse eyes with water as a precaution.

First-aid measures after ingestion : Call a poison center/doctor/physician if you feel unwell.

4.2. Most important symptoms and effects, both acute and delayed

Symptoms/injuries : Not expected to present a significant hazard under anticipated conditions of normal use.

4.3. Indication of any immediate medical attention and special treatment needed

Not applicable.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media : Dry powder. Foam. Carbon dioxide.

Unsuitable extinguishing media : Do not use water spray.

5.2. Special hazards arising from the substance or mixture

Fire hazard : Extremely flammable liquid and vapor.

Explosion hazard : Contains gas under pressure; may explode if heated.

Reactivity : The product is non-reactive under normal conditions of use, storage and transport.

5.3. Advice for firefighters

Firefighting instructions : Leaking gas fire: Do not extinguish, unless leak can be stopped safely. In case of major fire and large quantities: Evacuate area. Fight fire remotely due to the risk of explosion.

Protection during firefighting : Do not attempt to take action without suitable protective equipment. Self-contained breathing apparatus. Complete protective clothing.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

General measures : Eliminate every possible source of ignition. Evacuate area.

6.1.1. For non-emergency personnel

Emergency procedures : Evacuate unnecessary personnel.

6.1.2. For emergency responders

Protective equipment : Do not attempt to take action without suitable protective equipment. For further information refer to section 8: "Exposure controls/personal protection".

Emergency procedures : Stop leak if safe to do so.

6.2. Environmental precautions

Avoid release to the environment.

6.3. Methods and material for containment and cleaning up

Methods for cleaning up : Exclude sources of ignition and ventilate the area. Notify authorities if product enters sewers or public waters.

Other information : Dispose of materials or solid residues at an authorized site.

6.4. Reference to other sections

For further information refer to section 13.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling : Wear personal protective equipment. Do not breathe vapors. Flammable vapors may accumulate in the container. Handling this product may result in electrostatic accumulation. Use proper grounding procedures. Prevent the build-up of electrostatic charge. Provide good ventilation in process area to prevent formation of vapor.

Hygiene measures : Do not eat, drink or smoke when using this product. Always wash hands after handling the product.

7.2. Conditions for safe storage, including any incompatibilities

Storage conditions : Store in a well-ventilated place. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Natural Gas		
ACGIH	ACGIH TWA (ppm)	1000 ppm Aliphatic hydrocarbon gases: Alkane C1-4

Natural gas, dried (68410-63-9)
Not applicable

8.2. Exposure controls

Appropriate engineering controls : Ensure good ventilation of the work station. Use only explosion-proof equipment.

Hand protection : Protective gloves.

Eye protection : Safety glasses.

Skin and body protection : Wear suitable protective clothing.

Respiratory protection : In case of insufficient ventilation, wear suitable respiratory equipment.

Environmental exposure controls : Avoid release to the environment.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state : Gas

Appearance : Clear, colorless gas.

Color : Colorless

Odor : odorless

Odor threshold : No data available

pH : No data available

Melting point : No data available

Freezing point : No data available

Boiling point : -258 F

Flash point : -305.86 F

Relative evaporation rate (butyl acetate=1) : No data available

Flammability (solid, gas) : No data available

Explosion limits : No data available

Explosive properties : No data available

Oxidizing properties : No data available

Vapor pressure : < 35000 kPa @37.8 C

Relative density : No data available

Relative vapor density at 20 °C : 0.56

Solubility : Water: 3.5 %
Ethanol: Soluble
Ether: Soluble
Organic solvent:Soluble

Log Pow : 2.8

Auto-ignition temperature : -1000.4 F

Decomposition temperature : No data available

Viscosity	:	No data available
Viscosity, kinematic	:	No data available
Viscosity, dynamic	:	No data available

9.2. Other information

Gas group : Compressed gas

SECTION 10: Stability and reactivity

10.1. Reactivity

The product is non-reactive under normal conditions of use, storage and transport.

10.2. Chemical stability

Stable under normal conditions.

10.3. Possibility of hazardous reactions

No dangerous reactions known under normal conditions of use.

10.4. Conditions to avoid

None under recommended storage and handling conditions (see section 7).

10.5. Incompatible materials

Halogens. Oxidizing agent. Acids. Aluminum chloride.

10.6. Hazardous decomposition products

Thermal decomposition generates : Carbon dioxide. Carbon monoxide. nitrogen oxides (NOx) and sulphur oxides.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity	:	Not classified
Skin corrosion/irritation	:	Not classified
Serious eye damage/irritation	:	Not classified
Respiratory or skin sensitization	:	Not classified
Germ cell mutagenicity	:	Not classified
Carcinogenicity	:	Not classified
Reproductive toxicity	:	Not classified
Specific target organ toxicity (single exposure)	:	Not classified
Specific target organ toxicity (repeated exposure)	:	Not classified
Aspiration hazard	:	Not classified

SECTION 12: Ecological information

12.1. Toxicity

Ecology - general : The product is not considered harmful to aquatic organisms or to cause long-term adverse effects in the environment.

12.2. Persistence and degradability

Natural Gas	
Persistence and degradability	Not established.

12.3. Bioaccumulative potential

Natural Gas	
Log Pow	2.8
Bioaccumulative potential	Not established.

Natural gas, dried (68410-63-9)	
Log Pow	<= 2.8

12.4. Mobility in soil

Natural Gas	
Ecology - soil	Not established.

12.5. Other adverse effects

Effect on global warming : No known ecological damage caused by this product.
Not established

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Waste treatment methods : Dispose of contents/container in accordance with licensed collector's sorting instructions.

Waste disposal recommendations : Dispose in a safe manner in accordance with local/national regulations.

SECTION 14: Transport information

Department of Transportation (DOT)

In accordance with DOT

Transport document description : UN1971 Natural gas, compressed (with high methane content), 2.1

UN-No.(DOT) : UN1971

Proper Shipping Name (DOT) : Natural gas, compressed
(with high methane content)

Class (DOT) : 2.1 - Class 2.1 - Flammable gas 49 CFR 173.115

Hazard labels (DOT) : 2.1 - Flammable gas

DOT Packaging Non Bulk (49 CFR 173.xxx) : 302

DOT Packaging Bulk (49 CFR 173.xxx) : 302

DOT Packaging Exceptions (49 CFR 173.xxx) : 306

DOT Quantity Limitations Passenger aircraft/rail (49 CFR 173.27) : Forbidden

DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75) : 150 kg

DOT Vessel Stowage Location : E - The material may be stowed ''on deck'' or ''under deck'' on a cargo vessel and on a passenger vessel carrying a number of passengers limited to not more than the larger of 25 passengers, or one passenger per each 3 m of overall vessel length, but is prohibited from carriage on passenger vessels in which the limiting number of passengers is exceeded

DOT Vessel Stowage Other : 40 - Stow ''clear of living quarters''

Emergency Response Guide (ERG) Number : 115

Other information : No supplementary information available.

TDG

Transport document description : UN1971 NATURAL GAS, COMPRESSED (with high methane content), 2.1

UN-No. (TDG) : UN1971

TDG Proper Shipping Name : NATURAL GAS, COMPRESSED

TDG Primary Hazard Classes : 2.1 - Class 2.1 - Flammable Gas.

ERAP Index : 3 000

Explosive Limit and Limited Quantity Index : 0.125 L

Passenger Carrying Road Vehicle or Passenger Carrying Railway Vehicle Index : Forbidden

Passenger Carrying Ship Index : Forbidden

Transport by sea

UN-No. (IMDG) : 1971

Proper Shipping Name (IMDG)	:	NATURAL GAS, COMPRESSED
Class (IMDG)	:	Not regulated for transport

Air transport

UN-No. (IATA)	:	1971
Proper Shipping Name (IATA)	:	Natural gas, compressed
Class (IATA)	:	Not regulated for transport

SECTION 15: Regulatory information

15.1. US Federal regulations

This product or mixture does not contain a toxic chemical or chemicals in excess of the applicable de minimis concentration as specified in 40 CFR §372.38(a) subject to the reporting requirements of section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

Natural gas, dried (68410-63-9)
Listed on the United States TSCA (Toxic Substances Control Act) inventory

15.2. International regulations

National regulations

Natural Gas
All chemical substances in this product are listed in the EPA (Environment Protection Agency) TSCA (Toxic Substances Control Act) Inventory

Natural gas, dried (68410-63-9)
Listed on the AICS (Australian Inventory of Chemical Substances) Listed on IECSC (Inventory of Existing Chemical Substances Produced or Imported in China) Listed on the Korean ECL (Existing Chemicals List)

15.3. US State regulations

California Proposition 65 - This product does not contain any substances known to the state of California to cause cancer, developmental and/or reproductive harm

SECTION 16: Other information

Full text of H-phrases:

H220	Extremely flammable gas
H280	Contains gas under pressure; may explode if heated
H380	May displace oxygen and cause rapid suffocation

SDS GHS US CUSTOM BLUE

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product

Exhibit 6. Enbridge SDS Document Currently Utilized in United States Markets

SAFETY DATA SHEET

Natural Gas

Section 1. Identification

GHS product identifier : Natural Gas

Product code : Not Available

Other means of identification : Methane, Sweet Gas, Fuel Gas, Pipeline Spec Gas, Sales Gas, Dry Natural Gas, Compressed Gas, CH4

Product type : Gas

Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Fuel

Manufacturer : Enbridge Inc. Including Enbridge Legal Entities: Algonquin Gas Transmission, LLC; Alliance Pipeline LP; Big Sandy Pipeline, LLC; Brazoria Interconnector Gas Pipeline, LLC; East Tennessee Natural Gas, LLC; Enbridge Offshore (Gas Transmission) LLC; Maritimes & Northeast Pipeline, LLC; NEXUS Gas Transmission, LLC; Texas Eastern Transmission, LP

Supplier's details : Enbridge Inc.
5400 Westheimer Court
Houston, Texas 77056

Emergency telephone number (with hours of operation) : 24x7 Emergency Contact Number: 1-800-231-7794

Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture : FLAMMABLE GASES - Category 1
GASES UNDER PRESSURE - Compressed gas
SIMPLE ASPHYXIANTS

GHS label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : H220 - Extremely flammable gas.
H280 - Contains gas under pressure; may explode if heated.
No code - May displace oxygen and cause rapid suffocation.

Precautionary statements

Section 2. Hazards identification

Prevention : P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.

Response : P377 - Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
P381 - Eliminate all ignition sources if safe to do so.

Storage : P410 - Protect from sunlight.
P403 - Store in a well-ventilated place.

Disposal : Not applicable.

Supplemental label elements : Keep container tightly closed. Use only with adequate ventilation. Do not enter storage areas and confined spaces unless adequately ventilated.

Hazards not otherwise classified : None known.

Section 3. Composition/information on ingredients

Substance/mixture : Mixture

Other means of identification : Methane, Sweet Gas, Fuel Gas, Pipeline Spec Gas, Sales Gas, Dry Natural Gas, Compressed Gas, CH4

Ingredient name	%	CAS number
Natural gas	80 - 100	8006-14-2
Methane	80 - 100	74-82-8
Ethane	1 - 5	74-84-0
Propane	1 - 5	74-98-6
Butane	1 - 5	106-97-8
Pentane	1 - 5	109-66-0
Nitrogen	1 - 5	7727-37-9
Carbon dioxide, gas	1 - 5	124-38-9

United States: The exact percentage (concentration) in the composition has been withheld as a trade secret in accordance with paragraph (i) of §1910.1200.
Canada: The exact percentage (concentration) in the composition has been withheld as a trade secret in accordance with the amended HPR as of April 2018.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 20 minutes. Get medical attention if irritation occurs.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Get medical attention if adverse health effects persist or are severe. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

Skin contact : Flush contaminated skin with plenty of water. To avoid the risk of static discharges and gas ignition, soak contaminated clothing thoroughly with water before removing it. Get medical attention if symptoms occur.

Ingestion : As this product is a gas, refer to the inhalation section.

Section 4. First aid measures

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : Contact with rapidly expanding gas may cause burns or frostbite.

Inhalation : At very high concentrations, can displace the normal air and cause suffocation from lack of oxygen.

Skin contact : Contact with rapidly expanding gas may cause burns or frostbite.

Ingestion : As this product is a gas, refer to the inhalation section.

Over-exposure signs/symptoms

Eye contact : No known significant effects or critical hazards.

Inhalation : No known significant effects or critical hazards.

Skin contact : No known significant effects or critical hazards.

Ingestion : No known significant effects or critical hazards.

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

Specific treatments : No specific treatment.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Use dry chemical, CO_2, water spray (fog) or foam.

Unsuitable extinguishing media : None known.

Specific hazards arising from the chemical : Contains gas under pressure. Extremely flammable gas. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion.

Hazardous thermal decomposition products : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Contact supplier immediately for specialist advice. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool. If involved in fire, shut off flow immediately if it can be done without risk. If this is impossible, withdraw from area and allow fire to burn. Fight fire from protected location or maximum possible distance. Eliminate all ignition sources if safe to do so.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : Accidental releases pose a serious fire or explosion hazard. No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : Not applicable.

Environmental precautions : Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

Spill : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Contains gas under pressure. Avoid contact with eyes, skin and clothing. Avoid breathing gas. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use only non-sparking tools. Empty containers retain product residue and can be hazardous. Do not puncture or incinerate container.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in a segregated and approved area. Store away from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Eliminate all ignition sources. Keep container tightly closed and sealed until ready for use. See Section 10 for incompatible materials before handling or use.

Section 8. Exposure controls/personal protection

Control parameters

United States

Occupational exposure limits

Ingredient name	Exposure limits
Natural gas	**ACGIH TLV (United States, 3/2018). Oxygen Depletion [Asphyxiant]. Explosive potential.**
Methane	**ACGIH TLV (United States, 3/2018). Oxygen Depletion [Asphyxiant]. Explosive potential.**
Ethane	**ACGIH TLV (United States, 3/2018). Oxygen Depletion [Asphyxiant]. Explosive potential.**
Propane	**NIOSH REL (United States, 10/2016).** TWA: 1000 ppm 10 hours. TWA: 1800 mg/m³ 10 hours. **OSHA PEL (United States, 5/2018).** TWA: 1000 ppm 8 hours. TWA: 1800 mg/m³ 8 hours. **ACGIH TLV (United States, 3/2018). Oxygen Depletion [Asphyxiant]. Explosive potential.**
Butane	**NIOSH REL (United States, 10/2016).** TWA: 800 ppm 10 hours. TWA: 1900 mg/m³ 10 hours. **ACGIH TLV (United States, 3/2018). Explosive potential.** STEL: 1000 ppm 15 minutes.
Pentane	**ACGIH TLV (United States, 3/2018).** TWA: 1000 ppm 8 hours. **NIOSH REL (United States, 10/2016).** TWA: 120 ppm 10 hours. TWA: 350 mg/m³ 10 hours. CEIL: 610 ppm 15 minutes. CEIL: 1800 mg/m³ 15 minutes. **OSHA PEL (United States, 5/2018).** TWA: 1000 ppm 8 hours. TWA: 2950 mg/m³ 8 hours.
Nitrogen	**ACGIH TLV (United States, 3/2018). Oxygen Depletion [Asphyxiant].**
Carbon dioxide, gas	**ACGIH TLV (United States, 3/2018).** TWA: 5000 ppm 8 hours. TWA: 9000 mg/m³ 8 hours. STEL: 30000 ppm 15 minutes. STEL: 54000 mg/m³ 15 minutes. **NIOSH REL (United States, 10/2016).** TWA: 5000 ppm 10 hours. TWA: 9000 mg/m³ 10 hours. STEL: 30000 ppm 15 minutes. STEL: 54000 mg/m³ 15 minutes. **OSHA PEL (United States, 5/2018).** TWA: 5000 ppm 8 hours. TWA: 9000 mg/m³ 8 hours.

Canada

Occupational exposure limits

Ingredient name	Exposure limits
Natural gas	**CA Alberta Provincial (Canada, 6/2018).** 8 hrs OEL: 1000 ppm 8 hours. **CA Ontario Provincial (Canada, 1/2018).** TWA: 1000 ppm 8 hours. **CA Saskatchewan Provincial (Canada, 7/2013).** STEL: 1250 ppm 15 minutes. TWA: 1000 ppm 8 hours. **CA British Columbia Provincial (Canada, 7/2018). Oxygen Depletion [Asphyxiant]. Explosive potential.**
Methane	**CA Alberta Provincial (Canada, 6/2018).** 8 hrs OEL: 1000 ppm 8 hours. **CA Ontario Provincial (Canada, 1/2018).** TWA: 1000 ppm 8 hours. **CA Saskatchewan Provincial (Canada, 7/2013).**

Section 8. Exposure controls/personal protection

	STEL: 1250 ppm 15 minutes. TWA: 1000 ppm 8 hours. **CA Quebec Provincial (Canada, 1/2014). Oxygen Depletion [Asphyxiant].**
Ethane	**CA British Columbia Provincial (Canada, 7/2018). Oxygen Depletion [Asphyxiant]. Explosive potential.** **CA Alberta Provincial (Canada, 6/2018).** 8 hrs OEL: 1000 ppm 8 hours. **CA Ontario Provincial (Canada, 1/2018).** TWA: 1000 ppm 8 hours. **CA Saskatchewan Provincial (Canada, 7/2013).** STEL: 1250 ppm 15 minutes. TWA: 1000 ppm 8 hours. **CA Quebec Provincial (Canada, 1/2014). Oxygen Depletion [Asphyxiant].**
Propane	**CA British Columbia Provincial (Canada, 7/2018). Oxygen Depletion [Asphyxiant]. Explosive potential.** **CA Alberta Provincial (Canada, 6/2018).** 8 hrs OEL: 1000 ppm 8 hours. **CA Quebec Provincial (Canada, 1/2014).** TWAEV: 1000 ppm 8 hours. TWAEV: 1800 mg/m³ 8 hours. **CA Ontario Provincial (Canada, 1/2018).** TWA: 1000 ppm 8 hours. **CA Saskatchewan Provincial (Canada, 7/2013).** STEL: 1250 ppm 15 minutes. TWA: 1000 ppm 8 hours.
Butane	**CA British Columbia Provincial (Canada, 7/2018). Oxygen Depletion [Asphyxiant]. Explosive potential.** **CA Alberta Provincial (Canada, 6/2018).** 8 hrs OEL: 1000 ppm 8 hours. **CA Quebec Provincial (Canada, 1/2014).** TWAEV: 800 ppm 8 hours. TWAEV: 1900 mg/m³ 8 hours. **CA Ontario Provincial (Canada, 1/2018).** TWA: 800 ppm 8 hours. **CA Saskatchewan Provincial (Canada, 7/2013).** STEL: 1250 ppm 15 minutes. TWA: 1000 ppm 8 hours. **CA British Columbia Provincial (Canada, 7/2018). Explosive potential.**
Pentane	STEL: 1000 ppm 15 minutes. **CA Alberta Provincial (Canada, 6/2018).** 8 hrs OEL: 600 ppm 8 hours. 8 hrs OEL: 1770 mg/m³ 8 hours. **CA British Columbia Provincial (Canada, 7/2018).** TWA: 1000 ppm 8 hours. **CA Ontario Provincial (Canada, 1/2018).** TWA: 1000 ppm 8 hours. **CA Quebec Provincial (Canada, 1/2014).** TWAEV: 120 ppm 8 hours. TWAEV: 350 mg/m³ 8 hours. **CA Saskatchewan Provincial (Canada, 7/2013).** STEL: 750 ppm 15 minutes. TWA: 600 ppm 8 hours.
Nitrogen	**CA Alberta Provincial (Canada, 6/2018). Oxygen Depletion [Asphyxiant].** **CA British Columbia Provincial (Canada, 7/2018). Oxygen Depletion [Asphyxiant].** **CA Ontario Provincial (Canada, 1/2018). Oxygen Depletion [Asphyxiant].** **CA Quebec Provincial (Canada, 1/2014). Oxygen Depletion [Asphyxiant].**
Carbon dioxide, gas	**CA Alberta Provincial (Canada, 6/2018).** 15 min OEL: 54000 mg/m³ 15 minutes.

Section 8. Exposure controls/personal protection

	8 hrs OEL: 5000 ppm 8 hours. 15 min OEL: 30000 ppm 15 minutes. 8 hrs OEL: 9000 mg/m³ 8 hours. **CA British Columbia Provincial (Canada, 7/2018).** TWA: 5000 ppm 8 hours. STEL: 15000 ppm 15 minutes. **CA Ontario Provincial (Canada, 1/2018).** TWA: 5000 ppm 8 hours. STEL: 30000 ppm 15 minutes. **CA Quebec Provincial (Canada, 1/2014).** TWAEV: 5000 ppm 8 hours. TWAEV: 9000 mg/m³ 8 hours. STEV: 30000 ppm 15 minutes. STEV: 54000 mg/m³ 15 minutes. **CA Saskatchewan Provincial (Canada, 7/2013).** STEL: 30000 ppm 15 minutes. TWA: 5000 ppm 8 hours.

Appropriate engineering controls : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: safety glasses with side-shields.

Skin protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. When there is a risk of ignition from static electricity, wear anti-static protective clothing. For the greatest protection from static discharges, clothing should include anti-static overalls, boots and gloves.

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Section 8. Exposure controls/personal protection

Respiratory protection : The gas can cause asphyxiation without warning by replacing the oxygen in the air. Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. If operating conditions cause high gas concentrations to be produced or any recommended or statutory exposure limit is exceeded, use an air-fed respirator or self-contained breathing apparatus. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Section 9. Physical and chemical properties

Appearance

Physical state : Gas.

Color : Natural gas in its pure state is colorless.

Odor : Natural gas in its pure state is odorless. An odorant, consisting of Mercaptan is added before natural gas enters a gas distribution system. The odor is quite offensive like rotten eggs.

Odor threshold : <10000 ppm

pH : Not available.

Melting point : -182.6°C (-296.7°F)

Boiling point/boiling range : -161.5°C (-258.7°F)

Flash point : -188°C (methane)

Evaporation rate : >1 (Butyl acetate = 1)

Flammability (solid, gas) : Flammable in the presence of the following materials or conditions: open flames, sparks and static discharge.

Lower and upper explosive (flammable) limits : Lower: 5%
Upper: 15%

Vapor pressure : >133.3 kPa (>1000 mm Hg) [room temperature]

Vapor density : 0.56 to 0.59 [Air = 1]

Relative density : Not available.

Solubility : Not available.

Partition coefficient: n-octanol/water : Not available.

Auto-ignition temperature : 537°C (998.6°F)

Decomposition temperature : Not available.

Viscosity : Not available.

Flow time (ISO 2431) : Not available.

Section 10. Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients.

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Section 10. Stability and reactivity

Conditions to avoid : Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Do not allow gas to accumulate in low or confined areas.

Incompatible materials : Reactive or incompatible with the following materials: oxidizing materials.

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Butane	LC50 Inhalation Vapor	Rat	658000 mg/m³	4 hours
Pentane	LC50 Inhalation Vapor	Rat	364 g/m³	4 hours

Irritation/Corrosion

There is no data available.

Sensitization

There is no data available.

Mutagenicity

There is no data available.

Carcinogenicity

There is no data available.

Reproductive toxicity

There is no data available.

Teratogenicity

There is no data available.

Specific target organ toxicity (single exposure)

Name	Category	Target organs
Pentane	Category 3	Narcotic effects

Specific target organ toxicity (repeated exposure)

There is no data available.

Aspiration hazard

Name	Result
Pentane	ASPIRATION HAZARD - Category 1

Information on the likely routes of exposure : Dermal contact. Eye contact. Inhalation.

Potential acute health effects

Eye contact : Contact with rapidly expanding gas may cause burns or frostbite.

Inhalation : At very high concentrations, can displace the normal air and cause suffocation from lack of oxygen.

Skin contact : Contact with rapidly expanding gas may cause burns or frostbite.

Ingestion : As this product is a gas, refer to the inhalation section.

Section 11. Toxicological information

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : No known significant effects or critical hazards.

Inhalation : No known significant effects or critical hazards.

Skin contact : No known significant effects or critical hazards.

Ingestion : No known significant effects or critical hazards.

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : No known significant effects or critical hazards.

Potential delayed effects : No known significant effects or critical hazards.

Long term exposure

Potential immediate effects : No known significant effects or critical hazards.

Potential delayed effects : No known significant effects or critical hazards.

Potential chronic health effects

General : No known significant effects or critical hazards.

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

There is no data available.

Section 12. Ecological information

Toxicity

There is no data available.

Persistence and degradability

There is no data available.

Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
Methane	1.09	-	low
Ethane	1.09	-	low
Propane	1.09	-	low
Butane	2.89	-	low
Pentane	3.45	171	low
Nitrogen	0.67	-	low
Carbon dioxide, gas	0.83	-	low

Mobility in soil

Section 12. Ecological information

Soil/water partition coefficient (K_{OC}) : Not available.

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Empty pressure vessels should be returned to the supplier. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Empty containers or liners may retain some product residues. Do not puncture or incinerate container.

Section 14. Transport information

	DOT Classification	TDG Classification	IMDG	IATA
UN number	UN1971	UN1971	UN1971	UN1971
UN proper shipping name	METHANE, COMPRESSED OR NATURAL GAS, COMPRESSED (Methane, Natural gas)	METHANE, COMPRESSED OR NATURAL GAS, COMPRESSED (Methane, Natural gas)	METHANE, COMPRESSED OR NATURAL GAS, COMPRESSED (Methane, Natural gas)	METHANE, COMPRESSED OR NATURAL GAS, COMPRESSED (Methane, Natural gas)
Transport hazard class(es)	2.1 	2.1 	2.1 	2.1 
Packing group	-	-	-	-
Environmental hazards	No.	No.	No.	No.

AERG : 115

Additional information

TDG Classification : Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2.13-2.17 (Class 2).

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Section 15. Regulatory information

U.S. Federal regulations : **United States inventory (TSCA 8b)**: All components are listed or exempted.

Clean Air Act (CAA) 112 regulated flammable substances: Methane; Pentane; Butane; Propane; Ethane

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs) : Not listed

Section 15. Regulatory information

Clean Air Act Section 602 Class I Substances : Not listed

Clean Air Act Section 602 Class II Substances : Not listed

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List II Chemicals (Essential Chemicals) : Not listed

SARA 302/304

No products were found.

SARA 304 RQ : Not applicable.

SARA 311/312

Classification : FLAMMABLE GASES - Category 1
GASES UNDER PRESSURE - Compressed gas
SIMPLE ASPHYXIANTS

Composition/information on ingredients

Name	Classification
Pentane	FLAMMABLE LIQUIDS - Category 2 SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Narcotic effects) - Category 3 ASPIRATION HAZARD - Category 1

SARA 313

There is no data available.

State regulations

Massachusetts : The following components are listed: Natural gas; Methane; Pentane; Butane; Propane; Ethane; Nitrogen; Carbon dioxide, gas

New York : None of the components are listed.

New Jersey : The following components are listed: Methane; Pentane; Butane; Propane; Ethane; Nitrogen; Carbon dioxide, gas

Pennsylvania : The following components are listed: Natural gas; Methane; Pentane; Butane; Propane; Ethane; Nitrogen; Carbon dioxide, gas

California Prop. 65

This product does not require a Safe Harbor warning under California Prop. 65.

Canadian lists

Canada inventory (DSL NDSL) : All components are listed or exempted.

Canadian NPRI : The following components are listed: Methane; Pentane; Butane; Propane; Ethane

CEPA Toxic substances : The following components are listed: Methane; Ethane; Carbon dioxide, gas

Section 16. Other information

Procedure used to derive the classification

Classification	Justification
FLAMMABLE GASES - Category 1 GASES UNDER PRESSURE - Compressed gas SIMPLE ASPHYXIANTS	On basis of test data On basis of test data Expert judgment

History

Date of issue mm/dd/yyyy : 12/15/2019

Section 16. Other information

Date of previous issue	:	Not applicable
Version	:	1
Internal code	:	425-001
Prepared by	:	KMK Regulatory Services Inc.
Key to abbreviations	:	ATE = Acute Toxicity Estimate BCF = Bioconcentration Factor GHS = Globally Harmonized System of Classification and Labelling of Chemicals IATA = International Air Transport Association IBC = Intermediate Bulk Container IMDG = International Maritime Dangerous Goods LogPow = logarithm of the octanol/water partition coefficient MARPOL = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution) UN = United Nations

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

Exhibit 7. ERG Guide 115

The documentation includes a copy of the cover of the 2016 ERG, and the pages of Guide 115, as included in the 2016 ERG.

A guidebook intended for use by first responders during the initial phase of a **transportation incident involving dangerous goods/hazardous materials**

2016

EMERGENCY RESPONSE GUIDEBOOK

U.S. Department of Transportation
Pipeline and Hazardous Materials Safety Administration

Transport Canada

Transports Canada

SCT
SECRETARÍA DE COMUNICACIONES Y TRANSPORTES

GUIDE 115 Gases - Flammable (Including Refrigerated Liquids)

POTENTIAL HAZARDS

FIRE OR EXPLOSION

- **EXTREMELY FLAMMABLE.**
- Will be easily ignited by heat, sparks or flames.
- Will form explosive mixtures with air.
- Vapors from liquefied gas are initially heavier than air and spread along ground.

CAUTION: Hydrogen (UN1049), Deuterium (UN1957), Hydrogen, refrigerated liquid (UN1966) and Methane (UN1971) are lighter than air and will rise. Hydrogen and Deuterium fires are difficult to detect since they burn with an invisible flame. Use an alternate method of detection (thermal camera, broom handle, etc.)

- Vapors may travel to source of ignition and flash back.
- Cylinders exposed to fire may vent and release flammable gas through pressure relief devices.
- Containers may explode when heated.
- Ruptured cylinders may rocket.

HEALTH

- Vapors may cause dizziness or asphyxiation without warning.
- Some may be irritating if inhaled at high concentrations.
- Contact with gas or liquefied gas may cause burns, severe injury and/or frostbite.
- Fire may produce irritating and/or toxic gases.

PUBLIC SAFETY

- **CALL EMERGENCY RESPONSE Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.**
- As an immediate precautionary measure, isolate spill or leak area for at least 100 meters (330 feet) in all directions.
- Keep unauthorized personnel away.
- Stay upwind, uphill and/or upstream.
- Many gases are heavier than air and will spread along ground and collect in low or confined areas (sewers, basements, tanks).

PROTECTIVE CLOTHING

- Wear positive pressure self-contained breathing apparatus (SCBA).
- Structural firefighters' protective clothing will only provide limited protection.
- Always wear thermal protective clothing when handling refrigerated/cryogenic liquids.

EVACUATION

Large Spill

- Consider initial downwind evacuation for at least 800 meters (1/2 mile).

Fire

- If tank, rail car or tank truck is involved in a fire, ISOLATE for 1600 meters (1 mile) in all directions; also, consider initial evacuation for 1600 meters (1 mile) in all directions.
- In fires involving Liquefied Petroleum Gases (LPG) (UN1075); Butane, (UN1011); Butylene, (UN1012); Isobutylene, (UN1055); Propylene, (UN1077); Isobutane, (UN1969); and Propane, (UN1978), also refer to BLEVE – SAFETY PRECAUTIONS (Page 368)

In Canada, an Emergency Response Assistance Plan (ERAP) may be required for this product. Please consult the shipping document and/or the ERAP Program Section (page 391).

EMERGENCY RESPONSE

FIRE

- **DO NOT EXTINGUISH A LEAKING GAS FIRE UNLESS LEAK CAN BE STOPPED.**

CAUTION: Hydrogen (UN1049), Deuterium (UN1957) and Hydrogen, refrigerated liquid (UN1966) burn with an invisible flame. Hydrogen and Methane mixture, compressed (UN2034) may burn with an invisible flame.

Small Fire

- Dry chemical or CO_2.

Large Fire

- Water spray or fog.
- Move containers from fire area if you can do it without risk.

Fire involving Tanks

- Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
- Cool containers with flooding quantities of water until well after fire is out.
- Do not direct water at source of leak or safety devices; icing may occur.
- Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
- ALWAYS stay away from tanks engulfed in fire.
- For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

SPILL OR LEAK

- ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
- All equipment used when handling the product must be grounded.
- Do not touch or walk through spilled material.
- Stop leak if you can do it without risk.
- If possible, turn leaking containers so that gas escapes rather than liquid.
- Use water spray to reduce vapors or divert vapor cloud drift. Avoid allowing water runoff to contact spilled material.
- Do not direct water at spill or source of leak.
- Prevent spreading of vapors through sewers, ventilation systems and confined areas.
- Isolate area until gas has dispersed.

CAUTION: When in contact with refrigerated/cryogenic liquids, many materials become brittle and are likely to break without warning.

FIRST AID

- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
- Move victim to fresh air.
- Call 911 or emergency medical service.
- Give artificial respiration if victim is not breathing.
- Administer oxygen if breathing is difficult.
- Remove and isolate contaminated clothing and shoes.
- Clothing frozen to the skin should be thawed before being removed.
- In case of contact with liquefied gas, thaw frosted parts with lukewarm water.
- In case of burns, immediately cool affected skin for as long as possible with cold water. Do not remove clothing if adhering to skin.
- Keep victim calm and warm.

Exhibit 8. Calculations of the Investigation[1]

Report § Equation Topic

§ 1.9.5 **Potential Impact Radius of the Area Proximate to the Release Site**

$PIR^2 = (0.69)\sqrt{(maop)(d^2)} = (0.69)\sqrt{(936)(30^2)} = 633.3$ feet

in which:

PIR = Potential Impact Radius[3], feet,
maop = maximum allowable operating pressure [in the pipeline segment], psi,
d = nominal pipeline diameter, inches.

§ 2.5.4 **Pipe Volumetric Calculation[4] of Pipeline Segments Between the Two Valve Stations[5]**

$V_N = (\pi)(r^2)\,Ln = (3.14)(1.219)^2(21{,}648) = 101{,}008$ cu. ft.

$V_S = (\pi)(r^2)\,Ls = (3.14)(1.219)^2(100{,}426) = 468{,}579$ cu. ft.

$V_T = Vn + Vs = 101{,}008 + 468{,}579 = 569{,}587$ cu. ft.

in which:

V_N = volume of pipeline 'northern' segment, in cubic feet (cu. ft.; i.e., ft^3)
V_S = volume of pipeline 'southern' segment, in cu. ft.
V_T = total volume of both ('northern' + 'southern') pipeline segments, in cu. ft.
r = nominal pipeline radius, in feet, = diameter ÷ 2,
= nominal pipeline [inside] diameter = 29.25 inches ÷ 2 = 14.625 inches
= 1.219 feet
Ln = length of pipe, between release site and valve station to the north, in feet,
= 4.10 miles x 5,280 feet/mile = 21,648 feet
Ls = length of pipe, between release site and valve station to the south, in feet,
= 19.02 miles x 5,280 feet/mile = 100,426 feet

-- End of Exhibit --

[1] i.e., calculations as performed by the author of this report.

[2] Equation source: as prescribed in 49 CFR 192.903(4)(c), within the definition of *Potential Impact Radius*.

[3] Ref., i.e., the "… radius of a circle within which the potential failure of a pipeline could have significant impact on people or property.", as cited in 49 CFR 192.903(4)(c), within the definition of *Potential Impact Radius*.

[4] Equation source: E. A. Avallone, and T. Baumeister III, Marks', Standard Handbook for Mechanical Engineers, 9th Edition, McGraw-Hill, 1986; section 2.1 Mathematics; [subsection] Geometry, Areas, and Volumes.

[5] This distance represents the maximum (total) approximate capacity of the pipeline, in cubic feet, between the two valve stations, as measured at 14.7 psia (pressure, absolute).

Exhibit 9. Enbridge Documentation of Estimated Product Release Data and Calculations

This Exhibit is comprised of a copy of documentation, as made available to the investigation by Enbridge, describing the calculations methodology detail and data of the estimated natural gas product release.[1, 2]

[1] Ref, email messages between the SF Group Chair, and the Enbridge Party - SF Group participant, dated 02/19 to 03/19/2020, inclusive, which was comprised of successive explanatory documentation transmittals, dated 02/24, 02/27 (which included an Excel spreadsheet, which was later converted to a .pdf), and 03/06/2020, respectively, each having a 'DR 114' [document identity] designation, culminating in transmittal of [Enbridge designated] DR 114 documentation, [titled] "Company Response to March 12, 2020, NTSB Follow-Up Request Concerning DR114, March 19, 2020", in an email dated 03/19/2020, which provided the resolution [methodology / data] of the calculations that addressed this topic-point, that document of which is included in this Exhibit.

[2] Note: the DR 114 documentation included in this Exhibit is provided verbatim (in its entirety), which includes select areas of yellow highlight (shading overlay), which were imprinted therein by the document originator.

COMPANY RESPONSE TO MARCH 12, 2020 NTSB FOLLOW-UP REQUEST CONCERNING DR114
March 19, 2020

NTSB Request [1] The Excel spreadsheet provided in Enbridge's most recent transmittal here [03/06/2020], needs to be converted to a pdf document (rather than the Excel format, as provided), in that, when attempting to printout that spreadsheet document, despite attempting printings in both a horizontal and vertical orientation, data of the document ends up being truncated (cutoff) in the printing process, in which also, it's suggested that the pdf document provided be proofread to assure that all of the 'truncated data' is actually included in the submitted pdf document (… as I attempted the pdf conversion, to find this 'non-truncation printing' effort a signif-challenge, where if not carefully checked, data is truncated).
Accordingly, this to afford Enbridge the opportunity to remedy this, such that the received spreadsheet document doesn't experience 'printability' issues.

Company Response: The excel spreadsheet has been converted into a PDF, a copy of which is enclosed. Given the size and complexity of the spreadsheets, the first two tabs are broken into 20 tabloid size pages to ensure that all formulas are visible.

NTSB Request [2] In Enbridge's most recent transmittal here [03/06/2020], the principal equation used in this calculation activity, is identified as the "Panhandle B" equation, as provided in Attachment 2 (i.e., included as a photocopy of a page from the publication "Gas Engineers Handbook", in which no publication date is cited). To this, research was conducted by the investigation, to identify other potential sources of the "Panhandle B" equation, such to 'reasonably vet' the calculation methodology / equations as were employed by Enbridge in this activity. From this, the investigation found that an equation by this exact title, which is described in the literature as being well-recognized in the transmission pipeline business, was located in a number of professional papers that had been published on this specific topic (i.e., calculation of volumetric product loss from a breached pipeline).

Copies of several of these located professional papers are attached for your convenience, in which also, Enbridge is welcome to locate other professional papers or studies that address the gas release dynamics as occurred in the accident, in which the equation is utilized.
Review of those located "Panhandle B" equations, as cited in the professional papers reviewed, indicated that a number of different versions of that equation were cited among the papers, which were comprised of different constants and variable factors, which appear to be due to considerations of … turbulence, transmission factors [for the specific application], isothermal steady-state flow, discharge coefficients, etc, etc.
Moreover, as a significant consideration here, the equation offered in Enbridge's transmittal, is sourced to the publication "Gas Engineers Handbook", in which no publication date is cited. With this, as the Gas Engineers Handbook has editions dating back to 1934, perhaps the equation offered was from an early edition, such that it's potentially 'out of date', and/or obsolete (for lack of a better explanation), in which more

current studies [professional papers] of this topic / gas flow phenomenon, offer a more accurate / more applicable version of the "Panhandle B" equation ?
Thus, this observation begs the obvious question … with multiple versions of the "Panhandle B" equation identified / available, where the Gas Engineers Handbook version of the "Panhandle B" equation, as offered to the investigation, may be obsolete / not the most applicable version to use (… relative to comparable equations as might be located in the current literature), what equation, or which version of same, would be the 'best fit' (i.e., the most applicable) to describe the gas release dynamics that occurred at the accident site ?
Accordingly, rather than take the Gas Engineers Handbook version of the "Panhandle B" equation at face value, where it might be later demonstrated that this equation was not the 'best fit', this to afford Enbridge the opportunity to delve into what might be the most applicable version of the "Panhandle B" equation, as potentially identified in equation(s) as cited in current studies [professional papers] that address this topic / gas flow phenomenon ? … or be it, as might be determined by assessment of the spectrum of available equations in this, the Gas Engineers Handbook version (as offered in Enbridge's most recent transmittal [03/06/2020]) ?

Company Response: A number of gas flow equations are available for calculating gas flow. It is important to note that these equations are theoretical, as they rely on calculations to provide a reasonable result. The fundamental difference among the available equations is based on the input variables, including pipe friction, and conditions existing in the pipeline system in which tests were conducted and the flow equation is developed. For example, the Panhandle B equation is named after the system previously known as Panhandle and was developed and tested under conditions existing on the Panhandle system. The availability of multiple equations does not mean that one is better than another, or that a newer equation is more "up to date" than an older equation; rather, an appropriate equation is chosen to best calculate gas loss for a particular pipeline system. The Company is comfortable that Panhandle B renders a good representation of its system, and provides a reasonable calculation of natural gas loss in this instance. Multiple sources as current as 2005 have utilized the Panhandle B equation for gas flow. Such sources include "The Gas Engineer Handbook", The Industrial Press, New York, New York, 1966; "Engineering Data Book", Gas Processors Suppliers Association, 1981; "Gas Pipeline Hydraulics", CRC Press, Boca Raton, Florida, 2005.

NTSB Request [3] In reviews of the explanatory narrative in, and data of Enbridge's most recent transmittal here [03/06/2020], although the 'pre-isolation …', and the 'post-isolation … total [gas] volume outflows' are mentioned, what's doesn't seem to be cogently described is the volumetric output flow rate of the product pumps, at both the north-end and the south-end pumping stations (i.e., on both sides of the breach), that was occurring …
[a] just prior to the pipeline breach, and
[b] immediately subsequent to the breach (i.e., up to the point in time that the block valves on both sides of the breach were closed), in which the south-end pump, of course, would be in 'draft' mode, commencing at that point in time, given the southbound flow.
If the data is included in the transmittal document, then it simply needs to be more distinctly described / annotated.

Accordingly, to help address this element (open question) of the equation factor(s), this to afford Enbridge the opportunity to document the specific data of volumetric output flow rate of the product pumps, at both the north-end and the south-end pumping stations (i.e., on both sides of the breach), that was occurring [a] just prior to the pipeline breach, and [b] immediately subsequent to the breach ?

Company Response: The Company does not believe that attempting to calculate volumetric output flow rate from the compressor stations adds any information that is necessary for calculating the amount of either: (i) the natural gas flow at the point of rupture; or (ii) the volume of natural gas lost due to the rupture. Mainline meters do not exist at either the Danville Compressor Station or the Tompkinsville Compressor Station to allow for a measurement of flow; accordingly, the flow rate would need to be calculated using similar theoretical equations that are already utilized as part of the Company's methodology to calculate the volume of gas released. In addition, Line 15 ran in common with two other lines in the same right-of-way; all three pipelines (inclusive of Line 15) were fed natural gas from the Danville Compressor Station flowing toward the Tompkinsville Compressor Station. Using a calculated volumetric output flow rate based on the Compressor stations that were operated in common with two pipelines adjacent to Line 15 merely adds variables and complexity without providing a more accurate gas loss volume. For these reasons, the Company believes that using volumetric output from compressor stations upstream, would complicate the calculation and result in less accurate determination of gas loss.

NTSB Request [4] The first two pages of Enbridge's most recent transmittal here [03/06/2020] contain an assemblage of narrative that includes the rambling history of data as submitted to the investigation. However, what was envisioned when this exercise was first proffered, was a simple, straight-forward document, compiled by Enbridge (engineering department / staff ?) that succinctly summarized the calculation methodology / equations as employed, to identify the volume of gas product as released in the accident. If it's Enbridge's preference to maintain this document as it currently stands, given the 'rambling history of data' cited, this 'history' will need to be annotated / explained to some degree in the SF Factual Report, so that the reader can attain a straight-forward understanding of what this transmittal is all about.
However, as a consideration, in which Enbridge might prefer to submit a document that better aligns with what was envisioned when this exercise was first proffered (… a simple, straight-forward document that succinctly summarizes the calculation methodology / equations as had been employed), this to afford Enbridge the opportunity to perhaps recraft / edit the first two pages of Enbridge's most recent transmittal here, such that the document content more closely aligns with what was envisioned in this exercise ?

Company Response: A succinct summary of the gas loss calculation methodology is as follows:

> Calculated volume of gas released following the rupture =
>
> The volume of gas released (Vs) can be calculated as gas flow rate (Qs) times the duration (t) [Vs = Qs x t].

Flow of Gas (Qs) is calculated by inputting the upstream pressure of the gas (P1) and the pressure of the gas at the rupture location (P2) into the Panhandle B pipeline flow equation.

The Panhandle B equation uses inputs of Upstream Pipeline Internal Pressure, Gas Temperature in Pipeline, Specific Gravity of Gas, Pipe Outside Diameter, Pipe Wall Thickness, Length of Line, Duration of Flow, Efficiency Factor for Friction Loss, Atmospheric Pressure (psia), Pressure Base (psia), and Temperature Base (converted to degrees R).

To determine P2, an additional equation based on critical flow is solved simultaneously with the Panhandle B equation. Once P2 is determined, that value can then be used to solve flow using Panhandle B.

The time element (t) is addressed in increments because flow rate changes over time; thus, the calculation is done in a stepped process to account for the passing of time and decreasing upstream pressures, and the incremental volumes are summed.

GAS LOSS DUE TO RUPTURE

Edits are in Yellow Highlight

Date: 08/01/19

Location: Danville Discharge Line 15

Line 15 Rupture Volume, Danville to Rupture Flowing West (Upstream to Downstream)

Input:

Po =	925	Upstream Pipeline Internal Pressure (psig)			This value represents the pressure upstream of rupture location. It is used to calculate Critical Pressure below.
To =	50	Gas Temperature in Pipeline (degrees F)			This value is used in various calculations below.
S.G. =	0.599	Specific Gravity of Gas			This value is used in various calculations below.
D =	30	Pipe Outside Diameter (inches)			This value is used in various calculations below.
t =	0.375	Pipe Wall Thickness (inches)			This value is used in various calculations below.
L =	4.1	Length of Line (miles)			This value represents the the length of pipe from rupture
Time =	1.00	Duration of Flow (minutes)			This value is used to calculate Average Volume Rate below.
Cd =	0.98	Efficiency Factor for Friction Loss			This value is used in various calculations below.
Pa =	14.7	Atmospheric Pressure (psia)			This value is used in various calculations below.
Pb =	14.73	Pressure Base (psia)			This value is used in various calculations below.
Tb =	60	Temperature Base (degrees F) =	519.67	degrees R	This value is calculated based on a conversion factor from degrees F to degrees R, and is used in various calculations below.

Calculated Values:

Downstream Press. =	0	psig		
Avg. Rupture Flow Rate, Q =	199,909	Mscfh		
======> GAS LOSS =	**33,318**	**Mscf**	3,332	Mscf based on average volume rate

Basis For Rupture Rate Calculation:

During a rupture, gas will exit the pipe at critical (sonic) velocity . Flow rate may be calulated using a standard gas flow formula based on, among other factors, friction loss and upstream and downstream pressures. However, downstream pressure (at the outlet) is usually unknown but is known to be limited by critical (sonic) velocity. The downstream pressure may be determined simultaneously solving flow equation based on friction loss (pressure drop) and critical (sonic) velocity. Once the downstream pressure has been determined, it can be substituted into either flow equation to determine flow rate.

Ft = Temperature Adjustment Factor = (519.67 deg. R)/Tc =	1.05	Calculated from Gas Temperature entered above - thie value is not used in calculations below.
gc = Gravity Constant = 32.2 lbm-ft / lbf-sec2		Entered constant - this value is used in calculations below.
k = Ratio of Specific Heats for Natural Gas =	1.31	Entered value used to calculate Rcp, Pc, Rct and Tc.
M = Molecular Mass of Natural Gas		
= S.G. * Molecular Mass of Air = S.G. * 28.9625 lbs/Mol) =	17.35	Calculated from specific gravity entered above - used in calculations below.
Pc = Critical Pressure = Rcp*(Po+Pa)	510.99	Calculated from Initial Upstream Pressure entered above - this value is not used in calculations below.
R = Universal Gas Constant = 1545 ft-lbf/Mol-deg.R		Entered constant - used in calculations below.
Rcp = Critical Pressure Ratio = [2/(k+1)]^k/(k-1) =	0.5439	Calculated from "k"- not used in calculations below.
Rct = Critical Temperature Ratio = 2/(k+1) =	0.8658	Calculated from "k"- not used in calculations below.
Tc = Critical Temperature = Rct*(To+459.67 deg.R) =	493.22	Calculated from Initial Gas Temperature entered above - this value is used in calculations below.
Vc = Critical (Sonic) Velocity = [k*gc*(R/M)*Tc]^0.5 =	1288	Calculated from various variables - thie value is used in calculations below. Also referred to below as "C" in Column R calculations.

Both Equations Below are solved Simultaneously to Determine Pressure at Rupture Si

Flow Calculation Based on Panhandle B Flow Equation for Transmission Pipelines Based on Known Pressure West of Rupture and Unknown Pressure at Rupture Site

Calculated from Time Increment x Flow Rate	Manually entered value	Calculated value	Manually entered value for each time incr. from the Press Sums Tab Column A	Calculated value	Calculated value B14 & B15	Calculated value B16	Entered value from B13	Calculated value B12	Compress. calculation.	Value used to calculate "S1" compress.	Portion of Flow Rate Calculation	Portion of Flow Rate Calculation (2)
Volume	Time Incr.	FLOW RATE	UPST. P.	DNST. P.	DIAMETER	LENGTH	SPECIFIC	FLOWING	COMPRESS.	AVG.		
Mscf	minutes	Mscfd	psia	psia	inches	miles	GRAVITY	TEMP.- R	FACTOR - Z	PRESS.		
2,891	1	4,163,281	925	19	29.250	4.10	0.599	510	0.90	617	742.967	742.967
Volume	Time Incr.	FLOW RATE	UPST. P.	DNST. P.	DIAMETER	LENGTH	SPECIFIC	FLOWING	COMPRESS.	AVG.		
Mscf	minutes	Mscfd	psia	psia	inches	miles	GRAVITY	TEMP.- R	FACTOR - Z	PRESS.		
2,518	1	3,625,755	812	17	29.250	4.10	0.599	510	0.91	542	566.564	566.564
Volume	Time Incr.	FLOW RATE	UPST. P.	DNST. P.	DIAMETER	LENGTH	SPECIFIC	FLOWING	COMPRESS.	AVG.		
Mscf	minutes	Mscfd	psia	psia	inches	miles	GRAVITY	TEMP.- R	FACTOR - Z	PRESS.		
2,481	1	3,572,330	801	16	29.250	4.10	0.599	510	0.91	534	550.311	550.311

Volume	Time Incr.	FLOW RATE	UPST. P.	DNST. P.	DIAMETER	LENGTH	SPECIFIC	FLOWING	COMPRESS.	AVG.		
Mscf	minutes	Mscfd	psia	psia	inches	miles	GRAVITY	TEMP.- R	FACTOR - Z	PRESS.		
2,423	1	3,488,783	784	16	29.250	4.10	0.599	510	0.91	523	525.359	525.359
Volume	Time Incr.	FLOW RATE	UPST. P.	DNST. P.	DIAMETER	LENGTH	SPECIFIC	FLOWING	COMPRESS.	AVG.		
Mscf	minutes	Mscfd	psia	psia	inches	miles	GRAVITY	TEMP.- R	FACTOR - Z	PRESS.		
2,406	1	3,464,819	779	16	29.250	4.10	0.599	510	0.92	519	518.306	518.306
Volume	Time Incr.	FLOW RATE	UPST. P.	DNST. P.	DIAMETER	LENGTH	SPECIFIC	FLOWING	COMPRESS.	AVG.		
Mscf	minutes	Mscfd	psia	psia	inches	miles	GRAVITY	TEMP.- R	FACTOR - Z	PRESS.		
2,373	1	3,416,941	768	16	29.250	4.10	0.599	510	0.92	512	504.356	504.356
Volume	Time Incr.	FLOW RATE	UPST. P.	DNST. P.	DIAMETER	LENGTH	SPECIFIC	FLOWING	COMPRESS.	AVG.		
Mscf	minutes	Mscfd	psia	psia	inches	miles	GRAVITY	TEMP.- R	FACTOR - Z	PRESS.		
2,344	1	3,375,323	760	15	29.250	4.10	0.599	510	0.92	507	492.382	492.382
Volume	Time Incr.	FLOW RATE	UPST. P.	DNST. P.	DIAMETER	LENGTH	SPECIFIC	FLOWING	COMPRESS.	AVG.		
Mscf	minutes	Mscfd	psia	psia	inches	miles	GRAVITY	TEMP.- R	FACTOR - Z	PRESS.		
2,321	1	3,342,589	753	15	29.250	4.10	0.599	510	0.92	502	483.062	483.062
Volume	Time Incr.	FLOW RATE	UPST. P.	DNST. P.	DIAMETER	LENGTH	SPECIFIC	FLOWING	COMPRESS.	AVG.		
Mscf	minutes	Mscfd	psia	psia	inches	miles	GRAVITY	TEMP.- R	FACTOR - Z	PRESS.		
2,304	1	3,317,839	747	15	29.250	4.10	0.599	510	0.92	498	476.074	476.074

Volume	Time Incr.	FLOW RATE	UPST. P.	DNST. P.	DIAMETER	LENGTH	SPECIFIC	FLOWING	COMPRESS.	AVG.		
Mscf	minutes	Mscfd	psia	psia	inches	miles	GRAVITY	TEMP.- R	FACTOR - Z	PRESS.		
2,283	1	3,287,808	741	15	29.250	4.10	0.599	510	0.92	494	467.661	467.661
Volume	Time Incr.	FLOW RATE	UPST. P.	DNST. P.	DIAMETER	LENGTH	SPECIFIC	FLOWING	COMPRESS.	AVG.		
Mscf	minutes	Mscfd	psia	psia	inches	miles	GRAVITY	TEMP.- R	FACTOR - Z	PRESS.		
2,265	1	3,261,331	735	15	29.250	4.10	0.599	510	0.92	490	460.305	460.305
Volume	Time Incr.	FLOW RATE	UPST. P.	DNST. P.	DIAMETER	LENGTH	SPECIFIC	FLOWING	COMPRESS.	AVG.		
Mscf	minutes	Mscfd	psia	psia	inches	miles	GRAVITY	TEMP.- R	FACTOR - Z	PRESS.		
2,247	1	3,235,757	730	15	29.250	4.10	0.599	510	0.92	487	453.255	453.255
Volume	Time Incr.	FLOW RATE	UPST. P.	DNST. P.	DIAMETER	LENGTH	SPECIFIC	FLOWING	COMPRESS.	AVG.		
Mscf	minutes	Mscfd	psia	psia	inches	miles	GRAVITY	TEMP.- R	FACTOR - Z	PRESS.		
2,231	1	3,212,842	725	15	29.250	4.10	0.599	510	0.92	484	446.982	446.982
Volume	Time Incr.	FLOW RATE	UPST. P.	DNST. P.	DIAMETER	LENGTH	SPECIFIC	FLOWING	COMPRESS.	AVG.		
Mscf	minutes	Mscfd	psia	psia	inches	miles	GRAVITY	TEMP.- R	FACTOR - Z	PRESS.		
2,231	1	3,212,842	725	15	29.250	4.10	0.599	510	0.92	484	446.982	446.982
Total Volume, Mscf	Total Time, minutes	Average Flow, Mscfh										
33,318	14	199,909										

Revisions:	
04/29/16	Updated formula.

te								
Flow Calculation Based on Critical Flow at Rupture Site								
Calculation for downstream pressure at Rupture	Downstream Pressure must be ≥ 14.7	Downstream Pressure must be ≤ Upstream Pressure	Critical flow calculation.	Critical flow calculation.	Compress. calculation.		Compress. calculation.	
DNST.			CRITICAL		SUPER.			
PRESS.			FLOW		FACTOR			
psia			Mscfd	Cd*A*C*Ft	S		1.110	S1 = Compressibility Ratio factor based on average gas parameters = (1/(1/(1+344400*Pf*10^(1.785*G)/(T+459.67)^3.825))) = 1/Z = (Fpv)^2
19.1	19.1	19.1	4,163,281	217,771	1.00		1.003	S2 = Compressibility Ratio factor based on downstream gas parameters = (1/(1/(1+344400*Pf*10^(1.785*G)/(T+459.67)^3.825))) = 1/Z = (Fpv)^2
PRESS.			FLOW		FACTOR			
psia			Mscfd	Cd*A*C*Ft	S		1.097	S1 = Compressibility Ratio factor based on average gas parameters = (1/(1/(1+344400*Pf*10^(1.785*G)/(T+459.67)^3.825))) = 1/Z = (Fpv)^2
16.6	16.6	16.6	3,625,755	217,771	1.00		1.003	S2 = Compressibility Ratio factor based on downstream gas parameters = (1/(1/(1+344400*Pf*10^(1.785*G)/(T+459.67)^3.825))) = 1/Z = (Fpv)^2
PRESS.			FLOW		FACTOR			
psia			Mscfd	Cd*A*C*Ft	S		1.095	S1 = Compressibility Ratio factor based on average gas parameters = (1/(1/(1+344400*Pf*10^(1.785*G)/(T+459.67)^3.825))) = 1/Z = (Fpv)^2
16.4	16.4	16.4	3,572,330	217,771	1.00		1.003	S2 = Compressibility Ratio factor based on downstream gas parameters = (1/(1/(1+344400*Pf*10^(1.785*G)/(T+459.67)^3.825))) = 1/Z = (Fpv)^2

PRESS.			FLOW		FACTOR			
psia			Mscfd	Cd*A*C*Ft	S		1.093	S1 = Compressibility Ratio factor based on average gas parameters = (1/(1/(1+344400*Pf*10^(1.785*G)/(T+459.67)^3.825))) = 1/Z = (Fpv)^2
16.0	16.0	16.0	3,488,783	217,771	1.00		1.003	S2 = Compressibility Ratio factor based on downstream gas parameters = (1/(1/(1+344400*Pf*10^(1.785*G)/(T+459.67)^3.825))) = 1/Z = (Fpv)^2
PRESS.			FLOW		FACTOR			
psia			Mscfd	Cd*A*C*Ft	S		1.093	S1 = Compressibility Ratio factor based on average gas parameters = (1/(1/(1+344400*Pf*10^(1.785*G)/(T+459.67)^3.825))) = 1/Z = (Fpv)^2
15.9	15.9	15.9	3,464,819	217,771	1.00		1.003	S2 = Compressibility Ratio factor based on downstream gas parameters = (1/(1/(1+344400*Pf*10^(1.785*G)/(T+459.67)^3.825))) = 1/Z = (Fpv)^2
PRESS.			FLOW		FACTOR			
psia			Mscfd	Cd*A*C*Ft	S		1.091	S1 = Compressibility Ratio factor based on average gas parameters = (1/(1/(1+344400*Pf*10^(1.785*G)/(T+459.67)^3.825))) = 1/Z = (Fpv)^2
15.6	15.6	15.6	3,416,941	217,771	1.00		1.003	S2 = Compressibility Ratio factor based on downstream gas parameters = (1/(1/(1+344400*Pf*10^(1.785*G)/(T+459.67)^3.825))) = 1/Z = (Fpv)^2
PRESS.			FLOW		FACTOR			
psia			Mscfd	Cd*A*C*Ft	S		1.090	S1 = Compressibility Ratio factor based on average gas parameters = (1/(1/(1+344400*Pf*10^(1.785*G)/(T+459.67)^3.825))) = 1/Z = (Fpv)^2
15.5	15.5	15.5	3,375,323	217,771	1.00		1.003	S2 = Compressibility Ratio factor based on downstream gas parameters = (1/(1/(1+344400*Pf*10^(1.785*G)/(T+459.67)^3.825))) = 1/Z = (Fpv)^2
PRESS.			FLOW		FACTOR			
psia			Mscfd	Cd*A*C*Ft	S		1.089	S1 = Compressibility Ratio factor based on average gas parameters = (1/(1/(1+344400*Pf*10^(1.785*G)/(T+459.67)^3.825))) = 1/Z = (Fpv)^2
15.3	15.3	15.3	3,342,589	217,771	1.00		1.003	S2 = Compressibility Ratio factor based on downstream gas parameters = (1/(1/(1+344400*Pf*10^(1.785*G)/(T+459.67)^3.825))) = 1/Z = (Fpv)^2
PRESS.			FLOW		FACTOR			
psia			Mscfd	Cd*A*C*Ft	S		1.089	S1 = Compressibility Ratio factor based on average gas parameters = (1/(1/(1+344400*Pf*10^(1.785*G)/(T+459.67)^3.825))) = 1/Z = (Fpv)^2
15.2	15.2	15.2	3,317,839	217,771	1.00		1.003	S2 = Compressibility Ratio factor based on downstream gas parameters = (1/(1/(1+344400*Pf*10^(1.785*G)/(T+459.67)^3.825))) = 1/Z = (Fpv)^2

PRESS.			FLOW		FACTOR			
psia			Mscfd	Cd*A*C*Ft	S		1.088	S1 = Compressibility Ratio factor based on average gas parameters = (1/(1/(1+344400*Pf*10^(1.785*G)/(T+459.67)^3.825))) = 1/Z = (Fpv)^2
15.1	15.1	15.1	3,287,808	217,771	1.00		1.003	S2 = Compressibility Ratio factor based on downstream gas parameters = (1/(1/(1+344400*Pf*10^(1.785*G)/(T+459.67)^3.825))) = 1/Z = (Fpv)^2
PRESS.			FLOW		FACTOR			
psia			Mscfd	Cd*A*C*Ft	S		1.087	S1 = Compressibility Ratio factor based on average gas parameters = (1/(1/(1+344400*Pf*10^(1.785*G)/(T+459.67)^3.825))) = 1/Z = (Fpv)^2
14.9	14.9	14.9	3,261,331	217,771	1.00		1.003	S2 = Compressibility Ratio factor based on downstream gas parameters = (1/(1/(1+344400*Pf*10^(1.785*G)/(T+459.67)^3.825))) = 1/Z = (Fpv)^2
PRESS.			FLOW		FACTOR			
psia			Mscfd	Cd*A*C*Ft	S		1.087	S1 = Compressibility Ratio factor based on average gas parameters = (1/(1/(1+344400*Pf*10^(1.785*G)/(T+459.67)^3.825))) = 1/Z = (Fpv)^2
14.8	14.8	14.8	3,235,757	217,771	1.00		1.003	S2 = Compressibility Ratio factor based on downstream gas parameters = (1/(1/(1+344400*Pf*10^(1.785*G)/(T+459.67)^3.825))) = 1/Z = (Fpv)^2
PRESS.			FLOW		FACTOR			
psia			Mscfd	Cd*A*C*Ft	S		1.086	S1 = Compressibility Ratio factor based on average gas parameters = (1/(1/(1+344400*Pf*10^(1.785*G)/(T+459.67)^3.825))) = 1/Z = (Fpv)^2
14.7	14.7	14.7	3,212,842	217,771	1.00		1.003	S2 = Compressibility Ratio factor based on downstream gas parameters = (1/(1/(1+344400*Pf*10^(1.785*G)/(T+459.67)^3.825))) = 1/Z = (Fpv)^2
PRESS.			FLOW		FACTOR			
psia			Mscfd	Cd*A*C*Ft	S		1.086	S1 = Compressibility Ratio factor based on average gas parameters = (1/(1/(1+344400*Pf*10^(1.785*G)/(T+459.67)^3.825))) = 1/Z = (Fpv)^2
14.7	14.7	14.7	3,212,842	217,771	1.00		1.003	S2 = Compressibility Ratio factor based on downstream gas parameters = (1/(1/(1+344400*Pf*10^(1.785*G)/(T+459.67)^3.825))) = 1/Z = (Fpv)^2

GAS LOSS DUE TO RUPTURE

Edits are in Yellow Highlight

Date:	08/01/19				
Location:	Danville Discharge Line 15				
	Line 15 Rupture Volume, MLV MP 408.08 to Rupture flowing East (Downstream to Upstream)				
Input:					
Po =	866	Upstream Pipeline Internal Pressure (psig)			This value represents the pressure upstream of rupture location. It is used to calculate Critical Pressure below.
To =	50	Gas Temperature in Pipeline (degrees F)			This value is used in various calculations below.
S.G. =	0.599	Specific Gravity of Gas			This value is used in various calculations below.
D =	30	Pipe Outside Diameter (inches)			This value is used in various calculations below.
t =	0.375	Pipe Wall Thickness (inches)			This value is used in various calculations below.
L =	14.92	Length of Line (miles)			This value represents the the length of pipe from rupture location to the point upsream where the pressure is obtained from SCADA. It is used in various calculations below.
Time =	53.00	Duration of Flow (minutes)			This value is used to calculate Average Volume Rate below.
Cd =	0.98	Efficiency Factor for Friction Loss			This value is used in various calculations below.
Pa =	14.7	Atmospheric Pressure (psia)			This value is used in various calculations below.
Pb =	14.73	Pressure Base (psia)			This value is used in various calculations below.
Tb =	60	Temperature Base (degrees F) =	519.67	degrees R	This value is calculated based on a conversion factor from degrees F to degrees R, and is used in various calculations below.
Calculated Values:					
Downstream Press. =	0	psig			
Avg. Rupture Flow Rate, Q =	26,061	Mscfh			
=====> GAS LOSS =	**55,384**	**Mscf**	23,021	Mscf based on average volume rate	

Basis For Rupture Rate Calculation:

During a rupture, gas will exit the pipe at critical (sonic) velocity . Flow rate may be calulated using a standard gas flow formula based on, among other factors, friction loss and upstream and downstream pressures. However, downstream pressure (at the outlet) is usually unknown but is known to be limited by critical (sonic) velocity. The downstream pressure may be determined simultaneously solving flow equation based on friction loss (pressure drop) and critical (sonic) velocity. Once the downstream pressure has been determined, it can be substituted into either

flow equation to determine flow rate.												
Ft = Temperature Adjustment Factor = (519.67 deg. R)/Tc =					1.05	Calculated from Gas Temperature entered above - thie value is not used in calculations below.						
gc = Gravity Constant = 32.2 lbm-ft / lbf-sec2						Entered constant - this value is used in calculations below.						
k = Ratio of Specific Heats for Natural Gas =					1.31	Entered value used to calculate Rcp, Pc, Rct and Tc.						
M = Molecular Mass of Natural Gas												
= S.G. * Molecular Mass of Air = S.G. * 28.9625 lbs/Mol) =					17.35	Calculated from specific gravity entered above - used in calculations below.						
Pc = Critical Pressure = Rcp*(Po+Pa)					479.04	Calculated from Initial Upstream Pressure entered above - this value is not used in calculations below.						
R = Universal Gas Constant = 1545 ft-lbf/Mol-deg.R						Entered constant - used in calculations below.						
Rcp = Critical Pressure Ratio = [2/(k+1)]^k/(k-1) =					0.5439	Calculated from "k"- not used in calculations below.						
Rct = Critical Temperature Ratio = 2/(k+1) =					0.8658	Calculated from "k"- not used in calculations below.						
Tc = Critical Temperature = Rct*(To+459.67 deg.R) =					493.22	Calculated from Initial Gas Temperature entered above - this value is used in calculations below.						
Vc = Critical (Sonic) Velocity = [k*gc*(R/M)*Tc]^0.5 =					1288	Calculated from various variables - thie value is used in calculations below. Also referred to below as "C" in Column R calculations.						
Both Equations Below are solved Simultaneously to Determine Pressure at Rupture Sit												
Flow Calculation Based on Panhandle B Flow Equation for Transmission Pipelines Based on Known Pressure East of Rupture and Unknown Pressure at Rupture Site												
Calculated from Time Increment x Flow Rate	Manually entered value	Calculated value	Manually entered value for each time incr. from the Press Sums Tab Column A	Calculated value	Calculated value B14 & B15	Calculated value B16	Entered value from B13	Calculated value B12	Compress. calculation.	Value used to calculate "S1" compress.	Portion of Flow Rate Calculation	Portion of Flow Rate Calculation (2)
Volume	Time Incr.	FLOW RATE	UPST. P.	DNST. P.	DIAMETER	LENGTH	SPECIFIC	FLOWING	COMPRESS.	AVG.		
Mscf	minutes	Mscfd	psia	psia	inches	miles	GRAVITY	TEMP.- R	FACTOR - Z	PRESS.		
11,164	8	2,009,512	866	15	29.250	14.92	0.599	510	0.91	578	178.108	178.108
Volume	Time Incr.	FLOW RATE	UPST. P.	DNST. P.	DIAMETER	LENGTH	SPECIFIC	FLOWING	COMPRESS.	AVG.		
Mscf	minutes	Mscfd	psia	psia	inches	miles	GRAVITY	TEMP.- R	FACTOR - Z	PRESS.		
16,556	15	1,589,378	695	15	29.250	14.92	0.599	510	0.92	463	112.448	112.448
Volume	Time Incr.	FLOW RATE	UPST. P.	DNST. P.	DIAMETER	LENGTH	SPECIFIC	FLOWING	COMPRESS.	AVG.		

Mscf	minutes	Mscfd	psia	psia	inches	miles	GRAVITY	TEMP.- R	FACTOR - Z	PRESS.		
14,277	15	1,370,586	604	15	29.250	14.92	0.599	510	0.93	403	84.107	84.107
Volume	Time Incr.	FLOW RATE	UPST. P.	DNST. P.	DIAMETER	LENGTH	SPECIFIC	FLOWING	COMPRESS.	AVG.		
Mscf	minutes	Mscfd	psia	psia	inches	miles	GRAVITY	TEMP.- R	FACTOR - Z	PRESS.		
13,388	15	1,285,202	568	15	29.250	14.92	0.599	510	0.94	379	74.141	74.141
Total Volume, Mscf	Total Time, minutes	Average Flow, Mscfh										
55,384	53	26,061										

				Revisions:				
				04/29/16	Updated formula.			

e								
Flow Calculation Based on Critical Flow at Rupture Site								
Calculation for downstream pressure at Rupture	Downstream Pressure must be ≥ 14.7	Downstream Pressure must be ≤ Upstream Pressure	Critical flow calculation.	Critical flow calculation.	Compress. calculation.		Compress. calculation.	
DNST.			CRITICAL		SUPER.			
PRESS.			FLOW		FACTOR			
psia			Mscfd	Cd*A*C*Ft	S		1.103	S1 = Compressibility Ratio factor based on average gas parameters = (1/(1/(1+344400*Pf*10^(1.785*G)/(T+459.67)^3.825))) = 1/Z = (Fpv)^2
9.2	14.7	14.7	3,209,612	217,771	1.00		1.003	S2 = Compressibility Ratio factor based on downstream gas parameters = (1/(1/(1+344400*Pf*10^(1.785*G)/(T+459.67)^3.825))) = 1/Z = (Fpv)^2
PRESS.			FLOW		FACTOR			
psia			Mscfd	Cd*A*C*Ft	S		1.083	S1 = Compressibility Ratio factor based on average gas parameters = (1/(1/(1+344400*Pf*10^(1.785*G)/(T+459.67)^3.825))) = 1/Z = (Fpv)^2
7.3	14.7	14.7	3,209,612	217,771	1.00		1.003	S2 = Compressibility Ratio factor based on downstream gas parameters = (1/(1/(1+344400*Pf*10^(1.785*G)/(T+459.67)^3.825))) = 1/Z = (Fpv)^2
PRESS.			FLOW		FACTOR			

psia			Mscfd	Cd*A*C*Ft	S		1.072	S1 = Compressibility Ratio factor based on average gas parameters = (1/(1/(1+344400*Pf*10^(1.785*G)/(T+459.67)^3.825))) = 1/Z = (Fpv)^2
6.3	14.7	14.7	3,209,612	217,771	1.00		1.003	S2 = Compressibility Ratio factor based on downstream gas parameters = (1/(1/(1+344400*Pf*10^(1.785*G)/(T+459.67)^3.825))) = 1/Z = (Fpv)^2
PRESS.			FLOW		FACTOR			
psia			Mscfd	Cd*A*C*Ft	S		1.068	S1 = Compressibility Ratio factor based on average gas parameters = (1/(1/(1+344400*Pf*10^(1.785*G)/(T+459.67)^3.825))) = 1/Z = (Fpv)^2
5.9	14.7	14.7	3,209,612	217,771	1.00		1.003	S2 = Compressibility Ratio factor based on downstream gas parameters = (1/(1/(1+344400*Pf*10^(1.785*G)/(T+459.67)^3.825))) = 1/Z = (Fpv)^2

Section		Time, CST	Pressure, psig
Line Pressure To/From CS-TOMP for Line 15 on CS-	2342	8/1/19 12:02 AM	923.813
Line Pressure To/From CS-TOMP for Line 15 on CS-	2343	8/1/19 12:03 AM	924
Line Pressure To/From CS-TOMP for Line 15 on CS-	2344	8/1/19 12:03 AM	923.625
Line Pressure To/From CS-TOMP for Line 15 on CS-	2345	8/1/19 12:03 AM	923.438
Line Pressure To/From CS-TOMP for Line 15 on CS-	2346	8/1/19 12:08 AM	923.813
Line Pressure To/From CS-TOMP for Line 15 on CS-	2347	8/1/19 12:08 AM	924
Line Pressure To/From CS-TOMP for Line 15 on CS-	2348	8/1/19 12:15 AM	924.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2349	8/1/19 12:16 AM	924.563
Line Pressure To/From CS-TOMP for Line 15 on CS-	2350	8/1/19 12:16 AM	924
Line Pressure To/From CS-TOMP for Line 15 on CS-	2351	8/1/19 12:18 AM	924.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2352	8/1/19 12:18 AM	924.563
Line Pressure To/From CS-TOMP for Line 15 on CS-	2353	8/1/19 12:21 AM	924
Line Pressure To/From CS-TOMP for Line 15 on CS-	2354	8/1/19 12:21 AM	924.375
Line Pressure To/From CS-TOMP for Line 15 on CS-	2355	8/1/19 12:22 AM	924.563
Line Pressure To/From CS-TOMP for Line 15 on CS-	2356	8/1/19 12:24 AM	924.75
Line Pressure To/From CS-TOMP for Line 15 on CS-	2357	8/1/19 12:24 AM	819.75
Line Pressure To/From CS-TOMP for Line 15 on CS-	2358	8/1/19 12:24 AM	819
Line Pressure To/From CS-TOMP for Line 15 on CS-	2359	8/1/19 12:24 AM	816
Line Pressure To/From CS-TOMP for Line 15 on CS-	2360	8/1/19 12:25 AM	812.438
Line Pressure To/From CS-TOMP for Line 15 on CS-	2361	8/1/19 12:25 AM	810.563
Line Pressure To/From CS-TOMP for Line 15 on CS-	2362	8/1/19 12:25 AM	807.938
Line Pressure To/From CS-TOMP for Line 15 on CS-	2363	8/1/19 12:25 AM	805.313
Line Pressure To/From CS-TOMP for Line 15 on CS-	2364	8/1/19 12:25 AM	803.25
Line Pressure To/From CS-TOMP for Line 15 on CS-	2365	8/1/19 12:25 AM	801.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2366	8/1/19 12:27 AM	783.563
Line Pressure To/From CS-TOMP for Line 15 on CS-	2367	8/1/19 12:27 AM	783.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2368	8/1/19 12:27 AM	781.125
Line Pressure To/From CS-TOMP for Line 15 on CS-	2369	8/1/19 12:27 AM	780
Line Pressure To/From CS-TOMP for Line 15 on CS-	2370	8/1/19 12:28 AM	778.5
Line Pressure To/From CS-TOMP for Line 15 on CS-	2371	8/1/19 12:28 AM	776.25
Line Pressure To/From CS-TOMP for Line 15 on CS-	2372	8/1/19 12:29 AM	768.375
Line Pressure To/From CS-TOMP for Line 15 on CS-	2373	8/1/19 12:29 AM	768
Line Pressure To/From CS-TOMP for Line 15 on CS-	2374	8/1/19 12:29 AM	766.5
Line Pressure To/From CS-TOMP for Line 15 on CS-	2375	8/1/19 12:29 AM	762.375
Line Pressure To/From CS-TOMP for Line 15 on CS-	2376	8/1/19 12:29 AM	761.813
Line Pressure To/From CS-TOMP for Line 15 on CS-	2377	8/1/19 12:29 AM	760.125
Line Pressure To/From CS-TOMP for Line 15 on CS-	2378	8/1/19 12:30 AM	759.563
Line Pressure To/From CS-TOMP for Line 15 on CS-	2379	8/1/19 12:30 AM	758.063
Line Pressure To/From CS-TOMP for Line 15 on CS-	2380	8/1/19 12:30 AM	757.313
Line Pressure To/From CS-TOMP for Line 15 on CS-	2381	8/1/19 12:30 AM	756.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2382	8/1/19 12:30 AM	754.875
Line Pressure To/From CS-TOMP for Line 15 on CS-	2383	8/1/19 12:30 AM	753.563
Line Pressure To/From CS-TOMP for Line 15 on CS-	2384	8/1/19 12:31 AM	752.625
Line Pressure To/From CS-TOMP for Line 15 on CS-	2385	8/1/19 12:31 AM	752.063
Line Pressure To/From CS-TOMP for Line 15 on CS-	2386	8/1/19 12:31 AM	750.938
Line Pressure To/From CS-TOMP for Line 15 on CS-	2387	8/1/19 12:31 AM	749.625

Line Pressure To/From CS-TOMP for Line 15 on CS-	2388	8/1/19 12:31 AM	748.5
Line Pressure To/From CS-TOMP for Line 15 on CS-	2389	8/1/19 12:31 AM	747.75
Line Pressure To/From CS-TOMP for Line 15 on CS-	2390	8/1/19 12:32 AM	747.375
Line Pressure To/From CS-TOMP for Line 15 on CS-	2391	8/1/19 12:32 AM	745.313
Line Pressure To/From CS-TOMP for Line 15 on CS-	2392	8/1/19 12:32 AM	744.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2393	8/1/19 12:32 AM	743.625
Line Pressure To/From CS-TOMP for Line 15 on CS-	2394	8/1/19 12:32 AM	742.875
Line Pressure To/From CS-TOMP for Line 15 on CS-	2395	8/1/19 12:32 AM	741.938
Line Pressure To/From CS-TOMP for Line 15 on CS-	2396	8/1/19 12:33 AM	741
Line Pressure To/From CS-TOMP for Line 15 on CS-	2397	8/1/19 12:33 AM	739.688
Line Pressure To/From CS-TOMP for Line 15 on CS-	2398	8/1/19 12:33 AM	739.125
Line Pressure To/From CS-TOMP for Line 15 on CS-	2399	8/1/19 12:33 AM	738.375
Line Pressure To/From CS-TOMP for Line 15 on CS-	2400	8/1/19 12:33 AM	737.625
Line Pressure To/From CS-TOMP for Line 15 on CS-	2401	8/1/19 12:33 AM	736.125
Line Pressure To/From CS-TOMP for Line 15 on CS-	2402	8/1/19 12:34 AM	735.375
Line Pressure To/From CS-TOMP for Line 15 on CS-	2403	8/1/19 12:34 AM	734.625
Line Pressure To/From CS-TOMP for Line 15 on CS-	2404	8/1/19 12:34 AM	733.875
Line Pressure To/From CS-TOMP for Line 15 on CS-	2405	8/1/19 12:34 AM	733.125
Line Pressure To/From CS-TOMP for Line 15 on CS-	2406	8/1/19 12:34 AM	732.375
Line Pressure To/From CS-TOMP for Line 15 on CS-	2407	8/1/19 12:34 AM	731.063
Line Pressure To/From CS-TOMP for Line 15 on CS-	2408	8/1/19 12:35 AM	729.938
Line Pressure To/From CS-TOMP for Line 15 on CS-	2409	8/1/19 12:35 AM	729.375
Line Pressure To/From CS-TOMP for Line 15 on CS-	2410	8/1/19 12:35 AM	727.875
Line Pressure To/From CS-TOMP for Line 15 on CS-	2411	8/1/19 12:36 AM	725.063
Line Pressure To/From CS-TOMP for Line 15 on CS-	2412	8/1/19 12:37 AM	725.063
Line Pressure To/From CS-TOMP for Line 15 on CS-	2413	8/1/19 12:37 AM	719.063
Line Pressure To/From CS-TOMP for Line 15 on CS-	2414	8/1/19 12:38 AM	718.688
Line Pressure To/From CS-TOMP for Line 15 on CS-	2415	8/1/19 12:39 AM	260.625
Line Pressure To/From CS-TOMP for Line 15 on CS-	2416	8/1/19 12:39 AM	235.125
Line Pressure To/From CS-TOMP for Line 15 on CS-	2417	8/1/19 12:39 AM	209.438
Line Pressure To/From CS-TOMP for Line 15 on CS-	2418	8/1/19 12:39 AM	186.375
Line Pressure To/From CS-TOMP for Line 15 on CS-	2419	8/1/19 12:39 AM	165.75
Line Pressure To/From CS-TOMP for Line 15 on CS-	2420	8/1/19 12:39 AM	146.813
Line Pressure To/From CS-TOMP for Line 15 on CS-	2421	8/1/19 12:40 AM	130.313
Line Pressure To/From CS-TOMP for Line 15 on CS-	2422	8/1/19 12:40 AM	115.125
Line Pressure To/From CS-TOMP for Line 15 on CS-	2423	8/1/19 12:40 AM	102
Line Pressure To/From CS-TOMP for Line 15 on CS-	2424	8/1/19 12:40 AM	90.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2425	8/1/19 12:40 AM	79.5
Line Pressure To/From CS-TOMP for Line 15 on CS-	2426	8/1/19 12:40 AM	69.375
Line Pressure To/From CS-TOMP for Line 15 on CS-	2427	8/1/19 12:41 AM	61.125
Line Pressure To/From CS-TOMP for Line 15 on CS-	2428	8/1/19 12:41 AM	53.25
Line Pressure To/From CS-TOMP for Line 15 on CS-	2429	8/1/19 12:41 AM	46.688
Line Pressure To/From CS-TOMP for Line 15 on CS-	2430	8/1/19 12:41 AM	40.313
Line Pressure To/From CS-TOMP for Line 15 on CS-	2431	8/1/19 12:41 AM	35.25
Line Pressure To/From CS-TOMP for Line 15 on CS-	2432	8/1/19 12:41 AM	30.375
Line Pressure To/From CS-TOMP for Line 15 on CS-	2433	8/1/19 12:42 AM	25.875
Line Pressure To/From CS-TOMP for Line 15 on CS-	2434	8/1/19 12:42 AM	21.938
Line Pressure To/From CS-TOMP for Line 15 on CS-	2435	8/1/19 12:42 AM	18.563

Line Pressure To/From CS-TOMP for Line 15 on CS-	2436	8/1/19 12:42 AM	15.563
Line Pressure To/From CS-TOMP for Line 15 on CS-	2437	8/1/19 12:42 AM	13.125
Line Pressure To/From CS-TOMP for Line 15 on CS-	2438	8/1/19 12:42 AM	10.313
Line Pressure To/From CS-TOMP for Line 15 on CS-	2439	8/1/19 12:43 AM	8.25
Line Pressure To/From CS-TOMP for Line 15 on CS-	2440	8/1/19 12:43 AM	6.375
Line Pressure To/From CS-TOMP for Line 15 on CS-	2441	8/1/19 12:43 AM	4.875
Line Pressure To/From CS-TOMP for Line 15 on CS-	2442	8/1/19 12:43 AM	3.563
Line Pressure To/From CS-TOMP for Line 15 on CS-	2443	8/1/19 12:43 AM	2.813
Line Pressure To/From CS-TOMP for Line 15 on CS-	2444	8/1/19 12:43 AM	2.063
Line Pressure To/From CS-TOMP for Line 15 on CS-	2445	8/1/19 12:44 AM	1.313
Line Pressure To/From CS-TOMP for Line 15 on CS-	2446	8/1/19 12:44 AM	0.563
Line Pressure To/From CS-TOMP for Line 15 on CS-	2447	8/1/19 12:44 AM	0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2448	8/1/19 12:44 AM	0
Line Pressure To/From CS-TOMP for Line 15 on CS-	2449	8/1/19 12:45 AM	0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2450	8/1/19 12:45 AM	0.563
Line Pressure To/From CS-TOMP for Line 15 on CS-	2451	8/1/19 12:45 AM	0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2452	8/1/19 12:45 AM	-0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2453	8/1/19 12:47 AM	0
Line Pressure To/From CS-TOMP for Line 15 on CS-	2454	8/1/19 12:48 AM	0.375
Line Pressure To/From CS-TOMP for Line 15 on CS-	2455	8/1/19 12:54 AM	-0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2456	8/1/19 12:54 AM	0
Line Pressure To/From CS-TOMP for Line 15 on CS-	2457	8/1/19 12:54 AM	0.375
Line Pressure To/From CS-TOMP for Line 15 on CS-	2458	8/1/19 1:08 AM	0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2459	8/1/19 1:08 AM	0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2460	8/1/19 1:24 AM	0.375
Line Pressure To/From CS-TOMP for Line 15 on CS-	2461	8/1/19 1:24 AM	0.75
Line Pressure To/From CS-TOMP for Line 15 on CS-	2462	8/1/19 1:24 AM	0.375
Line Pressure To/From CS-TOMP for Line 15 on CS-	2463	8/1/19 1:25 AM	0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2464	8/1/19 1:29 AM	-0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2465	8/1/19 1:29 AM	-0.563
Line Pressure To/From CS-TOMP for Line 15 on CS-	2466	8/1/19 1:29 AM	0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2467	8/1/19 1:48 AM	-0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2468	8/1/19 1:48 AM	-0.375
Line Pressure To/From CS-TOMP for Line 15 on CS-	2469	8/1/19 1:48 AM	0
Line Pressure To/From CS-TOMP for Line 15 on CS-	2470	8/1/19 1:49 AM	0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2471	8/1/19 1:59 AM	-0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2472	8/1/19 2:00 AM	-0.375
Line Pressure To/From CS-TOMP for Line 15 on CS-	2473	8/1/19 2:00 AM	0
Line Pressure To/From CS-TOMP for Line 15 on CS-	2474	8/1/19 2:01 AM	0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2475	8/1/19 2:01 AM	0
Line Pressure To/From CS-TOMP for Line 15 on CS-	2476	8/1/19 2:01 AM	-0.375
Line Pressure To/From CS-TOMP for Line 15 on CS-	2477	8/1/19 2:01 AM	0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2478	8/1/19 2:02 AM	0
Line Pressure To/From CS-TOMP for Line 15 on CS-	2479	8/1/19 2:02 AM	-0.375
Line Pressure To/From CS-TOMP for Line 15 on CS-	2480	8/1/19 2:02 AM	0.375
Line Pressure To/From CS-TOMP for Line 15 on CS-	2481	8/1/19 2:02 AM	0
Line Pressure To/From CS-TOMP for Line 15 on CS-	2482	8/1/19 2:02 AM	-0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2483	8/1/19 2:10 AM	0

Line Pressure To/From CS-TOMP for Line 15 on CS-	2484	8/1/19 2:10 AM	0.375
Line Pressure To/From CS-TOMP for Line 15 on CS-	2485	8/1/19 2:11 AM	-0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2486	8/1/19 2:12 AM	0
Line Pressure To/From CS-TOMP for Line 15 on CS-	2487	8/1/19 2:13 AM	0.375
Line Pressure To/From CS-TOMP for Line 15 on CS-	2488	8/1/19 2:13 AM	0
Line Pressure To/From CS-TOMP for Line 15 on CS-	2489	8/1/19 2:13 AM	-0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2490	8/1/19 2:14 AM	0.375
Line Pressure To/From CS-TOMP for Line 15 on CS-	2491	8/1/19 2:15 AM	0
Line Pressure To/From CS-TOMP for Line 15 on CS-	2492	8/1/19 2:15 AM	-0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2493	8/1/19 2:17 AM	0
Line Pressure To/From CS-TOMP for Line 15 on CS-	2494	8/1/19 2:17 AM	0.375
Line Pressure To/From CS-TOMP for Line 15 on CS-	2495	8/1/19 2:17 AM	0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2496	8/1/19 2:18 AM	-0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2497	8/1/19 2:19 AM	0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2498	8/1/19 2:19 AM	0.375
Line Pressure To/From CS-TOMP for Line 15 on CS-	2499	8/1/19 2:19 AM	0
Line Pressure To/From CS-TOMP for Line 15 on CS-	2500	8/1/19 2:19 AM	-0.375
Line Pressure To/From CS-TOMP for Line 15 on CS-	2501	8/1/19 2:20 AM	0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2502	8/1/19 2:22 AM	-0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2503	8/1/19 2:22 AM	-0.375
Line Pressure To/From CS-TOMP for Line 15 on CS-	2504	8/1/19 2:23 AM	0
Line Pressure To/From CS-TOMP for Line 15 on CS-	2505	8/1/19 2:23 AM	0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2506	8/1/19 2:23 AM	-0.375
Line Pressure To/From CS-TOMP for Line 15 on CS-	2507	8/1/19 2:23 AM	0
Line Pressure To/From CS-TOMP for Line 15 on CS-	2508	8/1/19 2:23 AM	0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2509	8/1/19 2:29 AM	-0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2510	8/1/19 2:29 AM	-0.375
Line Pressure To/From CS-TOMP for Line 15 on CS-	2511	8/1/19 2:30 AM	0
Line Pressure To/From CS-TOMP for Line 15 on CS-	2512	8/1/19 2:30 AM	0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2513	8/1/19 2:35 AM	0
Line Pressure To/From CS-TOMP for Line 15 on CS-	2514	8/1/19 2:35 AM	-0.375
Line Pressure To/From CS-TOMP for Line 15 on CS-	2515	8/1/19 2:36 AM	0
Line Pressure To/From CS-TOMP for Line 15 on CS-	2516	8/1/19 2:37 AM	0.375
Line Pressure To/From CS-TOMP for Line 15 on CS-	2517	8/1/19 2:37 AM	-0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2518	8/1/19 2:39 AM	0.375
Line Pressure To/From CS-TOMP for Line 15 on CS-	2519	8/1/19 2:39 AM	0
Line Pressure To/From CS-TOMP for Line 15 on CS-	2520	8/1/19 2:39 AM	-0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2521	8/1/19 2:41 AM	0.375
Line Pressure To/From CS-TOMP for Line 15 on CS-	2522	8/1/19 2:42 AM	0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2523	8/1/19 2:43 AM	-0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2524	8/1/19 3:10 AM	0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2525	8/1/19 3:10 AM	0.375
Line Pressure To/From CS-TOMP for Line 15 on CS-	2526	8/1/19 3:10 AM	0
Line Pressure To/From CS-TOMP for Line 15 on CS-	2527	8/1/19 3:11 AM	-0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2528	8/1/19 3:18 AM	0
Line Pressure To/From CS-TOMP for Line 15 on CS-	2529	8/1/19 3:19 AM	0.375
Line Pressure To/From CS-TOMP for Line 15 on CS-	2530	8/1/19 3:19 AM	-0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2531	8/1/19 3:40 AM	0.188

Line Pressure To/From CS-TOMP for Line 15 on CS-	2532	8/1/19 3:40 AM	0.563
Line Pressure To/From CS-TOMP for Line 15 on CS-	2533	8/1/19 3:40 AM	-0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2534	8/1/19 3:41 AM	0.375
Line Pressure To/From CS-TOMP for Line 15 on CS-	2535	8/1/19 3:41 AM	0
Line Pressure To/From CS-TOMP for Line 15 on CS-	2536	8/1/19 3:42 AM	-0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2537	8/1/19 3:51 AM	0.375
Line Pressure To/From CS-TOMP for Line 15 on CS-	2538	8/1/19 3:51 AM	-0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2539	8/1/19 3:54 AM	0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2540	8/1/19 3:55 AM	-0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2541	8/1/19 3:56 AM	0
Line Pressure To/From CS-TOMP for Line 15 on CS-	2542	8/1/19 3:56 AM	0.375
Line Pressure To/From CS-TOMP for Line 15 on CS-	2543	8/1/19 3:57 AM	-0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2544	8/1/19 4:13 AM	0.563
Line Pressure To/From CS-TOMP for Line 15 on CS-	2545	8/1/19 4:13 AM	0
Line Pressure To/From CS-TOMP for Line 15 on CS-	2546	8/1/19 4:29 AM	-0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2547	8/1/19 4:31 AM	-0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2548	8/1/19 4:32 AM	0
Line Pressure To/From CS-TOMP for Line 15 on CS-	2549	8/1/19 4:32 AM	0
Line Pressure To/From CS-TOMP for Line 15 on CS-	2550	8/1/19 5:47 AM	0
Line Pressure To/From CS-TOMP for Line 15 on CS-	2551	8/1/19 5:47 AM	0
Line Pressure To/From CS-TOMP for Line 15 on CS-	2552	8/1/19 5:47 AM	-0.563
Line Pressure To/From CS-TOMP for Line 15 on CS-	2553	8/1/19 5:47 AM	-0.375
Line Pressure To/From CS-TOMP for Line 15 on CS-	2554	8/1/19 5:48 AM	0
Line Pressure To/From CS-TOMP for Line 15 on CS-	2555	8/1/19 5:49 AM	-0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2556	8/1/19 5:51 AM	-0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2557	8/1/19 5:55 AM	-0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2558	8/1/19 5:55 AM	0
Line Pressure To/From CS-TOMP for Line 15 on CS-	2559	8/1/19 5:57 AM	-0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2560	8/1/19 5:58 AM	0.375
Line Pressure To/From CS-TOMP for Line 15 on CS-	2561	8/1/19 5:58 AM	0
Line Pressure To/From CS-TOMP for Line 15 on CS-	2562	8/1/19 5:58 AM	-0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2563	8/1/19 6:02 AM	0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2564	8/1/19 6:03 AM	0
Line Pressure To/From CS-TOMP for Line 15 on CS-	2565	8/1/19 6:10 AM	-0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2566	8/1/19 6:10 AM	-0.563
Line Pressure To/From CS-TOMP for Line 15 on CS-	2567	8/1/19 6:11 AM	0
Line Pressure To/From CS-TOMP for Line 15 on CS-	2568	8/1/19 6:17 AM	0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2569	8/1/19 6:18 AM	0
Line Pressure To/From CS-TOMP for Line 15 on CS-	2570	8/1/19 6:24 AM	-0.563
Line Pressure To/From CS-TOMP for Line 15 on CS-	2571	8/1/19 6:24 AM	0
Line Pressure To/From CS-TOMP for Line 15 on CS-	2572	8/1/19 6:30 AM	-0.563
Line Pressure To/From CS-TOMP for Line 15 on CS-	2573	8/1/19 6:31 AM	0
Line Pressure To/From CS-TOMP for Line 15 on CS-	2574	8/1/19 6:34 AM	-0.375
Line Pressure To/From CS-TOMP for Line 15 on CS-	2575	8/1/19 6:34 AM	-0.563
Line Pressure To/From CS-TOMP for Line 15 on CS-	2576	8/1/19 6:35 AM	-0.375
Line Pressure To/From CS-TOMP for Line 15 on CS-	2577	8/1/19 6:35 AM	0
Line Pressure To/From CS-TOMP for Line 15 on CS-	2578	8/1/19 6:37 AM	-0.563
Line Pressure To/From CS-TOMP for Line 15 on CS-	2579	8/1/19 6:37 AM	0

Line Pressure To/From CS-TOMP for Line 15 on CS-	2580	8/1/19 6:45 AM	0
Line Pressure To/From CS-TOMP for Line 15 on CS-	2581	8/1/19 6:45 AM	0
Line Pressure To/From CS-TOMP for Line 15 on CS-	2582	8/1/19 6:57 AM	0
Line Pressure To/From CS-TOMP for Line 15 on CS-	2583	8/1/19 6:59 AM	-0.563
Line Pressure To/From CS-TOMP for Line 15 on CS-	2584	8/1/19 7:00 AM	-0.375
Line Pressure To/From CS-TOMP for Line 15 on CS-	2585	8/1/19 7:00 AM	0
Line Pressure To/From CS-TOMP for Line 15 on CS-	2586	8/1/19 7:13 AM	0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2587	8/1/19 7:13 AM	-0.563
Line Pressure To/From CS-TOMP for Line 15 on CS-	2588	8/1/19 7:14 AM	0
Line Pressure To/From CS-TOMP for Line 15 on CS-	2589	8/1/19 7:14 AM	-0.75
Line Pressure To/From CS-TOMP for Line 15 on CS-	2590	8/1/19 7:15 AM	0
Line Pressure To/From CS-TOMP for Line 15 on CS-	2591	8/1/19 7:15 AM	-0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2592	8/1/19 7:15 AM	-0.563
Line Pressure To/From CS-TOMP for Line 15 on CS-	2593	8/1/19 7:16 AM	0
Line Pressure To/From CS-TOMP for Line 15 on CS-	2594	8/1/19 7:18 AM	-0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2595	8/1/19 7:19 AM	-0.563
Line Pressure To/From CS-TOMP for Line 15 on CS-	2596	8/1/19 7:19 AM	-0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2597	8/1/19 7:20 AM	0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2598	8/1/19 7:21 AM	-0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2599	8/1/19 7:21 AM	-0.375
Line Pressure To/From CS-TOMP for Line 15 on CS-	2600	8/1/19 7:22 AM	0
Line Pressure To/From CS-TOMP for Line 15 on CS-	2601	8/1/19 7:23 AM	0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2602	8/1/19 7:23 AM	-0.375
Line Pressure To/From CS-TOMP for Line 15 on CS-	2603	8/1/19 7:23 AM	0.375
Line Pressure To/From CS-TOMP for Line 15 on CS-	2604	8/1/19 7:23 AM	-0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2605	8/1/19 7:50 AM	0
Line Pressure To/From CS-TOMP for Line 15 on CS-	2606	8/1/19 7:50 AM	0.563
Line Pressure To/From CS-TOMP for Line 15 on CS-	2607	8/1/19 7:51 AM	0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2608	8/1/19 7:51 AM	0
Line Pressure To/From CS-TOMP for Line 15 on CS-	2609	8/1/19 8:11 AM	-0.563
Line Pressure To/From CS-TOMP for Line 15 on CS-	2610	8/1/19 8:11 AM	0
Line Pressure To/From CS-TOMP for Line 15 on CS-	2611	8/1/19 8:15 AM	0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2612	8/1/19 8:15 AM	-0.563
Line Pressure To/From CS-TOMP for Line 15 on CS-	2613	8/1/19 8:15 AM	-0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2614	8/1/19 8:15 AM	0
Line Pressure To/From CS-TOMP for Line 15 on CS-	2615	8/1/19 8:25 AM	-0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2616	8/1/19 8:25 AM	-0.563
Line Pressure To/From CS-TOMP for Line 15 on CS-	2617	8/1/19 8:25 AM	0
Line Pressure To/From CS-TOMP for Line 15 on CS-	2618	8/1/19 8:58 AM	-0.563
Line Pressure To/From CS-TOMP for Line 15 on CS-	2619	8/1/19 8:59 AM	-0.375
Line Pressure To/From CS-TOMP for Line 15 on CS-	2620	8/1/19 8:59 AM	0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2621	8/1/19 9:00 AM	0
Line Pressure To/From CS-TOMP for Line 15 on CS-	2622	8/1/19 9:00 AM	-0.375
Line Pressure To/From CS-TOMP for Line 15 on CS-	2623	8/1/19 9:09 AM	-0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2624	8/1/19 9:09 AM	0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2625	8/1/19 9:12 AM	-0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2626	8/1/19 9:12 AM	-0.375
Line Pressure To/From CS-TOMP for Line 15 on CS-	2627	8/1/19 9:15 AM	0

Line Pressure To/From CS-TOMP for Line 15 on CS-	2628	8/1/19 9:15 AM	0.375
Line Pressure To/From CS-TOMP for Line 15 on CS-	2629	8/1/19 9:15 AM	0
Line Pressure To/From CS-TOMP for Line 15 on CS-	2630	8/1/19 9:16 AM	-0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2631	8/1/19 9:29 AM	0
Line Pressure To/From CS-TOMP for Line 15 on CS-	2632	8/1/19 9:29 AM	0.375
Line Pressure To/From CS-TOMP for Line 15 on CS-	2633	8/1/19 9:29 AM	-0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2634	8/1/19 9:37 AM	0.563
Line Pressure To/From CS-TOMP for Line 15 on CS-	2635	8/1/19 9:37 AM	-0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2636	8/1/19 9:40 AM	-0.75
Line Pressure To/From CS-TOMP for Line 15 on CS-	2637	8/1/19 9:40 AM	-0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2638	8/1/19 9:59 AM	0
Line Pressure To/From CS-TOMP for Line 15 on CS-	2639	8/1/19 10:00 AM	0.375
Line Pressure To/From CS-TOMP for Line 15 on CS-	2640	8/1/19 10:00 AM	-0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2641	8/1/19 10:45 AM	-0.375
Line Pressure To/From CS-TOMP for Line 15 on CS-	2642	8/1/19 10:45 AM	0.375
Line Pressure To/From CS-TOMP for Line 15 on CS-	2643	8/1/19 10:45 AM	0
Line Pressure To/From CS-TOMP for Line 15 on CS-	2644	8/1/19 10:45 AM	-0.188
Line Pressure To/From CS-TOMP for Line 15 on CS-	2645	8/1/19 10:52 AM	

Gas Pipeline Press for Line 15 on MR-70090	216	8/1/19 12:02 AM	866.144	
Gas Pipeline Press for Line 15 on MR-70090	217	8/1/19 12:17 AM	866.381	
Gas Pipeline Press for Line 15 on MR-70090	218	8/1/19 12:32 AM	694.903	694.903
Gas Pipeline Press for Line 15 on MR-70090	219	8/1/19 12:47 AM	604.047	604.047
Gas Pipeline Press for Line 15 on MR-70090	220	8/1/19 1:02 AM	568.28	
Gas Pipeline Press for Line 15 on MR-70090	221	8/1/19 1:17 AM	544.733	
Gas Pipeline Press for Line 15 on MR-70090	222	8/1/19 1:32 AM	643.865	
Gas Pipeline Press for Line 15 on MR-70090	223	8/1/19 1:47 AM	631.3	
Gas Pipeline Press for Line 15 on MR-70090	224	8/1/19 2:02 AM	628.028	
Gas Pipeline Press for Line 15 on MR-70090	225	8/1/19 2:17 AM	660.537	
Gas Pipeline Press for Line 15 on MR-70090	226	8/1/19 2:32 AM	684.356	
Gas Pipeline Press for Line 15 on MR-70090	227	8/1/19 2:47 AM	698.974	
Gas Pipeline Press for Line 15 on MR-70090	228	8/1/19 3:02 AM	698.555	
Gas Pipeline Press for Line 15 on MR-70090	229	8/1/19 3:17 AM	698.032	
Gas Pipeline Press for Line 15 on MR-70090	230	8/1/19 3:32 AM	698.115	
Gas Pipeline Press for Line 15 on MR-70090	231	8/1/19 3:47 AM	697.492	
Gas Pipeline Press for Line 15 on MR-70090	232	8/1/19 4:02 AM	698.024	
Gas Pipeline Press for Line 15 on MR-70090	233	8/1/19 4:17 AM	697.636	
Gas Pipeline Press for Line 15 on MR-70090	234	8/1/19 4:32 AM	697.409	
Gas Pipeline Press for Line 15 on MR-70090	235	8/1/19 5:58 AM	696.912	
Gas Pipeline Press for Line 15 on MR-70090	236	8/1/19 6:02 AM	696.464	
Gas Pipeline Press for Line 15 on MR-70090	237	8/1/19 6:47 AM	696.106	
Gas Pipeline Press for Line 15 on MR-70090	238	8/1/19 7:02 AM	695.853	
Gas Pipeline Press for Line 15 on MR-70090	239	8/1/19 7:32 AM	696.163	
Gas Pipeline Press for Line 15 on MR-70090	240	8/1/19 7:32 AM	696.407	
Gas Pipeline Press for Line 15 on MR-70090	241	8/1/19 7:47 AM	695.801	695.8925
Gas Pipeline Press for Line 15 on MR-70090	242	8/1/19 8:32 AM	695.984	
Gas Pipeline Press for Line 15 on MR-70090	243	8/1/19 8:47 AM	694.747	
Gas Pipeline Press for Line 15 on MR-70090	244	8/1/19 10:45 AM		

924.75
812.438
801.188
783.563
778.5
768.375
759.563
752.625
747.375
741
735.375
729.938
725.063
725.063
718.688

866.381
694.903
604.047
568.28
544.733
643.865
631.3
628.028
660.537
684.356
698.974

Exhibit 10. Accident Site Properties Acquired by Enbridge

This Exhibit is comprised of a copy of documentation, as made available to the investigation by Enbridge, describing the accident site properties that were acquired by Enbridge as a result of the accident.

Texas Eastern Transmission, LP

Lincoln County Incident

Texas Eastern Transmission, LP - 2019 Lincoln County, Kentucky Incident

Parcel Number	Damaged?	Purchased by TETLP Following Incident?	Description of Damage
1	No	No	Vacant/Undeveloped
2	Yes	No	Flying debris damaged vinyl siding and heat singed the yard.
3	No	Yes	No damage identified.
4	Yes	Yes	Total loss
5	Yes	No	Total loss
6	Yes	No	Total loss
6.5	No	Yes	Vacant/Undeveloped
7	Yes	Yes	Flying debris and heat damaged aluminum siding and scorched yard.
8	Yes	Yes	Flying debris and heat damaged vinyl siding, the concussive impact separated the center seam of the interior and damaged drywall tape and heat singed the yard.
9	Yes	No	Flying debris and heat damaged vinyl siding, hot rocks punctured the roof, the concussive impact cracked the ceiling and heat singed the yard.
10	No	No	Vacant/Undeveloped
11	No	No	Vacant/Undeveloped
12	No	No	Vacant/Undeveloped
14	Yes	No	Total loss
15	Yes	No	Total loss
16	Yes	Yes	Total loss
17	Yes	Yes	Total loss
18	Yes	Yes	Flying debris and heat damaged vinyl siding, the concussive impact damaged drywall and heat singed the yard.
19	Yes	No	Unknown.
20	Yes	Yes	Flying rock made a gash in the roof, flying debris and heat damaged the vinyl siding and heat singed the yard.
21	Yes	Yes	Heat and flying debris damaged the roof, heat and flying debris damaged the vinyl siding and the concussive impact knocked interior items to the floor.
22	Yes	Yes	Flying rock damaged the roof and an interior ceiling, flying debris damaged a window and heat damaged the vinyl siding.
23	No	Yes	No damage identified.
24	Yes	No	Heat singed fence tops and damaged wire fence.
25	Yes	Yes	Flying rock damaged shingle rook, flying debris and heat damaged vinyl siding and heat singed the yard.

Texas Eastern Transmission, LP - 2019 Lincoln County, Kentucky Incident

Parcel Number	Damaged?	Purchased by TETLP Following Incident?	Description of Damage
26	Yes	Yes	Heat and percussion damaged the roof, heat damaged the vinyl siding, and a section of a wall bowed inward.
27	Yes	Yes	Flying debris and heat damaged exterior walls and windows.
28	Yes	No	Flying debris and heat damaged exterior walls and heat singed the yard.
29	Yes	Yes	Flying debris and concussive impact damaged the roof, flying debris and heat damaged the vinyl siding, the concussive impact separated the center seam of the interior and damaged drywall tape and heat singed the yard.
30	Yes	No	Flying debris damaged the metal roof and exterior walls.
31	Yes	No	Flying debris damaged the metal roof and exterior walls.
32	Yes	No	Flying debris damaged the metal roof and exterior walls.
33	Yes	No	Flying debris damaged the roof of main structure and greenhouses and the concussive force damaged the structure framing.

Exhibit 11. Meteorological Factors Data Documentation

The recorded weather[1] at the nearest National Weather Service weather station[2], for the date of the accident (August 1, 2019), was obtained by the investigation, the data documentation of which is provided in the following pages[3, 4].

[1] Data was obtained from the NOAA weather station located closest to the accident site that retained recorded data.

[2] Source: Quality Controlled Local Climatological Data, hourly, for the Stuart Powell Field Airport [near Junction City], KY; Network ID [NOAA weather station] US WBAN: 72044800144 (KDVK), located about 3.3 miles northeast of the accident site, of 01 Aug. 2019; source, and for additional data, see [Internet] https://www.ncdc.noaa.gov/cdo-web/datasets/LCD/stations/WBAN:00144/detail.

[3] Note - Local Climatological Data (LCD) Dataset Documentation, which provides a Legend of the abbreviations and acronym nomenclature used in the data tabulation of this Exhibit, is available at [Internet] https://www1.ncdc.noaa.gov/pub/data/cdo/documentation/LCD_documentation.pdf.

[4] Note – the time of the data observation (cited in the data tabulation) is given as a 4-digit number using a 24-hour clock in Local Standard Time (LST) (e.g. 1751 = 5:51 pm LST). No adjustments are made [by NOAA] to account for Daylight Savings Time (DST). Because the event occurred during DST, add one hour to the LST (cited in the data tabulation) to obtain the DST of the data.

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Current Location: Elev: 1024 ft. Lat: 37.5780° N Lon: -84.7700° W

Station: **STUART POWELL FIELD AIRPORT, KY US WBAN: 72044800144 (KDVK)**

Local Climatological Data
Hourly Observations
August 2019

Generated on 03/18/2020

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Date	Time (LST)	Station Type	Sky Conditions	Visibility	Weather Type (see documentation)	Dry Bulb Temp		Wet Bulb Temp		Dew Point Temp		Rel Hum %	Wind Speed (MPH)	Wind Dir (Deg)	Wind Gusts (MPH)	Station Press (inHg)	Press. Tend	Net 3-Hr Change (inHg)	Sea Level Press. (inHg)	Report Type	Precip Total (in)	Altimeter Setting (inHg)
					AU | AW | MW	(F)	(C)	(F)	(C)	(F)	(C)											
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
01	0015	7	CLR:00	10.00		64	17.8	64	17.8	64	17.8	100	0	000		29.01				FM-15		30.11
01	0035	7	CLR:00	10.00		66	18.9	65	18.3	64	17.8	94	3	360		29.01				FM-15		30.11
01	0055	7	CLR:00	10.00		68	20.0	65	18.3	64	17.8	88	0	000		29.01				FM-15		30.11
01	0115	7	CLR:00	10.00		68	20.0	65	18.3	64	17.8	88	0	000		29.01				FM-15		30.11
01	0135	7	CLR:00	10.00		68	20.0	65	18.3	64	17.8	88	0	000		29.01				FM-15		30.11
01	0155	7	CLR:00	7.00		66	18.9	65	18.3	64	17.8	94	3	350		29.00				FM-15		30.10
01	0215	7	CLR:00	10.00		66	18.9	65	18.3	64	17.8	94	0	000		29.00				FM-15		30.10
01	0235	7	CLR:00	10.00		66	18.9	65	18.3	64	17.8	94	0	000		29.00				FM-15		30.10
01	0255	7	BKN:07 3	0.75	BR:1 ||	64	17.8	64	17.8	64	17.8	100	0	000		29.00				FM-15		30.10
01	0315	7	SCT:04 3	10.00		64	17.8	64	17.8	64	17.8	100	0	000		29.00				FM-15		30.10
01	0335	7	CLR:00	7.00		64	17.8	64	17.8	64	17.8	100	0	000		29.00				FM-15		30.10
01	0355	7	CLR:00	3.00	BR:1 ||	64	17.8	63	17.2	63	17.2	94	0	000		29.00				FM-15		30.10
01	0415	7	CLR:00	10.00		63	17.2	63	17.2	63	17.2	100	0	000		28.99				FM-15		30.09
01	0435	7	CLR:00	4.00	BR:1 ||	63	17.2	62	16.7	61	16.1	94	0	000		29.00				FM-15		30.10
01	0455	7	CLR:00	2.50V	BR:1 ||	63	17.2	63	17.2	63	17.2	100	0	000		29.00				FM-15		30.10
01	0515	7	BKN:07 3	0.75V	BR:1 ||	63	17.2	63	17.2	63	17.2	100	3	360		29.00				FM-15		30.10
01	0535	7	SCT:04 3	7.00		63	17.2	63	17.2	63	17.2	100	0	000		29.01				FM-15		30.11
01	0555	7	CLR:00	4.00	BR:1 ||	64	17.8	63	17.2	63	17.2	94	3	350		29.02				FM-15		30.12
01	0615	7	CLR:00	7.00		64	17.8	64	17.8	64	17.8	100	0	000		29.02				FM-15		30.12
01	0635	7	CLR:00	7.00		64	17.8	64	17.8	64	17.8	100	0	000		29.02				FM-15		30.12
01	0655	7	CLR:00	7.00		66	18.9	66	18.9	66	18.9	100	0	000		29.03				FM-15		30.13
01	0715	7	CLR:00	10.00		68	20.0	67	19.4	66	18.9	94	0	000		29.03				FM-15		30.13
01	0735	7	CLR:00	10.00		68	20.0	65	18.3	64	17.8	88	0	000		29.04				FM-15		30.14
01	0755	7	SCT:04 70	10.00		70	21.1	67	19.4	66	18.9	88	0	000		29.04				FM-15		30.14
01	0815	7	SCT:04 70	10.00		72	22.2	69	20.6	68	20.0	88	0	000		29.04				FM-15		30.14
01	0835	7	CLR:00	10.00		73	22.8	70	21.1	68	20.0	83	3	170		29.04				FM-15		30.14
01	0855	7	SCT:04 70	10.00		73	22.8	70	21.1	68	20.0	83	0	000		29.04				FM-15		30.14
01	0915	7	CLR:00	10.00		77	25.0	72	22.2	70	21.1	79	3	120		29.04				FM-15		30.14
01	0935	7	CLR:00	10.00		79	26.1	73	22.8	70	21.1	74	0	000		29.04				FM-15		30.14
01	0955	7	CLR:00	10.00		81	27.2	74	23.3	70	21.1	70	3	120		29.05				FM-15		30.15
01	1015	7	BKN:07 50	10.00		81	27.2	74	23.3	70	21.1	70	3	180		29.05				FM-15		30.15
01	1035	7	OVC:08 50	10.00		82	27.8	73	22.8	68	20.0	62	0	000		29.05				FM-15		30.15
01	1055	4		10.00		81	27.2			68	20.0	66	3	110						FM-15		30.15
01	1115	7	SCT:04 37 SCT:04 55	10.00		82	27.8	71	21.7	66	18.9	58	5	030		29.05				FM-15		30.15
01	1135	7	SCT:04 39 BKN:07 46	10.00		86	30.0	74	23.3	68	20.0	55	3	100		29.05				FM-15		30.15
01	1155	4		10.00		84	28.9			66	18.9	55	6	350						FM-15		30.14
01	1215	7	SCT:04 38 BKN:07 44 OVC:08 50	10.00		82	27.8	70	21.1	64	17.8	55	3	360		29.04				FM-15		30.14
01	1235	7	SCT:04 42 BKN:07 48 BKN:07 60	10.00		82	27.8	70	21.1	64	17.8	55	3	070		29.04				FM-15		30.14
01	1255	4		10.00		86	30.0			64	17.8	49	5	040						FM-15		30.13
01	1315	7	SCT:04 41 BKN:07 49 BKN:07 55	10.00		81	27.2	71	21.7	66	18.9	62	7	010		29.03				FM-15		30.13

01	1335	7	SCT:04 47 BKN:07 55 OVC:08 95	10.00		82	27.8	71	21.7	66	18.9	58	5	030		29.02				FM-15		30.12
01	1355	4		10.00		84	28.9			64	17.8	51	6	060						FM-15		30.11
01	1415	7	SCT:04 49 SCT:04 60	10.00		86	30.0	71	21.7	64	17.8	49	6	090		29.00				FM-15		30.10
01	1435	7	SCT:04 60 SCT:04 85	10.00		82	27.8	70	21.1	64	17.8	55	5	050		29.00				FM-15		30.10
01	1455	4		10.00		86	30.0			64	17.8	49	5	350						FM-15		30.09
01	1515	7	SCT:04 60 SCT:04 75	10.00		86	30.0	71	21.7	64	17.8	49	3	010		28.99				FM-15		30.09
01	1535	7	SCT:04 75	10.00		86	30.0	71	21.7	64	17.8	49	6	010		28.98				FM-15		30.08
01	1555	4		10.00		86	30.0			64	17.8	49	7	010						FM-15		30.08
01	1615	7	SCT:04 65	10.00		84	28.9	71	21.7	64	17.8	51	5	020		28.97				FM-15		30.07
01	1635	7	SCT:04 65	10.00		86	30.0	71	21.7	64	17.8	49	3	040		28.97				FM-15		30.07
01	1655	7	CLR:00	10.00		86	30.0	71	21.7	64	17.8	49	5	040		28.97				FM-15		30.06
01	1715	7	CLR:00	10.00		86	30.0	71	21.7	64	17.8	49	5	030		28.97				FM-15		30.06
01	1735	7	CLR:00	10.00		84	28.9	71	21.7	64	17.8	51	5	060		28.97				FM-15		30.06
01	1755	7	SCT:04 55	10.00		82	27.8	70	21.1	64	17.8	55	3	060		28.97				FM-15		30.06
01	1815	7	SCT:04 65 BKN:07 100	10.00		81	27.2	70	21.1	64	17.8	58	0	000		28.97				FM-15		30.06
01	1835	7	SCT:04 50 SCT:04 65 OVC:08 90	10.00		82	27.8	70	21.1	64	17.8	55	0	000		28.97				FM-15		30.06
01	1855	7	SCT:04 50 SCT:04 65 OVC:08 90	10.00		81	27.2	71	21.7	66	18.9	62	3	050		28.97				FM-15		30.06
01	1915	7	SCT:04 90	10.00		79	26.1	70	21.1	66	18.9	65	0	000		28.97				FM-15		30.07
01	1930	7	SCT:04 70	10.00		79	26.1	70	21.1	66	18.9	65	3	060		28.97				FM-15		30.07
01	1955	7	SCT:04 70	10.00		75	23.9	69	20.6	66	18.9	74	3	060		28.97				FM-15		30.07
01	2015	7	CLR:00	10.00		73	22.8	68	20.0	66	18.9	78	0	000		28.98				FM-15		30.08
01	2035	7	CLR:00	10.00		72	22.2	67	19.4	64	17.8	78	0	000		28.99				FM-15		30.09
01	2055	7	CLR:00	10.00		72	22.2	67	19.4	64	17.8	78	0	000		28.99				FM-15		30.09
01	2115	7	CLR:00	10.00		72	22.2	67	19.4	64	17.8	78	0	000		29.00				FM-15		30.10
01	2135	7	CLR:00	10.00		72	22.2	67	19.4	64	17.8	78	0	000		29.00				FM-15		30.10
01	2155	7	CLR:00	10.00		70	21.1	66	18.9	64	17.8	83	0	000		29.00				FM-15		30.10
01	2215	7	CLR:00	10.00		70	21.1	66	18.9	64	17.8	83	0	000		29.00				FM-15		30.10
01	2235	7	CLR:00	10.00		70	21.1	66	18.9	64	17.8	83	0	000		29.00				FM-15		30.10
01	2255	7	CLR:00	10.00		70	21.1	66	18.9	64	17.8	83	0	000		29.00				FM-15		30.10
01	2315	7	CLR:00	10.00		68	20.0	65	18.3	64	17.8	88	0	000		29.00				FM-15		30.10
01	2335	7	CLR:00	10.00		68	20.0	65	18.3	64	17.8	88	0	000		29.00				FM-15		30.10
01	2355	7	CLR:00	10.00		66	18.9	65	18.3	64	17.8	94	0	000		29.00				FM-15		30.10

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Current Location: Elev: 1024 ft. Lat: 37.5780° N Lon: -84.7700° W

Station: **STUART POWELL FIELD AIRPORT, KY US WBAN: 72044800144 (KDVK)**

Local Climatological Data
Hourly Remarks
August 2019

Generated on 03/18/2020

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Date	Time (LST)	Remarks
01	0015	MET07308/01/19 00:15:02 METAR KDVK 010515Z 00000KT 10SM CLR 18/18 A3011 RMK AO2
01	0035	MET07308/01/19 00:35:02 METAR KDVK 010535Z 36003KT 10SM CLR 19/18 A3011 RMK AO2
01	0055	MET07308/01/19 00:55:02 METAR KDVK 010555Z 00000KT 10SM CLR 20/18 A3011 RMK AO2
01	0115	MET07308/01/19 01:15:02 METAR KDVK 010615Z 00000KT 10SM CLR 20/18 A3011 RMK AO2
01	0135	MET07308/01/19 01:35:02 METAR KDVK 010635Z 00000KT 10SM CLR 20/18 A3011 RMK AO2
01	0155	MET07208/01/19 01:55:02 METAR KDVK 010655Z 35003KT 7SM CLR 19/18 A3010 RMK AO2
01	0215	MET07308/01/19 02:15:02 METAR KDVK 010715Z 00000KT 10SM CLR 19/18 A3010 RMK AO2
01	0235	MET07308/01/19 02:35:02 METAR KDVK 010735Z 00000KT 10SM CLR 19/18 A3010 RMK AO2
01	0255	MET08008/01/19 02:55:02 METAR KDVK 010755Z 00000KT 3/4SM BR BKN003 18/18 A3010 RMK AO2
01	0315	MET07608/01/19 03:15:02 METAR KDVK 010815Z 00000KT 10SM SCT003 18/18 A3010 RMK AO2
01	0335	MET07208/01/19 03:35:02 METAR KDVK 010835Z 00000KT 7SM CLR 18/18 A3010 RMK AO2
01	0355	MET07508/01/19 03:55:02 METAR KDVK 010855Z 00000KT 3SM BR CLR 18/17 A3010 RMK AO2
01	0415	MET07308/01/19 04:15:02 METAR KDVK 010915Z 00000KT 10SM CLR 17/17 A3009 RMK AO2
01	0435	MET07508/01/19 04:35:02 METAR KDVK 010935Z 00000KT 4SM BR CLR 17/16 A3010 RMK AO2
01	0455	MET08708/01/19 04:55:02 METAR KDVK 010955Z 00000KT 2 1/2SM BR CLR 17/17 A3010 RMK AO2 VIS 1V5
01	0515	MET09008/01/19 05:15:02 METAR KDVK 011015Z 36003KT 3/4SM BR BKN003 17/17 A3010 RMK AO2 VIS 1/4V5
01	0535	MET07508/01/19 05:35:02 METAR KDVK 011035Z 00000KT 7SM SCT003 17/17 A3011 RMK AO2
01	0555	MET07508/01/19 05:55:02 METAR KDVK 011055Z 35003KT 4SM BR CLR 18/17 A3012 RMK AO2
01	0615	MET07208/01/19 06:15:02 METAR KDVK 011115Z 00000KT 7SM CLR 18/18 A3012 RMK AO2
01	0635	MET07208/01/19 06:35:02 METAR KDVK 011135Z 00000KT 7SM CLR 18/18 A3012 RMK AO2
01	0655	MET07208/01/19 06:55:02 METAR KDVK 011155Z 00000KT 7SM CLR 19/19 A3013 RMK AO2
01	0715	MET07308/01/19 07:15:02 METAR KDVK 011215Z 00000KT 10SM CLR 20/19 A3013 RMK AO2
01	0735	MET07308/01/19 07:35:02 METAR KDVK 011235Z 00000KT 10SM CLR 20/18 A3014 RMK AO2
01	0755	MET07608/01/19 07:55:02 METAR KDVK 011255Z 00000KT 10SM SCT070 21/19 A3014 RMK AO2
01	0815	MET07608/01/19 08:15:02 METAR KDVK 011315Z 00000KT 10SM SCT070 22/20 A3014 RMK AO2
01	0835	MET07308/01/19 08:35:02 METAR KDVK 011335Z 17003KT 10SM CLR 23/20 A3014 RMK AO2
01	0855	MET07608/01/19 08:55:02 METAR KDVK 011355Z 00000KT 10SM SCT070 23/20 A3014 RMK AO2
01	0915	MET07308/01/19 09:15:02 METAR KDVK 011415Z 12003KT 10SM CLR 25/21 A3014 RMK AO2
01	0935	MET07308/01/19 09:35:02 METAR KDVK 011435Z 00000KT 10SM CLR 26/21 A3014 RMK AO2
01	0955	MET07308/01/19 09:55:02 METAR KDVK 011455Z 12003KT 10SM CLR 27/21 A3015 RMK AO2
01	1015	MET07608/01/19 10:15:02 METAR KDVK 011515Z 18003KT 10SM BKN050 27/21 A3015 RMK AO2
01	1035	MET07608/01/19 10:35:02 METAR KDVK 011535Z 00000KT 10SM OVC050 28/20 A3015 RMK AO2
01	1055	MET064METAR KDVK 011555Z AUTO 11003KT 10SM SCT050 27/20 A3015 RMK AO2=
01	1115	MET08308/01/19 11:15:02 METAR KDVK 011615Z 03004KT 10SM SCT037 SCT055 28/19 A3015 RMK AO2
01	1135	MET08308/01/19 11:35:02 METAR KDVK 011635Z 10003KT 10SM SCT039 BKN046 30/20 A3015 RMK AO2
01	1155	MET071METAR KDVK 011655Z AUTO 35005KT 10SM SCT044 OVC050 29/19 A3014 RMK AO2=
01	1215	MET09008/01/19 12:15:02 METAR KDVK 011715Z 36003KT 10SM SCT038 BKN044 OVC050 28/18 A3014 RMK AO2
01	1235	MET09008/01/19 12:35:02 METAR KDVK 011735Z 07003KT 10SM SCT042 BKN048 BKN060 28/18 A3014 RMK AO2
01	1255	MET078METAR KDVK 011755Z AUTO 04004KT 10SM SCT065 SCT075 SCT090 30/18 A3013 RMK AO2=
01	1315	MET09008/01/19 13:15:02 METAR KDVK 011815Z 01006KT 10SM SCT041 BKN049 BKN055 27/19 A3013 RMK AO2
01	1335	MET09008/01/19 13:35:02 METAR KDVK 011835Z 03004KT 10SM SCT047 BKN055 OVC095 28/19 A3012 RMK AO2
01	1355	MET078METAR KDVK 011855Z AUTO 06005KT 10SM SCT049 SCT060 SCT070 29/18 A3011 RMK AO2=
01	1415	MET08308/01/19 14:15:02 METAR KDVK 011915Z 09005KT 10SM SCT049 SCT060 30/18 A3010 RMK AO2
01	1435	MET08308/01/19 14:35:02 METAR KDVK 011935Z 05004KT 10SM SCT060 SCT085 28/18 A3010 RMK AO2
01	1455	MET071METAR KDVK 011955Z AUTO 35004KT 10SM SCT060 SCT085 30/18 A3009 RMK AO2=
01	1515	MET08308/01/19 15:15:02 METAR KDVK 012015Z 01003KT 10SM SCT060 SCT075 30/18 A3009 RMK AO2
01	1535	MET07608/01/19 15:35:02 METAR KDVK 012035Z 01005KT 10SM SCT075 30/18 A3008 RMK AO2
01	1555	MET061METAR KDVK 012055Z AUTO 01006KT 10SM CLR 30/18 A3008 RMK AO2=
01	1615	MET07608/01/19 16:15:02 METAR KDVK 012115Z 02004KT 10SM SCT065 29/18 A3007 RMK AO2
01	1635	MET07608/01/19 16:35:02 METAR KDVK 012135Z 04003KT 10SM SCT065 30/18 A3007 RMK AO2

01	1655	MET07308/01/19 16:55:02 METAR KDVK 012155Z 04004KT 10SM CLR 30/18 A3006 RMK AO2
01	1715	MET07308/01/19 17:15:02 METAR KDVK 012215Z 03004KT 10SM CLR 30/18 A3006 RMK AO2
01	1735	MET07308/01/19 17:35:02 METAR KDVK 012235Z 06004KT 10SM CLR 29/18 A3006 RMK AO2
01	1755	MET07608/01/19 17:55:02 METAR KDVK 012255Z 06003KT 10SM SCT055 28/18 A3006 RMK AO2
01	1815	MET08308/01/19 18:15:02 METAR KDVK 012315Z 00000KT 10SM SCT065 BKN100 27/18 A3006 RMK AO2
01	1835	MET09008/01/19 18:35:02 METAR KDVK 012335Z 00000KT 10SM SCT050 SCT065 OVC090 28/18 A3006 RMK AO2
01	1855	MET09008/01/19 18:55:02 METAR KDVK 012355Z 05003KT 10SM SCT050 SCT065 OVC090 27/19 A3006 RMK AO2
01	1915	MET07608/01/19 19:15:01 METAR KDVK 020015Z 00000KT 10SM SCT090 26/19 A3007 RMK AO2
01	1930	MET07608/01/19 19:30:01 METAR KDVK 020030Z 06003KT 10SM SCT070 26/19 A3007 RMK AO2
01	1955	MET07608/01/19 19:55:01 METAR KDVK 020055Z 06003KT 10SM SCT070 24/19 A3007 RMK AO2
01	2015	MET07308/01/19 20:15:01 METAR KDVK 020115Z 00000KT 10SM CLR 23/19 A3008 RMK AO2
01	2035	MET07308/01/19 20:35:01 METAR KDVK 020135Z 00000KT 10SM CLR 22/18 A3009 RMK AO2
01	2055	MET07308/01/19 20:55:01 METAR KDVK 020155Z 00000KT 10SM CLR 22/18 A3009 RMK AO2
01	2115	MET07308/01/19 21:15:01 METAR KDVK 020215Z 00000KT 10SM CLR 22/18 A3010 RMK AO2
01	2135	MET07308/01/19 21:35:01 METAR KDVK 020235Z 00000KT 10SM CLR 22/18 A3010 RMK AO2
01	2155	MET07308/01/19 21:55:01 METAR KDVK 020255Z 00000KT 10SM CLR 21/18 A3010 RMK AO2
01	2215	MET07308/01/19 22:15:01 METAR KDVK 020315Z 00000KT 10SM CLR 21/18 A3010 RMK AO2
01	2235	MET07308/01/19 22:35:02 METAR KDVK 020335Z 00000KT 10SM CLR 21/18 A3010 RMK AO2
01	2255	MET07308/01/19 22:55:02 METAR KDVK 020355Z 00000KT 10SM CLR 21/18 A3010 RMK AO2
01	2315	MET07308/01/19 23:15:02 METAR KDVK 020415Z 00000KT 10SM CLR 20/18 A3010 RMK AO2
01	2335	MET07308/01/19 23:35:02 METAR KDVK 020435Z 00000KT 10SM CLR 20/18 A3010 RMK AO2
01	2355	MET07308/01/19 23:55:02 METAR KDVK 020455Z 00000KT 10SM CLR 19/18 A3010 RMK AO2

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Current Location: Elev: 1024 ft. Lat: 37.5780° N Lon: -84.7700° W

Station: **STUART POWELL FIELD AIRPORT, KY US WBAN: 72044800144 (KDVK)**

Local Climatological Data
Hourly Precipitation
August 2019

Generated on 03/18/2020

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Date	For Hour (LST) Ending at																							Date
	1 AM	2 AM	3 AM	4 AM	5 AM	6 AM	7 AM	8 AM	9 AM	10 AM	11 AM	NOON	1 PM	2 PM	3 PM	4 PM	5 PM	6 PM	7 PM	8 PM	9 PM	10 PM	11 PM	MID	
01	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	01
02	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	02
03	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	03
04	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	04
05	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	05
06	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	06
07	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	07
08	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	08
09	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	09
10	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	10
11	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	11
12	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	12
13	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	13
14	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	14
15	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	15
16	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	16
17	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	17
18	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	18
19	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	19
20	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	20
21	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	21
22	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	22
23	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	23
24	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	24
25	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	25
26	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	26
27	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	27
28	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	28
29	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	29
30	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	30
31	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	31

Maximum Short Duration Precipitation

Time Period (Minutes)	5	10	15	20	30	45	60	80	100	120	150	180
Precipitation (inches)												
Ending Date Time (yyyy-mm-dd hh:mi)												

Hourly, daily, and monthly totals on the Daily Summary page and the Hourly Precipitation Table are shown as reported by the instrumentation at the site. However, NWS does not edit hourly values for its ASOS sites, but may edit the daily and monthly totals for selected sites which will be reflected on the Daily Summary page.

T = Trace
s = Suspect
* = Erroneous
blank = No precipitation observed
M = Missing

Exhibit 12. Corrective Action Orders Issued by the PHMSA to Texas Eastern

This Exhibit is comprised of a copy of [an initial] Corrective Action Order (CAO), dated August 8, 2019, and an Amended CAO, dated April 28, 2020, both as obtained from the PHMSA.[1]

[1] The investigation observed that the subject documentation contained *personally identifiable information* (PII) (e.g., signatures, email addresses), in which, pursuant to NTSB investigative practice, this PII has been redacted in this copy of the documentation (see further [Internet] https://www.gsa.gov/reference/gsa-privacy-program/rules-and-policies-protecting-pii-privacy-act).

U.S. Department
of Transportation

Pipeline and Hazardous Materials
Safety Administration

AUG 0 8 2019

1200 New Jersey Ave., SE
Washington, DC 20590

CORRECTIVE ACTION ORDER
ISSUED WITHOUT PRIOR NOTICE

VIA CERTIFIED MAIL AND FAX TO: 403-231-3920

Mr. William T. Yardley
Executive VP and President
Gas Transmission and Midstream
Enbridge Inc.
1100 Louisiana Street, Suite 300
Houston, Texas 77002

Re: CPF No. 2-2019-1002H

Dear Mr. Yardley:

Enclosed is a Corrective Action Order issued in the above-referenced case to your subsidiary, Texas Eastern Transmission, LP, to take certain corrective actions with respect to Line 15, which failed on August 1, 2019, near Danville Kentucky, and the adjacent Lines 10 and 25. Service is being made by certified mail and facsimile. Service of the Corrective Action Order by electronic transmission is deemed complete upon transmission and acknowledgement of receipt, or as otherwise provided under 49 C.F.R. § 190.5. The terms and conditions of this Order are effective upon completion of service.

Thank you for your cooperation in this matter.

Sincerely,

[redacted]

Alan K. Mayberry
Associate Administrator
for Pipeline Safety

Enclosure

cc: Ms. Linda Daugherty, Deputy Associate Administrator for Field Operations, Office of Pipeline Safety, PHMSA
Mr. James Urisko, Director, Southern Region, Office of Pipeline Safety, PHMSA
Mr. Rick Kivela, Manager, Operational Compliance, Enbridge Inc.

U.S. DEPARTMENT OF TRANSPORTATION
PIPELINE AND HAZARDOUS MATERIALS SAFETY ADMINISTRATION
OFFICE OF PIPELINE SAFETY
WASHINGTON, D.C. 20590

In the Matter of	)	
Texas Eastern Transmission, LP, a subsidiary of Enbridge Inc.,	)	**CPF No. 2-2019-1002H**
Respondent.	)	

CORRECTIVE ACTION ORDER

Purpose and Background:

This Corrective Action Order (Order) is being issued under the authority of 49 U.S.C. § 60112, to require Texas Eastern Transmission, LP (TETLP or Respondent), to take the necessary corrective action to protect the public, property, and the environment from potential hazards associated with the recent gas transmission pipeline failure on TETLP's 30-inch Line 15 near Danville, Kentucky (Failure).

On August 1, 2019, an incident occurred on Line 15, resulting in the release of approximately 66 million cubic feet of natural gas, which ignited and resulted in the death of one person and the hospitalization of six others. The resulting fire also destroyed multiple structures and burned vegetation over approximately 30 acres of land. Pursuant to 49 U.S.C. § 60117, the Pipeline and Hazardous Materials Safety Administration (PHMSA), Office of Pipeline Safety (OPS), initiated an investigation of the accident. The National Transportation Safety Board (NTSB) is now leading the investigation. The preliminary findings of PHMSA's ongoing investigation are as follows.

Preliminary Findings:

- TETLP is a wholly-owned subsidiary of Spectra Energy Partners, LP, which is in turn a wholly-owned subsidiary of Enbridge Inc. (Enbridge), which is based in Calgary, Alberta, Canada.[1] TETLP operates an approximately 9,100-mile pipeline system, transporting natural gas from the northeastern United States to the Gulf Coast Region.

[1] Enbridge Inc. website, *available at* https://www.enbridge.com/~/media/Enb/Documents/Investor%20Relations/Texas%20Eastern%20Transmission/TETLP%20Q1%202019%20Financial%20Statements%20-%20Final.pdf?la=en (last accessed August 6, 2019).

- TETLP's system transports natural gas to and through Texas, Louisiana, the Gulf of Mexico, Mississippi, Arkansas, Missouri, Tennessee, Illinois, Indiana, Kentucky, Ohio, Pennsylvania, New Jersey, and New York.

- The failed pipeline (Line 15 or Affected Segment) is a component of the above-reference TETLP system. It is a 775-mile long, 30-inch diameter, bi-directional pipeline that transports natural gas between Kosciusko, Mississippi and Uniontown, Pennsylvania. Line 15 is one of three parallel TETLP pipelines running in a common corridor near the site of the Failure. The other two TETLP pipelines are the 30-inch Line 10 and the 30/36-inch Line 25. At the Failure Site, Line 15 is the middle of the three pipelines. The Failure occurred near MP 423.4, approximately 6 miles south of Danville, Kentucky (Failure Site), on the Danville to Tompkinsville portion of the Affected Segment.

- Line 15 was constructed beginning in 1942. The portion of Line 15 at the Failure Site consists of 0.375-inch wall thickness, American Petroleum Institute X-52 grade pipe, manufactured by A.O. Smith using flash welding, and is coated with coal tar enamel. The line is cathodically protected with impressed current.

- Line 15 is a bi-directional pipeline. The maximum allowable operating pressure (MAOP) of Line 15 is dependent on flow direction. When flowing south-to-north, the MAOP is 1000 psig, established as 76.92 percent of the specified minimum yield strength (SMYS) of Line 15. When flowing north-to-south, the MAOP is 936 psig, established as 72 percent of the SMYS. When first constructed, Line 15 flowed south-to-north. In 2014, TETLP reversed the flow to north-to-south. At the time of the Failure, Line 15 was flowing north-to-south and was operating at 925 psig.

- It is estimated that approximately 66 million cubic feet of natural gas was released by the Failure.

- The Failure occurred at approximately 1:24 a.m. EDT. At approximately 1:25 am, Enbridge's Gas Control in Houston, Texas, received a rate of change alarm on Line 15 on the south side of Danville Compressor Station and during the ensuing minutes, received reports from the public of a fire in the area south of Danville Compressor Station. A Danville Compressor Station operator also received a rate of change alarm and observed the rupture fire from the window of the compressor station control room. During the ensuing minutes, other Enbridge employees confirmed the reported fire, indicating the failure of Line 15.

- TETLP's Danville Compressor Station personnel closed the Line 15 discharge valve located north of the Failure Site. TETLP field personnel responded by closing the Line 15 Main Line Block Valve located at Valve Site #4 (MP 408.48), located south of the Failure Site. Following confirmation of the Failure, Enbridge further isolated a portion (Isolated Segment) of the Affected Segment by closing Valve 15-382 at MP 408.48 and Valve 15-393 at the Danville Compressor Station near MP 427.5. Enbridge also shut down and shut in Lines 10 and 25, which are blocked in between the Danville Compressor Station and the Tompkinsville Compressor Station.

- The Failure resulted in the ejection of an approximately 30-foot long section of Line 15, which landed approximately 460 feet from the Failure Site. Additionally, the Failure resulted in a 50-foot long, 35-foot wide, 13-foot deep crater at the Failure Site. Gas released from the Failure ignited, causing a fire that resulted in the death of one person, the hospitalization of six people, and the destruction of several nearby homes and other structures. Railroad tracks operated by Norfolk Southern Corporation (NSC) were also damaged by the fire. NSC temporarily suspended rail service through the area. The fire also scorched or burned approximately 30 acres of land, resulting in numerous burned trees and grass.

- Fire fighters from the Lincoln County were the first responders to arrive at the Failure Site. Other local fire departments responded to this event and evacuated approximately 75 people from the nearby Indian Camp subdivision. Casey County emergency medical services transported one injured person to Ephraim McDowell emergency medical center and Boyle County emergency medical services transported 2 injured persons to the same emergency medical center. Other injured persons were self-transported to medical centers.

- The Affected Segment contains an as-yet-to-be-determined amount of A.O. Smith-manufactured pipe of similar vintage and type to the pipe involved in the Failure. At this time, the actual cause of the Failure has not been determined. The origin of the Failure has been identified and the specimen pipe is under control of the NTSB. NTSB and PHMSA investigators are collecting information related to potential causal factors and circumstances that may have led to the Failure. The NTSB will conduct a metallurgical investigation to determine the exact cause.

- Lines 10 and 25 run on either side of Line 15 in the immediate vicinity of the Failure Site. At this time, the possibility of damage to Lines 10 and 25 from the concussive force of the Failure or of thermal damage from the resulting fire cannot be ruled out.

- On November 2, 2003, Line 15 failed at MP 501.72 near Morehead, Kentucky, between the Danville Compressor Station and the Owingsville Compressor Station to the north of the Danville Compressor Station. The 2003 failure also occurred on A.O. Smith-manufactured pipe, and resulted from interactions between hard spots and mid-wall lamination, and in PHMSA's predecessor agency issuing a Corrective Action Order to TETLP's predecessor entity on November 6, 2003, in CPF 2-2003-1018H.

- TETLP reported that it performed an in-line inspection (ILI) to detect hard spots on Line 15 in 2011. The company also reported that it ran an ILI with a magnetic flux leakage tool in 2018 and an ILI with a dent and inertial measurement unit tool in 2019. The 2018 tool data indicated a small dent with metal loss that did not require action under federal pipeline safety regulations or TETLP's procedures. The results of the 2019 ILIs have not yet been provided to PHMSA.

Determination of Necessity for Corrective Action Order and Right to Hearing:

Section 60112 of Title 49, United States Code, provides for the issuance of a Corrective Action Order, after reasonable notice and the opportunity for a hearing, requiring corrective action, which may include the suspended or restricted use of a pipeline facility, physical inspection, testing, repair, replacement, or other action, as appropriate. The basis for making the determination that a pipeline facility is or would be hazardous and requiring corrective action, is set forth both in the above-referenced statute and 49 C.F.R. § 190.233.

Section 60112 and the regulations promulgated thereunder provide for the issuance of a Corrective Action Order, without prior notice and opportunity for hearing, upon a finding that failure to issue the Order expeditiously would result in the likelihood of serious harm to life, property, or the environment. In such cases, an opportunity for a hearing and expedited review will be provided as soon as practicable after the issuance of the Order.

After evaluating the foregoing preliminary findings of fact, I find that continued operation of the Affected Segment and the two other adjacent TETLP pipelines, Line 10 and Line 25, without corrective measures is or would be hazardous to life, property, or the environment. The adjacent lines could potentially have been affected by the Failure and that, accordingly, should not be restarted without further investigation. At this time, the risk of concussive force or thermal damage to the adjacent lines cannot be ruled out. In addition, having considered the uncertainties of the cause of the Failure, the pressure at which gas is transported, the vintage and type of pipe, the risk of fire to the environment and populated areas in the vicinity of the Affected Segment, and the potential damage to the two adjacent TETLP pipelines, I find that a failure to issue this Order expeditiously to require immediate corrective action would result in the likelihood of serious harm to life, property, or the environment.

Accordingly, this Order mandating immediate corrective action is issued without prior notice and opportunity for a hearing. The terms and conditions of this Order are effective upon receipt.

Within 10 days of receipt of this Order, Respondent may contest its issuance and obtain expedited review either by answering in writing or requesting a hearing under 49 C.F.R. § 190.211, to be held as soon as practicable under the terms of such regulation, by notifying the Associate Administrator for Pipeline Safety in writing, with a copy to the Director, Eastern Region, PHMSA (Region Director). If Respondent requests a hearing, it will be held telephonically or in-person in Atlanta, Georgia, or Washington, D.C, unless a different location is expressly agreed-to in writing by the Director.

After receiving and analyzing additional data in the course of this investigation, PHMSA may identify other corrective measures that need to be taken on the Affected Segment or other pipelines in the TETLP system. In that event, PHMSA will notify Respondent of any additional measures that are required and an amended Order will be issued, if necessary. To the extent consistent with safety, Respondent will be afforded notice and an opportunity for a hearing prior to the imposition of any additional corrective measures.

Required Corrective Actions:

Definitions:

Affected Segment means the approximately 775-mile long, 30-inch diameter Line 15 that transports natural gas between Kosciusko, Mississippi and Uniontown, Pennsylvania.

Isolated Segment means the approximately 19 miles of the Affected Segment between the Danville Compressor Station at MP 427.5 and Valve 15-382 at MP 408.48. It is the portion of the Affected Segment that was shut-in after the Failure on August 1, 2019, by closing main-line valves upstream and downstream of the Failure Site and that remains shut-in as of the date of this Order.

Director means the Director, Southern Region, Office of Pipeline Safety, PHMSA.

Pursuant to 49 U.S.C. § 60112, I hereby order Texas Eastern Transmission, LP to immediately take the following corrective actions for the Affected Segment, Line 10, and Line 25:

1. ***Shutdown of Isolated Section.*** Texas Eastern Transmission, LP (TETLP) must not operate the Isolated Segment or Lines 10 and 25 until authorized to do so by the Director

2. ***Operating Pressure Restriction.*** With respect to the remainder of the Affected Segment not shut down under Item 1, above, TETLP must reduce and maintain a twenty percent (20%) pressure reduction in the actual operating pressure along the entire length of the Affected Segment such that the operating pressure along the Affected Segment will not exceed eighty percent (80%) of the actual operating pressure in effect immediately prior to the Failure.

   (A) This pressure restriction is to remain in effect until the Director provides written approval for TETLP to either increase the pressure or return the pipeline to its pre-Failure operating pressure.

   (B) By August 21, 2019, TETLP must provide the Director the actual operating pressures of each compressor station and each main line pressure regulating station on the Affected Segment at the time of Failure and the reduced pressure restriction set-points at these same locations.

   (C) This pressure restriction requires any relevant remote or local alarm limits, software programming set-points or control points, and mechanical over-pressure devices to be adjusted accordingly.

   (D) When determining the pressure restriction set-points, TETLP must take into account any ILI features or anomalies present in the Affected Segment to provide for continued safe operation while further corrective actions are completed.

(E) TETLP must review the pressure restriction monthly by analyzing the operating pressure data. TETLP must take into account any ILI features or anomalies present in the Affected Segment and immediately reduce the operating pressure to maintain the safe operations of the Affected Segment, if warranted by the monthly review. TETLP must submit the results of the monthly review to the Director. The results must include, at a minimum, the current discharge set-points (including any additional pressure reductions), and any pressure exceedance at discharge set-points.

3. ***Restart Plan.*** Prior to resuming operation of the Isolated Segment, TETLP must develop and submit a written Restart Plan to the Director for prior approval.

(A) The Director may approve the Restart Plan incrementally without approving the entire plan but the Isolated Segment cannot resume operation until the Restart Plan has been approved in its entirety.

(B) Once approved by the Director, the Restart Plan will be incorporated by reference into this Order.

(C) The Restart Plan must provide for adequate patrolling of the Isolated Segment during the restart process and must include incremental pressure increases during start up, with each increment to be held for at least two hours.

(D) The Restart Plan must include sufficient surveillance of the pipeline during each pressure-increase increment to ensure that no leaks are present when operation of the line resumes.

(E) The Restart Plan must specify a day-light restart and include advance communications with local emergency response officials.

(F) The Restart Plan must provide for a review of the Isolated Segment for conditions similar to those surrounding the Failure including a review of construction, operating and maintenance (O&M) and integrity management records such as ILI results, hydrostatic tests, root cause failure analysis of prior failures, aerial and ground patrols, corrosion, cathodic protection, excavations and pipe replacements. TETLP must address any findings that require remedial measures to be implemented prior to restart.

(G) The Restart Plan must also include documentation of the completion of all mandated actions, and a management of change plan to ensure that all procedural modifications are incorporated into TETLP's operations and maintenance procedures manual.

(H) Procedures for the exposure, testing, and repair of Line 15 must include:

i. Exposure of Line 15 extending for at least two girth welds on either side of the Failure Site to examine for corrosion, coating condition, concussive damage, and thermally-impacted areas. If damage to the exposed pipe is discovered, TETLP must expose additional pipe until at least 10 feet of

undamaged pipe is exposed and examined. TETLP must perform safe operating-pressure calculations and remediation for any anomalies or threat found, using permanent repair methods and design factors based upon 49 C.F.R. §§ 192.713 and 192.111 and using ASME/ANSI B31G or R STRENG methods. TETLP must repair or replace pipe or coating, as necessary. Upon completion of pipe replacement and repairs, TETLP must provide proper backfill and protection from stones and rocks, pursuant to procedures developed under this Order;

ii. Establishment of adequate cathodic protection for the area where the Failure occurred. TETLP must replace any damaged rectifier(s) and must re-establish the electrical test station at the railroad crossing. Once backfill and land settling have occurred, TETLP must ensure pipe-to-soil readings are within applicable criteria; and

iii. Development of additional requirements for remediation and the eventual restart for Line 15 as the investigation yields more information about the cause of the Failure and the condition of the Affected Segment.

(I) Procedures for the exposure, examination, remediation, and restart of Lines 10 and 25 must include:

i. Development of assessment, remediation, and restart plans that are aligned with the criteria show immediately below;

ii. Exposure of Lines 10 and 25, extending for at least two girth welds in both directions from the Failure location. TETLP must examine the girth welds and pipeline coating materials for damage caused by thermal and concussive forces. TETLP must continue a broader exposure of each line if associated damage is discovered, until 10 feet of undamaged pipe is reached and verified. Any needed repairs are to be guided by established Enbridge procedures and safe operating-pressure calculations and the remediation for any pits or other forms of anomalies found, using engineering permanent repair methods and design factors based upon 49 C.F.R. §§ 192.713 and 192.111 and using ASME/ANSI B31O or R-STRENG methods. TETLP must repair or replace pipe or coating, as necessary. Upon completion of pipe replacement and repairs, and provide proper backfill and protection from stones and rocks, all pursuant to Enbridge's established procedures;

iii. Restarts for each individual line in pressure-increase increments, at 25%, 50%, and 80%, with each increment held for at least one hour after pressure stabilization. After reaching 80% pressure, Respondent must obtain specific individual written approval from the Director to increase pressure to pre-Failure normal pressure. Respondent must obtain separate approval for each pipe (Lines 10 and 25) before increasing pressure to the final normal operating pressure; and

iv. A ground-level, instrumented leak survey on Lines 10 and 25, for a distance of two miles in both directions from the Failure Site. TETLP must investigate any elevated readings and make all appropriate repairs.

4. ***Return to Service.*** After the Director approves the Restart Plan, TETLP may return the Isolated Segment to service but the operating pressure must not exceed 80% of the actual operating pressure in effect immediately prior to the Failure, in accordance with Item 2 above.

5. ***Removal or Modification of Pressure Restriction.*** The pressure restriction required by the above Items may be removed or modified, as follows:

   (A) The Director may allow the removal or modification of the pressure restriction upon a written request from TETLP demonstrating that restoring the pipeline to its pre-Failure operating pressure is justified based on a reliable engineering analysis showing that the pressure increase is safe considering all known defects, anomalies, and operating parameters of the pipeline.

   (B) The Director may allow the temporary removal or modification of the pressure restrictions upon a written request from TETLP demonstrating that temporary mitigative and preventive measures are being implemented prior to and during the temporary removal or modification of the pressure restriction. The Director's determination will be based on the Failure cause and provision of evidence that preventive and mitigative actions taken by TETLP provide for the safe operation of the Affected Segment during the temporary removal or modification of the pressure restriction. Appeals to determinations of the Director in this regard will be decided by the Associate Administrator for Pipeline Safety.

6. ***Instrumented Leakage Survey.*** Within 180 days of receipt of this Order, TETLP must perform an aerial or ground instrumented leakage survey of the Affected Segment. TETLP must investigate all leak indications and remedy all leaks discovered. TETLP must submit documentation of this survey to the Director within 45 days of the completion of the leak survey.

7. ***Records Verification.*** As recommended in PHMSA Advisory Bulletin 2012-06, verify the records for the Affected Segment to confirm the maximum allowable operating pressure (MAOP). The Affected Segment is bi-directional with two different MAOPs. TETLP must confirm the MAOPs for both flow directions. TETLP must submit documentation of this records verification to the Director within 45 days of receipt of this Order.

8. ***Review of Prior ILI Results.*** Within 30 days of receipt of this Order, conduct a review of the previous ILI results of the Affected Segment. TETLP must re-evaluate all ILI results from the past 20 calendar years, include a review of the ILI vendors' raw data and analysis. TETLP must determine whether any features were present in the failed pipe joint and/or any other pipe removed. Also, TETLP must determine if any features are present elsewhere on the Affected Segment. TETLP must submit documentation of this ILI review to the Director within 45 days of receipt of this Order as follows:

(A) List all ILI tool runs, tool types, and the calendar years of the tool runs.

(B) List, describe (type, size, wall loss, etc.), and identify the specific location of all ILI features present in the failed joint and/or other pipe removed.

(C) Explain the process used to review the ILI results and the results of the reevaluation.

9. ***Mechanical and Metallurgical Testing.*** Mechanical and metallurgical testing, including failure analysis will be performed by the NTSB in accordance with NTSB procedures and protocols. In the event the NTSB does not perform these functions, TETLP will be responsible for completing all testing and analysis. If the NTSB does not perform the analysis, TETLP must submit to the Director for prior approval a plan to complete the testing and analysis.

10. ***Root Cause Failure Analysis.*** The NTSB will perform a root cause failure analysis (RCFA) to determine the cause of the Failure. TETLP must incorporate the findings the NTSB RCFA into its integrity management plan and operations and maintenance manual. If the NTSB does not perform these tasks, TETLP must submit to the Director for prior approval a plan to complete an RCFA.

11. ***Emergency Response Plan and Training Review.*** TETLP must review and assess the effectiveness of its emergency response plan and operational actions with regards to the Failure. TETLP must include in the review and assessment the on-scene response and support, coordination, and communication with emergency responders and public officials. Also, TETLP must include a review and assessment of the effectiveness of its emergency training program. TETLP must amend its emergency response plan and emergency training, if necessary, to reflect the results of this review. The documentation of this Emergency Response Plan and Training Review must be included in the CAO Documentation Report (see Item 14 for description of the CAO Documentation Report).

12. ***Public Awareness Program Review.*** TETLP must review and assess the effectiveness of its Public Awareness Program with regards to the Failure. TETLP must amend its Public Awareness Program, if necessary, to reflect the results of this review. The documentation of this Public Awareness Program Review must be provided to the Director.

13. Remedial Work Plan (RWP).

(A) Within 90 days following receipt of this Order, TETLP must submit a Remedial Work Plan (RWP) to the Director for approval.

(B) The Director may approve the RWP incrementally without approving the entire RWP.

(C) Once approved by the Director, the RWP will be incorporated by reference into this Order.

(D) The RWP must specify the tests, inspections, assessments, evaluations, and remedial measures TETLP will use to verify the integrity of the Affected

Segment. The RWP must address all known or suspected factors and causes of the Failure. TETLP should consider both the risks and consequences of another failure arising from the same root cause as the August 1, 2019 Failure to develop a prioritized schedule for RWP related work along the Affected Segment.

(E) The RWP must include a procedure or process to:

i. Identify pipe in the Affected Segment with characteristics similar to the contributing factors identified for the Failure.

ii. Gather all data necessary to review the failure history (in service and pressure test failures) of the Affected Segment and to prepare a written report containing all the available information such as the locations, dates, and causes of leaks and failures.

iii. Integrate the results and conclusions of the NTSB's metallurgical testing and RCFA, and other corrective actions required by this Order with all relevant pre-existing operational and assessment data for the Affected Segment. Pre-existing operational data includes, but is not limited to, construction, operations, maintenance, testing, repairs, prior metallurgical analyses, and any third-party consultation information. Pre-existing assessment data includes, but is not limited to, ILI tool runs, hydrostatic pressure testing, direct assessments, close interval surveys, and DCVG/ACVG surveys.

iv. Determine if conditions similar to those contributing to the Failure are likely to exist elsewhere on the Affected Segment.

v. Conduct additional field tests, inspections, assessments, and/or evaluations to determine whether, and to what extent, the conditions associated with the Failure, and other failures from the failure history (*see* Item 13(E)(ii), above) or any other integrity threats are present elsewhere on the Affected Segment. At a minimum, this process must consider all failure causes and specify the use of one or more of the following:

a. Inline inspection (ILI) tools that are technically appropriate for assessing the pipeline system based on the cause of Failure, and that can reliably detect and identify anomalies,

b. Hydrostatic pressure testing,

c. Close-interval surveys,

d. Cathodic protection surveys, to include interference surveys in coordination with other utilities (e.g. underground utilities, overhead power lines, etc.) in the area,

e. Coating surveys,

f. Stress corrosion cracking surveys,

g. Selective seam corrosion surveys; and,

h. Other tests, inspections, assessments, and evaluations appropriate for the failure causes.

Note: TETLP may use the results of previous tests, inspections, assessments, and evaluations if approved by the Director, provided the results of the tests, inspections, assessments, and evaluations are analyzed with regard to the factors known or suspected to have caused the Failure.

vi. Describe the inspection and repair criteria TETLP will use to prioritize, excavate, evaluate, and repair anomalies, imperfections, and other identified integrity threats. Include a description of how any defects will be graded and a schedule for repairs or replacement.

vii. Based on the known history and condition of the Affected Segment, describe the methods TETLP will use to repair, replace, or take other corrective measures to remediate the conditions associated with the pipeline Failure, and to address other known integrity threats along the Affected Segment. The repair, replacement, or other corrective measures must meet the criteria specified in Item 13(E)(iv), above.

viii. Implement continuing long-term periodic testing and integrity verification measures to ensure the ongoing safe operation of the Affected Segment considering the results of the analyses, inspections, evaluations, and corrective measures undertaken pursuant to the Order.

ix. Implement specific actions TETLP will take on its entire pipeline system as a result of the lessons learned from work on this Order. Incorporate lessons learned on TETLP's entire pipeline system. TETLP will report lessons learned in the CAO Documentation Report (see Item 14 for description of the CAO Documentation Report).

(F) TETLP must include a proposed schedule for completion of the RWP.

(G) TETLP must revise the RWP as necessary to incorporate new information obtained during the NTSB and PHMSA's failure investigation and remedial activities taken under this Order, to incorporate the results of actions undertaken pursuant to this Order, and/or to incorporate modifications required by the Director.

i. TETLP must submit any plan revisions to the Director for prior approval.

ii. The Director may approve plan revisions incrementally.

iii. Any and all revisions to the RWP after it has been approved and incorporated by reference into this Order will be fully described and documented in the CAO Documentation Report (CDR).

(H) Implement the RWP as it is approved by the Director, including any revisions to the plan.

14. ***CAO Documentation Report (CDR).*** TETLP must create and revise, as necessary, a CAO Documentation Report (CDR). When TETLP has concluded all the items in this Order it will submit the final CDR in its entirety to the Director. This will allow the Director to complete a thorough review of all actions taken by TETLP with regards to this Order prior to approving the closure of this Order. The intent is for the CDR to summarize all activities and documentation associated with this Order in one document.

(A) The Director may approve the CDR incrementally without approving the entire CDR.

(B) Once approved by the Director, the CDR will be incorporated by reference into this Order.

(C) The CDR must include but not be limited to:

i. Table of Contents;

ii. Summary of the pipeline Failure, and the response activities;

iii. Summary of pipe data/properties and all prior assessments of the Affected Segment;

iv. Summary of all tests, inspections, assessments, evaluations, and analysis required by the Order;

v. Summary of the Mechanical and Metallurgical Testing as required by the Order;

vi. Documentation of all actions taken by TETLP to implement the RWP, the results of those actions, and the inspection and repair criteria used;

vii. Documentation of any revisions to the RWP including those necessary to incorporate the results of actions undertaken pursuant to this Order and whenever necessary to incorporate new information obtained during the failure investigation and remedial activities;

viii. Lessons learned while completing this Order;

ix. A description of specific actions TETLP will take on its entire pipeline system as a result of the lessons learned from work on this Order; and

x. Appendices (if required).

Other Requirements:

1. ***Reporting.*** Submit monthly reports to the Region Director that: (1) include all available data and results of the testing and evaluations required by this Order; and (2) describe the progress of the repairs or other remedial actions being undertaken. The first monthly report for the period August 1 through August 31 is due on September 15, 2019. The Region Director may change the interval for the submission of these reports.

2. ***Documentation of Costs.*** It is requested but not required that Respondent maintain documentation of the costs associated with implementation of this Order. Include in each monthly report the to-date total costs associated with: (1) preparation and revision of procedures, studies and analyses; (2) physical changes to pipeline infrastructure, including repairs, replacements and other modifications; and (3) environmental remediation, if applicable.

3. ***Approvals.*** With respect to each submission requiring the approval of the Region Director, the Region Director may: (a) approve the submission in whole or in part; (b) approve the submission on specified conditions; (c) modify the submission to cure any deficiencies; (d) disapprove the submission in whole or in part and direct Respondent to modify the submission; or (e) any combination of the above. In the event of approval, approval upon conditions, or modification by the Region Director, Respondent shall proceed to take all action required by the submission, as approved or modified by the Region Director. If the Region Director disapproves all or any portion of a submission, Respondent must correct all deficiencies within the time specified by the Region Director and resubmit it for approval.

4. ***Extensions of Time.*** The Region Director may grant an extension of time for compliance with any of the terms of this Order upon a written request timely submitted and demonstrating good cause for an extension.

5. Be advised that all material you submit in response to this enforcement action is subject to being made publicly available. If you believe that any portion of your responsive material qualifies for confidential treatment under 5 U.S.C. § 552(b), along with the complete original document you must provide a second copy of the document with the portions you believe qualify for confidential treatment redacted and an explanation of why you believe the redacted information qualifies for confidential treatment under 5 U.S.C. § 552(b).

In your correspondence on this matter, please refer to "CPF No.2-2019-1002H" and for each document you submit, please provide a copy in electronic format whenever possible. The actions required by this Order are in addition to and do not waive any requirements that apply to Respondent's pipeline system under 49 C.F.R. Parts 190 through 199, under any other order issued to Respondent under authority of 49 U.S.C. Chapter 601, or under any other provision of Federal or State law.

Respondent may appeal any decision of the Region Director to the Associate Administrator for Pipeline Safety. Decisions of the Associate Administrator shall be final.

Failure to comply with this Order may result in the assessment of civil penalties and in referral to the Attorney General for appropriate relief in United States District Court pursuant to 49 U.S.C. § 60120.

The terms and conditions of this Corrective Action Order are effective upon service in accordance with 49 C.F.R. § 190.5.

[redacted]

Alan K. Mayberry
Associate Administrator
for Pipeline Safety

AUG 0 8 2019

Date Issued

U.S. Department
of Transportation
**Pipeline and Hazardous
Materials Safety
Administration**

1200 New Jersey Avenue, SE
Washington, DC 20590

AMENDED CORRECTIVE ACTION ORDER
ISSUED WITHOUT PRIOR NOTICE

VIA ELECTRONIC MAIL TO: william.yardley@enbridge.com

Mr. William T. Yardley
Executive Vice President and President
Gas Transmission and Midstream
Enbridge, Inc.
5400 Westheimer Court
Houston, Texas 77056

Re: CPF No. 2-2019-1002H

Dear Mr. Yardley:

Enclosed is an Amended Corrective Action Order issued in the above-referenced case to your subsidiary, Texas Eastern Transmission, LP. It requires certain corrective actions that need to be taken with respect to Line 15, which failed on August 1, 2019, near Danville, Kentucky. Service of the Amended Corrective Action Order by electronic mail is deemed complete upon transmission and acknowledgement of receipt, or as otherwise provided under 49 C.F.R. § 190.5. The terms and conditions of this Amended Order are effective upon completion of service.

Thank you for your cooperation in this matter.

Sincerely,

Alan K. Mayberry
Associate Administrator
for Pipeline Safety

Enclosure

cc: Ms. Linda Daugherty, Deputy Associate Administrator for Field Operations, Office of Pipeline Safety, PHMSA
Mr. James Urisko, Director, Southern Region, Office of Pipeline Safety, PHMSA
Mr. Rick Kivela, Manager, Operational Compliance, Enbridge, [redacted]
Ms. Catherine Little, Counsel, Troutman Sanders, LLP, [redacted]

CONFIRMATION OF RECEIPT REQUESTED

U.S. DEPARTMENT OF TRANSPORTATION
PIPELINE AND HAZARDOUS MATERIALS SAFETY ADMINISTRATION
OFFICE OF PIPELINE SAFETY
WASHINGTON, D.C. 20590

In the Matter of	)	
Texas Eastern Transmission, LP, a subsidiary of Enbridge, Inc.,	)	**CPF No. 2-2019-1002H**
Respondent.	)	

AMENDED CORRECTIVE ACTION ORDER

Purpose and Background:

This Amended Corrective Action Order (Amended Order) is being issued under the authority of 49 U.S.C. § 60112, to require Texas Eastern Transmission, LP (TETLP or Respondent), to take the necessary corrective action to protect the public, property, and the environment from potential hazards associated with the recent gas transmission pipeline failure on TETLP's 30-inch Line 15 near Danville, Kentucky (Failure).

On August 1, 2019, an incident occurred on Line 15, resulting in the release of approximately 66 million cubic feet of natural gas, which ignited and resulted in the death of one person and the hospitalization of six others. The resulting fire also destroyed multiple structures and burned vegetation over approximately 30 acres of land. Pursuant to 49 U.S.C. § 60117, the Pipeline and Hazardous Materials Safety Administration (PHMSA), Office of Pipeline Safety (OPS), initiated an investigation of the accident. The National Transportation Safety Board (NTSB) is now leading the investigation.

On August 8, 2019, PHMSA issued a Corrective Action Order to TETLP requiring it to take certain corrective actions with respect to Line 15 and the adjacent Lines 10 and 25.

The purpose of these amendments is to update the terms of the Order to address actions taken by TETLP in response to the August 8 Corrective Action Order.

The amended preliminary findings of PHMSA's ongoing investigation are as follows:

Amended Preliminary Findings:

- TETLP is a wholly-owned subsidiary of Spectra Energy Partners, LP, which is, in turn, a wholly-owned subsidiary of Enbridge, Inc. (Enbridge), which is based in Calgary,

Alberta, Canada.[1] TETLP operates an approximately 9,100-mile pipeline system, transporting natural gas from the northeastern United States to the Gulf Coast Region.

- TETLP's system transports natural gas to and through Texas, Louisiana, the Gulf of Mexico, Mississippi, Arkansas, Missouri, Tennessee, Illinois, Indiana, Kentucky, Ohio, Pennsylvania, New Jersey, and New York.

- The failed pipeline (Line 15 or Affected Segment) is a component of the above-referenced TETLP system. It is a 775-mile long, 30-inch diameter, bi-directional pipeline that transports natural gas between Kosciusko, Mississippi and Uniontown, Pennsylvania. Line 15 is one of three parallel TETLP pipelines running in a common corridor near the site of the Failure. The other two TETLP pipelines are the 30-inch Line 10 and the 30/36-inch Line 25. At the Failure Site, Line 15 is the middle of the three pipelines. The Failure occurred near MP 423.4, approximately 4.5 miles south of Danville, Kentucky (Failure Site), on the Danville to Tompkinsville portion of the Affected Segment.

- Line 15 was constructed beginning in 1957. The portion of Line 15 at the Failure Site consists of 0.375-inch wall thickness, American Petroleum Institute X-52 grade pipe, manufactured by A.O. Smith using flash welding, and is coated with coal tar enamel. The line is cathodically protected with impressed current.

- Line 15 is a bi-directional pipeline. The line originally flowed south-to-north, with an MAOP of 1000 psig, established as 76.92 percent of the specified minimum yield strength (SMYS) of Line 15. In 2014, TETLP reversed the flow to north-to-south, and the MAOP was reestablished as 936 psig, or 72 percent of the SMYS, commensurate with 49 C.F.R. § 192.105. At the time of the Failure, Line 15 was flowing north-to-south and was operating at 925 psig.

- It is estimated that approximately 66 million cubic feet of natural gas was released by the Failure.

- The Failure occurred at approximately 1:24 a.m. EDT. At approximately 1:25 am, Enbridge's Gas Control in Houston, Texas, received a rate of change alarm on Line 15 on the south side of Danville Compressor Station and during the ensuing minutes, received reports from the public of a fire in the area south of Danville Compressor Station. A Danville Compressor Station operator also received a rate of change alarm and observed the rupture fire from the window of the compressor station control room. During the ensuing minutes, other Enbridge employees confirmed the reported fire, indicating the failure of Line 15.

- TETLP's Danville Compressor Station personnel closed the Line 15 discharge valve located north of the Failure Site. TETLP field personnel responded by closing the Line 15 Main Line Block Valve located at Valve Site #4 (MP 408.48), located south of the

[1] Enbridge, Inc. website, *available at* https://www.enbridge.com/~/media/Enb/Documents/Investor%20Relations/Texas%20Eastern%20Transmission/TETLP%20Q1%202019%20Financial%20Statements%20-%20Final.pdf?la=en (last accessed April 22, 2020).

Failure Site. Following confirmation of the Failure, Enbridge further isolated a portion (Isolated Segment) of the Affected Segment by closing Valve 15-382 at MP 408.48 and Valve 15-393 at the Danville Compressor Station near MP 427.5. Enbridge also shut down and shut in Lines 10 and 25, which are blocked in between the Danville Compressor Station and the Tompkinsville Compressor Station.

- The Failure resulted in the ejection of an approximately 30-foot long section of Line 15, which landed approximately 481 feet from the Failure Site. Additionally, the Failure resulted in a 43-foot long, 30-foot wide, 10-foot deep crater at the Failure Site. Gas released from the Failure ignited, causing a fire that resulted in the death of one person, the hospitalization of six people, and the destruction of several nearby homes and other structures. Railroad tracks operated by Norfolk Southern Corporation (NSC) were also damaged by the fire. NSC temporarily suspended rail service through the area. The fire also scorched or burned approximately 30 acres of land, resulting in numerous burned trees and grass.

- Fire fighters from the Lincoln County were the first responders to arrive at the Failure Site. Other local fire departments responded to this event and evacuated approximately 75 people from the nearby Indian Camp subdivision. Casey County emergency medical services transported one injured person to Ephraim McDowell emergency medical center and Boyle County emergency medical services transported two injured persons to the same emergency medical center. Other injured persons were self-transported to medical centers.

- The Affected Segment contains 33.2 feet of A.O. Smith-manufactured pipe of similar vintage and type to the pipe involved in the Failure. The origin of the Failure was identified and the specimen pipe is under control of the NTSB. NTSB and PHMSA investigators collected information related to potential causal factors and circumstances that may have led to the Failure. The NTSB will conduct a metallurgical investigation to determine the exact cause.

- Lines 10 and 25 run on either side of Line 15 in the immediate vicinity of the Failure Site. The possibility of damage to Lines 10 and 25 from the concussive force of the Failure or of thermal damage from the resulting fire was evaluated and determined to have no impact on these lines.

- Following TETLP's analysis, PHMSA approved a return to MAOP for Lines 10 and 25 on August 30, 2019, and August 23, 2019, respectively.

- On November 2, 2003, Line 15 failed at MP 501.72 near Morehead, Kentucky, between the Danville Compressor Station and the Owingsville Compressor Station to the north of the Danville Compressor Station. The 2003 failure also occurred on A.O. Smith-manufactured pipe, and resulted from interactions between hard spots and mid-wall lamination, and in PHMSA's predecessor agency issuing a Corrective Action Order to TETLP's predecessor entity on November 6, 2003, in CPF 2-2003-1018H.

- TETLP reported that it performed an in-line inspection (ILI) to detect hard spots on Line 15 in 2011. The company also reported that it ran an ILI with a magnetic flux leakage tool in 2018 and an ILI with a dent and inertial measurement unit tool in 2019. The 2018 tool data indicated a small dent with metal loss that did not require action under federal pipeline safety regulations or TETLP's procedures.

- The 2011 hard spot in-line inspection of Line 15 resulted in no evidence of hard spot indications. A 2019 post-incident review of the same hard spot in-line inspection data revealed ten hard spots located in the failed pipe joint. Further analysis revealed the location of the Line 15 failure origin coincided with the locations of two newly discovered hard spot indications.

Determination of Necessity for Amended Corrective Action Order and Right to Hearing:

Section 60112 of Title 49, United States Code, provides for the issuance of a Corrective Action Order, after reasonable notice and the opportunity for a hearing, requiring corrective action, which may include the suspended or restricted use of a pipeline facility, physical inspection, testing, repair, replacement, or other action, as appropriate. The basis for making the determination that a pipeline facility is or would be hazardous and requiring corrective action, is set forth both in the above-referenced statute and 49 C.F.R. § 190.233.

Section 60112 and the regulations promulgated thereunder provide for the issuance of a Corrective Action Order, without prior notice and opportunity for hearing, upon a finding that failure to issue the Order expeditiously would result in the likelihood of serious harm to life, property, or the environment. In such cases, an opportunity for a hearing and expedited review will be provided as soon as practicable after the issuance of the Order.

After evaluating the foregoing preliminary findings of fact, I find that continued operation of the Affected Segment without corrective measures is or would be hazardous to life, property, or the environment. In addition, having considered the uncertainties of the cause of the Failure, the pressure at which gas is transported, the vintage and type of pipe, the risk of fire to the environment and populated areas in the vicinity of the Affected Segment, I find that a failure to issue this Order expeditiously to require immediate corrective action would result in the likelihood of serious harm to life, property, or the environment.

Accordingly, this Amended Order mandating immediate corrective action is issued without prior notice and opportunity for a hearing. The terms and conditions of this Amended Order are effective upon receipt.

Within 10 days of receipt of this Amended Order, Respondent may contest its issuance and obtain expedited review either by answering in writing or requesting a hearing under 49 C.F.R. § 190.211, to be held as soon as practicable under the terms of such regulation, by notifying the Associate Administrator for Pipeline Safety in writing, with a copy to the Director, Southern Region, PHMSA (Region Director). If Respondent requests a hearing, it will be held telephonically or in-person in Atlanta, Georgia, or Washington, D.C, unless a different location is expressly agreed-to in writing by the Director.

After receiving and analyzing additional data in the course of this investigation, PHMSA may identify other corrective measures that need to be taken on the Affected Segment or other pipelines in the TETLP system. In that event, PHMSA will notify Respondent of any additional measures that are required and a further Amended Order will be issued, if necessary. To the extent consistent with safety, Respondent will be afforded notice and an opportunity for a hearing prior to the imposition of any additional corrective measures.

Required Corrective Actions:

Definitions:

> ***Affected Segment*** means the approximately 775-mile long, 30-inch diameter Line 15 that transports natural gas between Kosciusko, Mississippi and Uniontown, Pennsylvania.
>
> ***Isolated Segment*** means the approximately 19 miles of the Affected Segment between the Danville Compressor Station at MP 427.5 and Valve 15-382 at MP 408.48. It is the portion of the Affected Segment that was shut-in after the Failure on August 1, 2019, by closing main-line valves upstream and downstream of the Failure Site and that remains shut-in as of August 8, 2019.
>
> ***Director*** means the Director, Southern Region, Office of Pipeline Safety, PHMSA.

Pursuant to 49 U.S.C. § 60112, I hereby order Texas Eastern Transmission, LP to immediately take the following corrective actions for the Affected Segment:

1. ***Shutdown of Isolated Section.*** Texas Eastern Transmission, LP (TETLP) must not operate the Isolated Segment until authorized to do so by the Director

2. ***Operating Pressure Restriction.*** With respect to the remainder of the Affected Segment not shut down under Item 1, above, TETLP must reduce and maintain a twenty percent (20%) pressure reduction in the actual operating pressure along the entire length of the Affected Segment such that the operating pressure along the Affected Segment will not exceed eighty percent (80%) of the actual operating pressure in effect immediately prior to the Failure.

   (A) This pressure restriction is to remain in effect until the Director provides written approval for TETLP to either increase the pressure or return the pipeline to its pre-Failure operating pressure. A copy of the TETLP Restart Plan was provided to the Southern Region. After the region's review, approval of the Restart Plan was given to TETLP to return the pipeline to the pre-Failure operating pressure on March 20, 2020.

   (B) This pressure restriction requires any relevant remote or local alarm limits, software programming set-points or control points, and mechanical over-pressure devices to be adjusted accordingly.

(C) When determining the pressure restriction set-points, TETLP must take into account any ILI features or anomalies present in the Affected Segment to provide for continued safe operation while further corrective actions are completed.

(D) TETLP must review the pressure restriction monthly by analyzing the operating pressure data. TETLP must take into account any ILI features or anomalies present in the Affected Segment and immediately reduce the operating pressure to maintain the safe operations of the Affected Segment, if warranted by the monthly review. TETLP must submit the results of the monthly review to the Director. The results must include, at a minimum, the current discharge set-points (including any additional pressure reductions), and any pressure exceedance at discharge set-points.

3. ***Restart Plan.*** Prior to resuming operation of the Isolated Segment, TETLP developed and submitted a written Restart Plan to the Director. The Director approved the Restart Plan on March 20, 2020.

4. ***Return to Service.*** The Director approved the Restart Plan on March 20, 2020. TETLP may return the Isolated Segment to service but the operating pressure must not exceed 80 percent of the actual operating pressure in effect immediately prior to the Failure, in accordance with Item 2 above.

5. ***Removal or Modification of Pressure Restriction.*** The pressure restriction required by the above Items may be removed or modified, as follows:

(A) The Director may allow the removal or modification of the pressure restriction upon a written request from TETLP demonstrating that restoring the pipeline to its pre-Failure operating pressure is justified based on a reliable engineering analysis showing that the pressure increase is safe considering all known defects, anomalies, and operating parameters of the pipeline.

(B) The Director may allow the temporary removal or modification of the pressure restrictions upon a written request from TETLP demonstrating that temporary mitigative and preventive measures are being implemented prior to and during the temporary removal or modification of the pressure restriction. The Director's determination will be based on the Failure cause and provision of evidence that preventive and mitigative actions taken by TETLP provide for the safe operation of the Affected Segment during the temporary removal or modification of the pressure restriction. Appeals to determinations of the Director in this regard will be decided by the Associate Administrator for Pipeline Safety.

6. ***Instrumented Leakage Survey.*** Within 180 days of receipt of this Amended Order, TETLP must perform an aerial or ground instrumented leakage survey of the Affected Segment. TETLP must investigate all leak indications and remedy all leaks discovered. TETLP must submit documentation of this survey to the Director within 45 days of the completion of the leak survey.

7. ***Records Verification.*** As recommended in PHMSA Advisory Bulletin 2012-06, verify the records for the Affected Segment to confirm the maximum allowable operating

pressure (MAOP). The Affected Segment is bi-directional with two different MAOPs. TETLP must confirm the MAOPs for both flow directions. TETLP must submit documentation of this records verification to the Director within 45 days of receipt of this Amended Order.

8. ***Review of Prior ILI Results.*** Within 30 days of receipt of this Amended Order, conduct a review of the previous ILI results of the Affected Segment. TETLP must re-evaluate all ILI results from the past 20 calendar years, include a review of the ILI vendors' raw data and analysis. TETLP must determine whether any features were present in the failed pipe joint and/or any other pipe removed. Also, TETLP must determine if any features are present elsewhere on the Affected Segment. TETLP must submit documentation of this ILI review to the Director within 45 days of receipt of this Amended Order as follows:

   (A) List all ILI tool runs, tool types, and the calendar years of the tool runs.

   (B) List, describe (type, size, wall loss, etc.), and identify the specific location of all ILI features present in the failed joint and/or other pipe removed.

   (C) Explain the process used to review the ILI results and the results of the reevaluation.

   TETLP has begun this re-evaluation and has been submitting monthly reports to the Director, along with additional data. The latest report was received on March 11, 2020.

9. ***Mechanical and Metallurgical Testing.*** Mechanical and metallurgical testing, including failure analysis will be performed by the NTSB in accordance with NTSB procedures and protocols. In the event the NTSB does not perform these functions, TETLP will be responsible for completing all testing and analysis. If the NTSB does not perform the analysis, TETLP must submit to the Director for prior approval a plan to complete the testing and analysis.

10. ***Root Cause Failure Analysis.*** The NTSB will perform a root cause failure analysis (RCFA) to determine the cause of the Failure. TETLP must incorporate the findings the NTSB RCFA into its integrity management plan and operations and maintenance manual. If the NTSB does not perform these tasks, TETLP must submit to the Director for prior approval a plan to complete an RCFA.

11. ***Emergency Response Plan and Training Review.*** TETLP must review and assess the effectiveness of its emergency response plan and operational actions with regards to the Failure. TETLP must include in the review and assessment the on-scene response and support, coordination, and communication with emergency responders and public officials. Also, TETLP must include a review and assessment of the effectiveness of its emergency training program. TETLP must amend its emergency response plan and emergency training, if necessary, to reflect the results of this review. The documentation of this Emergency Response Plan and Training Review must be included in the CAO Documentation Report (see Item 14 for description of the CAO Documentation Report).

12. ***Public Awareness Program Review.*** TETLP must review and assess the effectiveness of its Public Awareness Program with regards to the Failure. TETLP must amend its Public Awareness Program, if necessary, to reflect the results of this review. The documentation of this Public Awareness Program Review must be provided to the Director.

13. ***Remedial Work Plan (RWP).***

(A) TETLP must submit a Remedial Work Plan (RWP) to the Director for approval by August 2, 2020.

(B) The Director may approve the RWP incrementally without approving the entire RWP.

(C) Once approved by the Director, the RWP will be incorporated by reference into this Amended Order.

(D) The RWP must specify the tests, inspections, assessments, evaluations, and remedial measures TETLP will use to verify the integrity of the Affected Segment. The RWP must address all known or suspected factors and causes of the Failure. TETLP should consider both the risks and consequences of another failure arising from the same root cause as the August 1, 2019 Failure to develop a prioritized schedule for RWP related work along the Affected Segment.

(E) The RWP must include a procedure or process to:

i. Identify pipe in the Affected Segment with characteristics similar to the contributing factors identified for the Failure.

ii. Gather all data necessary to review the failure history (in service and pressure test failures) of the Affected Segment and to prepare a written report containing all the available information such as the locations, dates, and causes of leaks and failures.

iii. Integrate the results and conclusions of the NTSB's metallurgical testing as well as those of the final RCFA, and other corrective actions required by this Amended Order with all relevant pre-existing operational and assessment data for the Affected Segment. Pre-existing operational data includes, but is not limited to, construction, operations, maintenance, testing, repairs, prior metallurgical analyses, and any third-party consultation information. Pre-existing assessment data includes, but is not limited to, ILI tool runs, hydrostatic pressure testing, direct assessments, close interval surveys, and DCVG/ACVG surveys.

iv. Determine if conditions similar to those contributing to the Failure are likely to exist elsewhere on the Affected Segment.

v. Conduct additional field tests, inspections, assessments, and/or evaluations to determine whether, and to what extent, the conditions associated with the Failure, and other failures from the failure history (*see* Item 13(E)(ii),

above) or any other integrity threats are present elsewhere on the Affected Segment. At a minimum, this process must consider all failure causes and specify the use of one or more of the following:

a. Inline inspection (ILI) tools that are technically appropriate for assessing the pipeline system based on the cause of Failure, and that can reliably detect and identify anomalies;

b. Hydrostatic pressure testing;

c. Close-interval surveys;

d. Cathodic protection surveys, to include interference surveys in coordination with other utilities (e.g. underground utilities, overhead power lines, etc.) in the area;

e. Coating surveys;

f. Stress corrosion cracking surveys;

g. Selective seam corrosion surveys; and

h. Other tests, inspections, assessments, and evaluations appropriate for the failure causes.

Note: TETLP may use the results of previous tests, inspections, assessments, and evaluations if approved by the Director, provided the results of the tests, inspections, assessments, and evaluations are analyzed with regard to the factors known or suspected to have caused the Failure.

vi. Describe the inspection and repair criteria TETLP will use to prioritize, excavate, evaluate, and repair anomalies, imperfections, and other identified integrity threats. Include a description of how any defects will be graded and a schedule for repairs or replacement.

vii. Based on the known history and condition of the Affected Segment, describe the methods TETLP will use to repair, replace, or take other corrective measures to remediate the conditions associated with the pipeline Failure, and to address other known integrity threats along the Affected Segment. The repair, replacement, or other corrective measures must meet the criteria specified in Item 13(E)(iv), above.

viii. Implement continuing long-term periodic testing and integrity verification measures to ensure the ongoing safe operation of the Affected Segment considering the results of the analyses, inspections, evaluations, and corrective measures undertaken pursuant to the Amended Order.

ix. Implement specific actions TETLP will take on its entire pipeline system as a result of the lessons learned from work on this Amended Order. Incorporate lessons learned on TETLP's entire pipeline system. TETLP will report lessons learned in the CAO Documentation Report (see Item 14 for description of the CAO Documentation Report).

(F) TETLP must include a proposed schedule for completion of the RWP.

(G) TETLP must revise the RWP as necessary to incorporate new information obtained during the NTSB and PHMSA's failure investigation and remedial activities taken under this Amended Order, to incorporate the results of actions undertaken pursuant to this Amended Order, and/or to incorporate modifications required by the Director.

i. TETLP must submit any plan revisions to the Director for prior approval.

ii. The Director may approve plan revisions incrementally.

iii. Any and all revisions to the RWP after it has been approved and incorporated by reference into this Amended Order will be fully described and documented in the CAO Documentation Report (CDR).

(H) Implement the RWP as it is approved by the Director, including any revisions to the plan.

14. ***CAO Documentation Report (CDR).*** TETLP must create and revise, as necessary, a CAO Documentation Report (CDR). When TETLP has concluded all the items in this Amended Order it will submit the final CDR in its entirety to the Director. This will allow the Director to complete a thorough review of all actions taken by TETLP with regards to this Amended Order prior to approving the closure of this Amended Order. The intent is for the CDR to summarize all activities and documentation associated with this Amended Order in one document.

(A) The Director may approve the CDR incrementally without approving the entire CDR.

(B) Once approved by the Director, the CDR will be incorporated by reference into this Amended Order.

(C) The CDR must include but not be limited to:

i. Table of Contents;

ii. Summary of the pipeline Failure, and the response activities;

iii. Summary of pipe data/properties and all prior assessments of the Affected Segment;

iv. Summary of all tests, inspections, assessments, evaluations, and analysis required by the Amended Order;

v. Summary of the Mechanical and Metallurgical Testing as required by the Amended Order;

vi. Documentation of all actions taken by TETLP to implement the RWP, the results of those actions, and the inspection and repair criteria used;

vii. Documentation of any revisions to the RWP including those necessary to incorporate the results of actions undertaken pursuant to this Amended Order and whenever necessary to incorporate new information obtained during the failure investigation and remedial activities;

viii. Lessons learned while completing this Amended Order;

ix. A description of specific actions TETLP will take on its entire pipeline system as a result of the lessons learned from work on this Amended Order; and

x. Appendices (if required).

Other Requirements:

1. ***Reporting.*** Submit monthly reports to the Region Director that: (1) include all available data and results of the testing and evaluations required by this Amended Order; and (2) describe the progress of the repairs or other remedial actions being undertaken. The first monthly report for the period August 1 through August 31 is due on September 15, 2019. The Region Director may change the interval for the submission of these reports.

2. ***Documentation of Costs.*** It is requested but not required that Respondent maintain documentation of the costs associated with implementation of this Amended Order. Include in each monthly report the to-date total costs associated with: (1) preparation and revision of procedures, studies and analyses; (2) physical changes to pipeline infrastructure, including repairs, replacements and other modifications; and (3) environmental remediation, if applicable.

3. ***Approvals.*** With respect to each submission requiring the approval of the Region Director, the Region Director may: (a) approve the submission in whole or in part; (b) approve the submission on specified conditions; (c) modify the submission to cure any deficiencies; (d) disapprove the submission in whole or in part and direct Respondent to modify the submission; or (e) any combination of the above. In the event of approval, approval upon conditions, or modification by the Region Director, Respondent shall proceed to take all action required by the submission, as approved or modified by the Region Director. If the Region Director disapproves all or any portion of a submission, Respondent must correct all deficiencies within the time specified by the Region Director and resubmit it for approval.

4. ***Extensions of Time.*** The Region Director may grant an extension of time for compliance with any of the terms of this Amended Order upon a written request timely submitted and demonstrating good cause for an extension.

5. Be advised that all material you submit in response to this enforcement action is subject to being made publicly available. If you believe that any portion of your responsive material qualifies for confidential treatment under 5 U.S.C. § 552(b), along with the complete original document you must provide a second copy of the document with the portions you believe qualify for confidential treatment redacted and an explanation of why you believe the redacted information qualifies for confidential treatment under 5 U.S.C. § 552(b).

In your correspondence on this matter, please refer to "CPF No. 2-2019-1002H" and for each document you submit, please provide a copy in electronic format whenever possible. The actions required by this Amended Order are in addition to and do not waive any requirements that apply to Respondent's pipeline system under 49 C.F.R. Parts 190 through 199, under any other order issued to Respondent under authority of 49 U.S.C. Chapter 601, or under any other provision of Federal or State law.

Respondent may appeal any decision of the Region Director to the Associate Administrator for Pipeline Safety. Decisions of the Associate Administrator shall be final.

Failure to comply with this Amended Order may result in the assessment of civil penalties and in referral to the Attorney General for appropriate relief in United States District Court pursuant to 49 U.S.C. § 60120.

The terms and conditions of this Amended Order are effective upon service in accordance with 49 C.F.R. § 190.5.

April 28, 2020

Alan K. Mayberry
Associate Administrator
for Pipeline Safety

Date Issued

Exhibit 13. Enbridge - History of PAP Printed Materials Distribution to Emergency Officials[1]

Enbridge documented to the investigation[2], the five-year history data of the annual distribution of Public Awareness Program (PAP) outreach activity, of printed Safety Information Distribution [hand-out, 'response guidance' brochures], as made available to the local emergency services agencies, for the years of 2015, through 2019, inclusive, to which a summarization of the data are as follows.

Data Tabulation (see Legend, below, for Agency, Document Item, Notes, DS annotation abbreviations)

Year	Agency	Delivery Date	Safety Information Distribution Document Item (brochure / Enbridge filename reference)	Notes	DS
2015	LCFPD	---	---	[1]	---
2015	LCEMA	---	---	[1]	---
2015	LCEMS	---	---	[1]	---
2015	LCSO	---	---	[1]	---
2015	911	---	---	[1]	---
2016	LCFPD	01/29/16	DR20AC ER Brochure 2016-c2	[3]	[A]
2016	LCEMA	01/29/16 01/29/16	DR20AC ER Brochure 2016-c2	[5] [6]	[A] [B]
2016	LCEMS	01/29/16	DR20AC ER Brochure 2016-c2	[4]	[A]
2016	LCSO	01/29/16	DR20AC ER Brochure 2016-c2		[B]
2016	911	02/13/16	DR20AC ER Brochure 2016-c2	[2]	[G]
2017	LCFPD	02/16/17	DR20AD ER Brochure 2017-c2	[3]	[C]
2017	LCEMA	02/16/17	DR20AD ER Brochure 2017-c2	[5]	[C]

[1] This Exhibit is in reference to SF Factual Report, § 4.4.2.

[2] Source: Enbridge PAP Printed Safety Information Materials documentation as made available during the on-scene phase of the investigation, which was transferred to the NTSB Accellion FTP [secure transmittal] website, with additional documentation / data clarifications provided in email correspondence from Enbridge SF Group - Party representative to the SF Group Chair, dated 5/08/2020 to 6/03/2020, inclusive, and as further described.

		02/16/17		[6]	[D]
2017	LCEMS	02/16/17	DR20AD ER Brochure 2017-c2	[4]	[C]
2017	LCSO	02/16/17	DR20AD ER Brochure 2017-c2		[D]
2017	911	02/16/17	DR20AD ER Brochure 2017-c2	[2]	[H]
2018	LCFPD	04/18/18	DR20AE ER GTM EOPO Brochure 2018-c2	[3]	[E]
2018	LCEMA	04/18/18 04/18/18	DR20AE ER GTM EOPO Brochure 2018-c2	[5] [6]	[E] [F]
2018	LCEMS	04/18/18	DR20AE ER GTM EOPO Brochure 2018-c2	[4]	[E]
2018	LCSO	04/18/18	DR20AE ER GTM EOPO Brochure 2018-c2		[F]
2018	911	04/19/18	DR20AE ER GTM EOPO Brochure 2018-c2		[I]
2019	LCFPD	02/12/19	DR36 19GTMEPE_Digital_PDF_20190311-c2		[M]
2019	LCEMA	4/18/19 - 5/30/19	DR36 19GTMEPE_Digital_PDF_20190311-c2	[7]	[N]
2019	LCEMS	02/12/19	DR36 19GTMEPE_Digital_PDF_20190311-c2		[L]
2019	LCSO	02/12/19	DR36 19GTMEPE_Digital_PDF_20190311-c2		[K]
2019	911	03/12/19	DR36 19GTMEPE_Digital_PDF_20190311-c2		[J]

Legend

Tabulation Header

Agency	Lincoln County - Emergency Services Agency
DS	Delivery Confirmation Data Source (document description / file reference)

Emergency Services Agencies of Lincoln County:

911	Bluegrass 911 - Call Processing / Emergency Services Dispatching [PSAP[3]]
LCFPD	Lincoln County Fire Protection District (fire department)
LCEMA	Lincoln County Emergency Management Agency
LCEMS	Lincoln County Emergency Medical Services (ambulance)
LCSO	Lincoln County Sheriff's Office (law enforcement)

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

Titles of printed Safety Information Distribution Document Item (brochure), as made available to emergency services agencies:

Publication title	Year distributed	Enbridge document file reference
Spectra Energy "Pipeline Safety"	2016	DR20AC ER Brochure 2016-c2
Enbridge "Pipeline Safety"	2017	DR20AD ER Brochure 2017-c2
Enbridge Pipeline Safety and Emergency Information for Emergency and Public Officials	2018	DR20AE ER GTM EOPO Brochure 2018-c2
Enbridge Pipeline Safety and Emergency Information for Emergency and Public Officials	2019	DR36 19GTMEPE_Digital_PDF_20190311-c2

Notes:

[1] No documentation could be located by Enbridge for a contact visit for this year (ref. email from Enbridge SF Group - Party participant, to SF Group Chair, [dated] 5/8/2020); the investigation noted that the ROW of the Line 15 pipeline was owned / operated at that time by Spectra Energy (which was later purchased by Texas Eastern).

[2] Enbridge delivery confirmation documentation stated this delivery was made to Local Agency "Garrard Co. 911", in which Enbridge clarified, to the effect, that this PSAP agency is jointly operated by Garrard County and Lincoln County, in which the delivery location in the documentation only cited the Garrard County PSAP designation (ref. email from Enbridge SF Group - Party participant, to SF Group Chair, [dated] 5/13/2020).

[3] "Prior to 2019, Stanford Fire Department was the central point of contact for Lincoln County Fire and affiliated agencies." (ref. email from Enbridge SF Group - Party participant, to SF Group Chair, [dated] 5/13/2020).

[4] The Enbridge documentation shows a delivery to Stamford EMS, in which the Director of this agency advised that this agency was 'renamed' from Stamford EMS to Lincoln County EMS, in which the agency is sometimes informally referred to by the prior name designation (ref. informal debriefing discussion with the agency Director, by SF Group Chair, [dated] 5/01/2020).

[5] The Enbridge documentation shows a delivery to Lincoln County Judge Executive, rather than delivery to the LCEMA, in which Enbridge documented to the investigation an explanation as to why the delivery to this agency, indicating "The Judge exec is the head of the county government. He is responsible for the county

budget and funding emergency response agencies in his county. It's important to note that emergency management (and the appointment of the Emergency Management Director) is under the authority and scope of the County Judge Exec. This is why we keep in communication with this office." (ref. email from Enbridge SF Group - Party participant, to SF Group Chair, [dated] 5/13/2020).

[6] The Enbridge documentation shows a delivery to "DES" (with no further explanation as to agency identification), in which the delivery address shown is the same as that of the LCEMA, which supports that this delivery was made to the LCEMA.

[7] Enbridge documented to the investigation[4] that "[an] Emergency outreach visit was conducted but [a] public awareness contact form [for this specific visit] could not be located. Alternatively, two sets of emergency official public awareness brochure mailers were sent and received by LCEMA. Confirmation of receipt [was] verified by [the] LCEMA's [agency Director]".

Additionally:

(a) As cited in the SF Factual Report[5], debriefing interviews, as conducted by NTSB staff during the on-scene phase of the investigation, with operations officials of the emergency services agencies that responded to the incident (i.e., including the LCEMA), indicated that all of the corresponding emergency services agency officials recalled that their agencies had received, either by hand-delivery or by mail, the [annual] 2019 printed safety brochures.

(b) Enbridge documented to the investigation[6] that a "3rd party contractor" by the name of Enertech[7] had performed this PAP mailing activity, in which a "… confirmation letter from Enertech [had been provided]. They were the contractor handling our bulk public awareness mailers in 2019.", in which a copy of the subject correspondence, from the President of this company to an Enbridge [Texas Eastern] management official (Houston, TX, facility), dated "June 2nd, 2020", was made available to the investigation, attesting that "… The 2019 Enbridge Public Awareness Program was mailed between the dates of 4/18/19 and 5/30/19. Lincoln County Emergency Management was mailed within the duration of these dates.".

DS codes - Delivery Confirmation / Data Source document [Enbridge file reference]:

[A] Excel spreadsheet [DR20I EmerRespBriefDocLincoln1 2016 NTSB004154-c2]

[B] Excel spreadsheet [DR20L EmerRespBriefDocLincoln2 2016 NTSB004157-c2]

[C] Excel spreadsheet [DR20J EmerRespBriefDocLincoln1 2017 NTSB004155-c2]

[D] Excel spreadsheet [DR20M EmerRespBriefDocLincoln2 2017 NTSB004158-c2]

[4] Source: email from Enbridge SF Group - Party representative to the SF Group Chair, dated 5/29/2020.

[5] Ref, SF Factual Report § 4.4.2.

[6] Source: emails between the Enbridge SF Group Party representative and the SF Group Chair, 6/01-03/2020, inclusive.

[7] Ref, and for further information see [Internet] https://enertech.com/.

[E] Excel spreadsheet [DR20K EmerRespBriefDocLincoln1 2018 NTSB004156-c2]

[F] Excel spreadsheet [DR20N EmerRespBriefDocLincoln2 2018 NTSB004159-c2]

[G] Spectra Energy Emergency Response Briefing Documentation
[DR20Y Garrard 2016-c2]

[H] Spectra Energy Emergency Response Briefing Documentation
[DR20Z EmerRespBriefDocGarrard 2017-c2]

[I] Spectra Energy Emergency Response Briefing Documentation
[DR20AA EmerRespBriefDocGarrard 2018-c2]

[J] Enbridge Public Awareness Contact Form
[DR20AB Garrard Co 911 Public Awareness Contact 2019-c2]

[K] Enbridge Public Awareness Contact Form
[DR20D Lincoln Co Sheriff]

[L] Enbridge Public Awareness Contact Form
[DR20E Lincoln Co. EMS]

[M] Enbridge Public Awareness Contact Form
[DR20F Lincoln Co. Fire]

[N] Enbridge 2019 Public Awareness Program Mailing List;
[DR15D 2019 Zip Code 40484 NTSB002785.xlsx]

-- End of Exhibit --

Exhibit 14. Content of Enbridge Printed 'Safety Pamphlets' as Distributed to Emergency Services Agencies

This Exhibit is comprised of a copy of documentation, as made available to the investigation by Enbridge, describing the content of printed 'Safety Pamphlets' as distributed to emergency services agencies.

Signs of a Natural Gas Pipeline Leak

Any one of the following could be a sign of a leak:

- Blowing or hissing sound
- Gaseous or "rotten egg" odor
- Flames, if a leak has ignited
- Dead or discolored vegetation in an otherwise green area
- Dust blowing from a hole in the ground
- Continuous bubbling in wet or flooded areas
- Disturbance on the surface of streams, rivers or other waterways

Hazards Associated with a Natural Gas Pipeline Leak or Rupture

- Dizziness or suffocation if leak occurs in a confined space
- Ignition/fire if ignition source is present during leak which may result in burns
- Potential explosion if the natural gas is mixed with air
- Projectiles ejected from the force of escaping gas

What to Do If You Suspect a Pipeline Leak

Your personal safety should be your first concern:

- Evacuate the area and try to prevent anyone from entering.
- Abandon any equipment being used in or near the area.
- Avoid any open flames.
- Avoid introducing any sources of ignition to the area (such as cell phones, pagers and two-way radios).
- Do not start or turn off motor vehicles or electrical equipment.
- If you suspect natural gas has leaked into a building, evacuate immediately. Do not turn lights on or off, use the phone or do anything that could produce a spark.
- Call **911** from a safe location or contact your local fire department or law enforcement personnel.
- Notify Spectra Energy by calling the toll-free emergency number (below) or the emergency number listed on the pipeline marker.
- Do not attempt to extinguish a natural gas fire.
- Do not attempt to operate any pipeline valves.

In case of an emergency, call toll-free 24 hours a day.
1-800-231-7794

In case of an emergency, call toll-free 24 hours a day.
1-800-231-7794

INGAA

Interstate Natural Gas Association of America (INGAA) member companies, including Spectra Energy, have committed to improve the safety performance of their natural gas pipelines. INGAA has 25 member companies which operate 200,000 miles of interstate transmission pipelines across the United States. INGAA member companies are implementing processes and technologies to improve response time for isolation of pipeline segments when incidents occur to enhance protection of people and property adjacent to those pipelines. INGAA members have also initiated new ways to engage emergency responders in the vicinity of the pipelines. You can get more information about INGAA by visiting their website at www.ingaa.org.

How to Contact Us

If you need general information or have a ***non-emergency question***, please call us toll-free at **1-888-293-7867**, email us at askspectra@spectraenergy.com – or write to us at:

Operational Compliance Department
Spectra Energy
P.O. Box 1642
Houston, TX 77251-1642

Frequently Asked Questions

Answers to frequently asked questions (FAQ) can be found on our website at: http://www.spectraenergy.com/Pipeline-FAQ or contact us and we'll send you a printed version.

CONNECT WITH US

PIPA

The Pipeline and Informed Planning Alliance (PIPA) is a stakeholder initiative supported by the U.S. Department of Transportation (DOT) to improve the safety of communities that surround large-diameter high-pressure transmission pipelines.

For more information about PIPA recommended practices visit: http://primis.phmsa.dot.gov/comm/pipa/landuseplanning.htm.

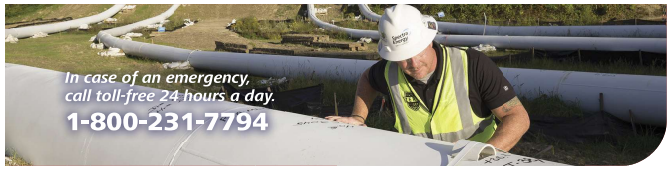
For more information, visit www.spectraenergy.com

2016

Pipeline Safety

You have received this brochure because we have identified you as an emergency responder with responsibilities in the vicinity of Spectra Energy's natural gas pipelines or related facilities. This document has been designed to provide basic pipeline safety information, such as how to identify a leak, what to do in case of a leak or natural gas fire, how to determine where our pipelines are located, and how to contact Spectra Energy in an emergency or to obtain additional information. Please share this important information with other emergency responders with whom you work.

Texas Eastern Transmission, LP | Algonquin Gas Transmission, LLC
East Tennessee Natural Gas, LLC | Maritimes & Northeast Pipeline, L.L.C.
Ozark Gas Transmission, L.L.C. | Ozark Gas Gathering, L.L.C.
Egan Hub Storage, LLC | Moss Bluff Hub, LLC | Bobcat Gas Storage
Saltville Gas Storage Company L.L.C. | Big Sandy Pipeline, LLC
Steckman Ridge, LP | Dauphin Island Gathering Partners (DIGP)



Pipeline Emergency Guides

Spectra Energy is committed to providing information that will help emergency responders near our pipeline facilities respond to events associated with unintended natural gas releases. The company has developed an emergency guide that includes facility maps, pipeline data, contact information, emergency response procedures and priorities, discussion of the incident command system, locating pipelines, natural gas properties, and pipeline operations. If you have not yet received a copy of the guide, contact us by calling **1-888-293-7867** or emailing askspectra@spectraenergy.com.

Pipeline Emergency Training Material

"Pipeline Emergencies" is an award winning training curriculum that provides information on how to safely and effectively respond to pipeline incidents. The material was developed by emergency response and industry experts in partnership with the National Association of State Fire Marshalls and the U.S. Department of Transportation. Request the materials in book or DVD format at www.pipelineemergencies.com or by calling **1-202-737-1226 (ext. 4)**.

What Spectra Energy Does if an Emergency Occurs

Spectra Energy facilities are designed to isolate pipeline segments in the event of an emergency. We have developed a comprehensive Crisis Management Plan to assure an effective response to pipeline emergencies. Our personnel are trained to work in cooperation with emergency responders to manage these events. For more information about Spectra Energy's emergency preparedness program in your area and how to access the local Spectra Energy emergency response plan, contact us by calling **1-888-293-7867** or emailing askspectra@spectraenergy.com.

Spectra Energy Supports the ICS

We consider the ***Incident Command System*** (ICS) to be paramount to organizing and coordinating response to emergency events, and that pre-established organizational structure, duties, and procedures among the various stakeholders responding to these events are important. Many Spectra Energy personnel have been trained in the ICS processes and will be made available should they be needed. More ICS information can be obtained on the FEMA web page at http://www.training.fema.gov/EMIWeb/IS/ICSResource/index.htm.

Properties of Natural Gas

- **Lighter than Air** – 40 percent lighter than air
- **Composition** – Mostly methane and small amounts of ethane
- **Hazardous Material** – Due to its flammability
- **Flammable** – Approximately 5 -15 percent gas-to-air mix is the flammable range.
- **Odorless** – Natural gas is odorless in its natural state. The smell of rotten egg often associated with natural gas is normally due to an odorant that is added in some pipelines and distribution systems.
- **Combustion Products** – No significant harmful compounds as a result of combustion. However, incomplete combustion may produce carbon monoxide.
- **Ignition Temperature** – The ignition temperature is nearly 1,200 degrees Fahrenheit. Static electricity, pilot lights, matches, and sparks from telephones, electric motors and internal combustion engines can easily reach this temperature.
- **Asphyxiant** – Natural gas can displace oxygen in an enclosed space, resulting in the potential for suffocation.
- **Non-Toxic**

Because of its high energy value and low environmental emissions when burned, it is increasingly a fuel of choice for heating homes, generating electricity and fueling industry. In fact, natural gas provides a quarter of all energy consumed in the U.S., making it a vital component of our domestic energy supply. And, as a clean, abundant, efficient and versatile resource, natural gas will increasingly be a fuel of choice for the future. Natural gas produces 45 percent less carbon dioxide (CO_2) than coal and 30 percent less than oil when burned. That's an important distinction as we tackle the dual challenge of meeting increased energy demand while reducing the amount of carbon released into the environment.

Pipeline Location and Markers

Pipeline markers like these are used to indicate the approximate location of a natural gas pipeline and to provide contact information. Aerial patrol planes also use the markers to identify the pipeline route. Markers should never be removed or relocated by anyone other than a pipeline operator.

Spectra Energy pipelines range in diameter from 2-inch to 42-inch.

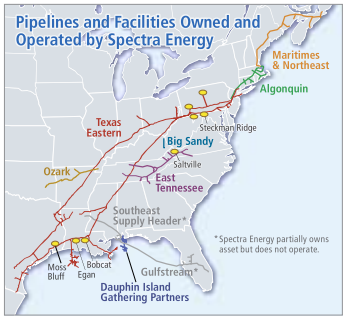
To find out where Spectra Energy pipelines are located in your area and what the diameters are, visit our website at: http://www.spectraenergy.com/Locator/US, contact a Spectra Energy representative at **1-888-293-7867**, or email askspectra@spectraenergy.com.

You can also find out which pipelines are in your area by going to the National Pipeline Mapping System website at www.npms.phmsa.dot.gov.

Spectra Energy Reliability

Spectra Energy operates more than 19,000 miles of high-pressure natural gas transmission pipelines in North America. Our pipelines cross North America for long distances (much like interstate highways), transporting natural gas to industrial facilities, power plants and local distribution companies. Local distribution companies then deliver the natural gas to homes and businesses.

We monitor our pipelines in many ways, including round-the-clock electronic monitoring, regular air and ground surveillance, and during routine operation and maintenance. In addition, Spectra Energy applies rigorous integrity management practices to all its facilities, regardless of whether or not those facilities are located within high consequence areas as defined by the federal regulations.



We work hard to maintain the integrity of our pipeline systems and keep them safe from security threats. We stay in touch with industry and government organizations to monitor potential threats and study new technologies that will help keep our facilities as safe and secure as possible.

For more information about Spectra Energy's integrity management program in your area, visit our website at http://www.spectraenergy.com/Integrity-Management or contact us by calling **1-888-293-7867** or emailing askspectra@spectraenergy.com.

Emergency responders like you can help us to maintain a safe, secure and reliable pipeline system. ***If you observe any unusual or suspicious activity near our pipeline facilities, or in the unlikely event an emergency occurs, please call us immediately using the toll-free emergency number listed in the above left corner.***

Integrity Management and High Consequence Areas

The objective of Spectra Energy integrity management program is to improve pipeline safety through a systematic approach involving data gathering, risk assessment, integrity assessments, prevention and mitigation. The U.S. Department of Transportation has developed specific High Consequence Area (HCAs) regulations for the operations and maintenance of natural gas transmission pipelines. These regulations are more rigorous than those for non-HCA locations and focus integrity management activities on populated areas and areas where it would be difficult to evacuate people. In most all cases, Spectra Energy applies the more rigorous requirements to the operation of all its pipeline facilities, not just the HCAs.

In case of an emergency, call toll-free 24 hours a day.
1-800-231-7794

Know what's **below.** Call 811 **before you dig.**

Signs of a Natural Gas Pipeline Leak

Any one of the following could be a sign of a leak:

- Blowing or hissing sound
- Gaseous or "rotten egg" odor
- Flames, if a leak has ignited
- Dead or discolored vegetation in an otherwise green area
- Dust blowing from a hole in the ground
- Continuous bubbling in wet or flooded areas
- Disturbance on the surface of streams, rivers or other waterways

Hazards Associated with a Natural Gas Pipeline Leak or Rupture

- Dizziness or suffocation if leak occurs in a confined space
- Ignition/fire if ignition source is present during leak which may result in burns
- Potential explosion if the natural gas is mixed with air
- Projectiles ejected from the force of escaping gas

What to Do If You Suspect a Pipeline Leak

Your personal safety should be your first concern:

- Evacuate the area and try to prevent anyone from entering.
- Abandon any equipment being used in or near the area.
- Avoid any open flames.
- Avoid introducing any sources of ignition to the area (such as cell phones, pagers and two-way radios).
- Do not start or turn off motor vehicles or electrical equipment.
- If you suspect natural gas has leaked into a building, evacuate immediately. Do not turn lights on or off, use the phone or do anything that could produce a spark.
- Call **911** from a safe location or contact your local fire department or law enforcement personnel.
- Notify Enbridge by calling the toll-free emergency number listed in this brochure or on the pipeline marker.
- Do not attempt to extinguish a natural gas fire.
- Do not attempt to operate any pipeline valves.

In case of an emergency, call toll-free 24 hours a day.
1-800-231-7794

INGAA

Interstate Natural Gas Association of America (INGAA) member companies, including Enbridge, have committed to improve the safety performance of their natural gas pipelines. INGAA has 25 member companies which operate 200,000 miles of interstate transmission pipelines across the United States. INGAA member companies are implementing processes and technologies to improve response time for isolation of pipeline segments when incidents occur to enhance protection of people and property adjacent to those pipelines. INGAA members have also initiated new ways to engage emergency responders in the vicinity of the pipelines. You can get more information about INGAA by visiting their website at www.ingaa.org.

PIPA

The Pipeline and Informed Planning Alliance (PIPA) is a stakeholder initiative supported by the U.S. Department of Transportation (DOT) to improve the safety of communities that surround large-diameter high-pressure transmission pipelines. For more information about PIPA recommended practices, visit http://primis.phmsa.dot.gov/comm/pipa/landuseplanning.htm.

How to Contact Us

If you need general information or have a ***non-emergency question***, call us toll-free at **1-888-293-7867**, email us at askspectra@spectraenergy.com – or write to us at:

Operational Compliance Department
Enbridge
P.O. Box 1642
Houston, TX 77251-1642

Frequently Asked Questions

Answers to frequently asked questions (FAQ) can be found on our website at http://www.spectraenergy.com/Pipeline-FAQ, or contact us and we'll send you a printed version.

2017

Pipeline Safety

You have received this brochure because we have identified you as an emergency responder with responsibilities in the vicinity of Enbridge's natural gas pipelines or related facilities. This document has been designed to provide basic pipeline safety information, such as how to identify a leak, what to do in case of a leak or natural gas fire, how to determine where our pipelines are located, and how to contact us in an emergency or to obtain additional information. Please share this important information with other emergency responders with whom you work.

Texas Eastern Transmission, LP | Algonquin Gas Transmission, LLC
East Tennessee Natural Gas, LLC | Maritimes & Northeast Pipeline, L.L.C.
Ozark Gas Transmission, L.L.C. | Ozark Gas Gathering, L.L.C.
Big Sandy Pipeline, LLC | Brazoria Interconnector Gas Pipeline LLC
Egan Hub Storage, LLC | Moss Bluff Hub, LLC | Bobcat Gas Storage
Saltville Gas Storage Company L.L.C. | Steckman Ridge, LP
Dauphin Island Gathering Partners (DIGP)

Pipeline Emergency Guides

Enbridge is committed to providing information that will help emergency responders near our pipeline facilities respond to events associated with unintended natural gas releases.

We have developed an emergency guide that includes facility maps, pipeline data, contact information, emergency response procedures and priorities, discussion of the incident command system, locating pipelines, natural gas properties, and pipeline operations.

If you have not yet received a copy of the guide, contact us by calling **1-888-293-7867** or emailing **askspectra@spectraenergy.com**.

Pipeline Emergency Training Material

"Pipeline Emergencies" is an award winning training curriculum that provides information on how to safely and effectively respond to pipeline incidents. The material was developed by emergency response and industry experts in partnership with the National Association of State Fire Marshalls and the U.S. Department of Transportation.

Request the materials in book or DVD format at **www.pipelineemergencies.com** or by calling **1-202-737-1226 (ext. 4)**.

What Enbridge Does if an Emergency Occurs

Our facilities are designed to isolate pipeline segments in the event of an emergency. We have developed a comprehensive Crisis Management Plan to ensure an effective response to pipeline emergencies. Our personnel are trained to work in cooperation with emergency responders to manage these events. For more information about our emergency preparedness program in your area and how to access our local emergency response plan, contact us by calling **1-888-293-7867** or emailing **askspectra@spectraenergy.com**.

Enbridge Supports the ICS

We consider the **Incident Command System** (ICS) to be paramount to organizing and coordinating response to emergency events, and that pre-established organizational structure, duties, and procedures among the various stakeholders responding to these events are important. Many of our personnel have been trained in the ICS processes and will be made available should they be needed. More ICS information can be obtained on the FEMA web page at **http://www.training.fema.gov/EMIWeb/IS/ICSResource/index.htm.**

Properties of Natural Gas

- **Lighter than Air –** 40 percent lighter than air
- **Composition –** Mostly methane and small amounts of ethane
- **Hazardous Material –** Due to its flammability
- **Flammable –** Approximately 5 -15 percent gas-to-air mix is the flammable range.
- **Odorless –** Natural gas is odorless in its natural state. The smell of rotten egg often associated with natural gas is normally due to an odorant that is added in some pipelines and distribution systems.
- **Combustion Products –** No significant harmful compounds as a result of combustion. However, incomplete combustion may produce carbon monoxide.
- **Ignition Temperature –** The ignition temperature is nearly 1,200 degrees Fahrenheit. Static electricity, pilot lights, matches, and sparks from phones, electric motors and internal combustion engines can easily reach this temperature.
- **Asphyxiant –** Natural gas can displace oxygen in an enclosed space, resulting in the potential for suffocation.
- **Non-Toxic**

Because of its high energy value and low environmental emissions when burned, it is increasingly a fuel of choice for heating homes, generating electricity and fueling industry. In fact, natural gas provides a quarter of all energy consumed in the U.S., making it a vital component of our domestic energy supply. And, as a clean, abundant, efficient and versatile resource, natural gas will increasingly be a fuel of choice for the future. Natural gas produces 45 percent less carbon dioxide (CO_2) than coal and 30 percent less than oil when burned. That's an important distinction as we tackle the dual challenge of meeting increased energy demand while reducing the amount of carbon released into the environment.

Pipeline Location and Markers

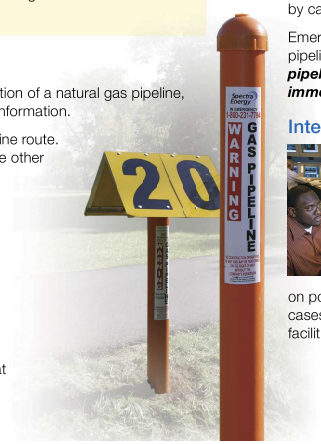
Pipeline markers like these indicate the approximate location of a natural gas pipeline, identify the operator of the pipeline and provide contact information.

Patrol aircraft also use these markers to identify the pipeline route. Markers should never be removed or relocated by anyone other than a pipeline operator.

Enbridge pipelines range in diameter from 2 inches to 42 inches.

To find out where our pipelines are located in your area and what the diameters are, visit our website at **http://www.spectraenergy.com/Locator/US**; contact one of our representatives at **1-888-293-7867**; or email us at **askspectra@spectraenergy.com**.

You can also find out where pipelines are in your area by going to the National Pipeline Mapping System website at **www.npms.phmsa.dot.gov**.



Enbridge Reliability

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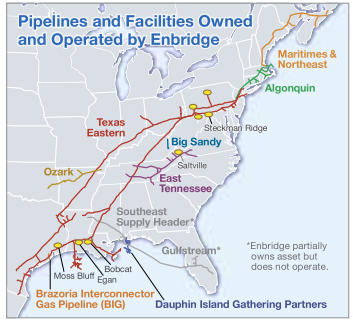
We monitor our pipelines in many ways, including round-the-clock electronic monitoring, regular air and ground surveillance, and during routine operation and maintenance. In addition, we apply rigorous integrity management practices to all our facilities, regardless of whether or not those facilities are located within high consequence areas as defined by the federal regulations.



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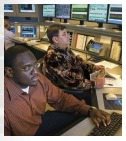
For more information about Enbridge's integrity management program in your area, visit our website at **http://www.spectraenergy.com/Integrity-Management** or contact us by calling **1-888-293-7867** or emailing **askspectra@spectraenergy.com**.

Emergency responders like you can help us to maintain a safe, secure and reliable pipeline system. ***If you observe any unusual or suspicious activity near our pipeline facilities, or in the unlikely event an emergency occurs, please call us immediately using the toll-free emergency number included in this brochure.***

Integrity Management and High Consequence Areas



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Resources

Free Training Opportunity for Emergency Responders and 911 Dispatchers

Emergency responders and others responsible for public safety in our counties of operation—including 911 dispatchers—can access our free online training program at **mypipelinetraining.com.**

The trainings can be completed in one or multiple sessions, and a wallet card and certificate are provided upon completion. This program may qualify for the following:

- Continuing education credits
- OSHA HAZMAT compliance
- Emergency Medical Services Training
- Insurance Service Office Fire Suppression Rating Schedule Program

For more information, please contact us at **888-293-7867** or **ERinfo@enbridge.com.**

Safe Community Grant Program

Enbridge offers annual grants to emergency response agencies in the communities where we operate. These grants can be used for equipment or training that will help organizations respond effectively to pipeline emergencies. If your agency would respond in the unlikely event of an Enbridge pipeline emergency, you can visit enbridge.com/safecommunity to apply.

Emergency Response Action Plans

Our Emergency Response Action Plans are available to emergency response organizations in counties where we operate. These action plans provide information on the ways we'll work with emergency responders during the initial stages of a pipeline incident. Visit emergencyresponderinfo.com to register and request the action plan for your area. Your request for access will be reviewed within 10 business days.

Additional resources

- mypipelinetraining.com
- emergencyresponderinfo.com
- phmsa.dot.gov/hazmat/library/erg
- npms.phmsa.dot.gov
- naturalgas.org
- ingaa.org
- gis2.rrc.state.tx.us/public
- pipeline101.org
- call811.com
- clickbeforeyoudig.com

Contact Enbridge

All of our pipelines are monitored 24-7. If you suspect a pipeline emergency, please find a safe place to call 911, and then call Enbridge's toll-free 24 hour emergency number:

1-800-231-7794

If you have a non-emergency question regarding Enbridge's damage prevention program, integrity management program or operations in your area you can call Public Awareness at **1-888-293-7867** or visit **Enbridge.com/USpublicawareness.**

Email
USPublicawareness@enbridge.com

Mail
Public Awareness Department
5400 Westheimer Court
Houston, TX 77056

Website
Enbridge.com/USpublicawareness

Facebook
Facebook.com/Enbridge

Emergency Information

Information for 911 Dispatchers

After identifying a potential pipeline emergency and dispatching local responders, take the following actions to facilitate a safe, effective response:

- Reassure the caller that emergency response crews and Enbridge will be contacted and will arrive as soon as possible.
- Advise the caller of the following as the situation dictates:
- Move as far away from the leak as possible (upwind if possible), avoiding contact with escaping liquids and gases
- Do not drive into the area or start your car
- Do not light a match
- Do not turn on or off anything that may create a spark – including cell phones, telephones, light switches, vehicle alarms, vehicle keyless entry and flashlights – until you are in a safe location
- Do not operate pipeline valves
- Do not remain in a building if the smell is stronger inside than outside
- If an evacuation center has been designated, advise the caller of the location
- Call Enbridge's toll-free, 24-hour emergency number for your area. It is important to contact the pipeline operator as soon as possible so we can stop product flow and make notifications as needed. Emergency numbers are located on the back cover of this brochure

The Role of the Local Responder

Besides handling traffic control and evacuating, securing the site and fighting secondary fires, local responders often assist by:

- Making appropriate contacts if it appears the pipeline incident impacts other agencies, facilities or local authorities
- Handling search and rescue
- Providing medical aid
- Coordinating a community emergency response plan, determining whether evacuation is warranted (mandating an evacuation, if required) and designating an evacuation center

Enbridge Supports the ICS

We consider the Incident Command System (ICS) to be paramount to organizing and coordinating response to emergency events. The pre-established structure, duties, and procedures among the various stakeholders responding to these events are important. Many Enbridge personnel have been trained in ICS and will be made available should they be needed. Additional information on ICS can be obtained on the FEMA webpage at **training.fema.gov/emiweb/is/icsresource/.**

Planning and Zoning Departments—Please Read!

Land development near pipelines

As rural areas become urbanized, more housing and commercial developments are built near pipelines and related facilities. Public officials involved in planning and zoning can help by verifying that land developers submit plans showing the accurate location of nearby pipelines and other buried utilities at the proposed site. If any exist, ask the developer:

- Have you consulted with the utility operator?
- Have you, working with the utility operator, considered the need for right-of-way access?
- Have you considered evacuation routes to be used in the unlikely event of an emergency?
- How will you prevent excavation damage to buried utilities during construction?
- Are there alternative uses for the pipeline right-of-way such as green spaces, parks, golf courses, trails and other recreational spaces?

To access the Department of Transportation's recommended practices for developing land near existing pipelines and facilities, please visit **phmsa.dot.gov.**

Contact Enbridge

If you have an emergency please contact the 24-hour emergency number in your area.

1-800-231-7794

Emergency Information

Recognizing a Pipeline Leak

In an emergency, protecting the public is your top priority – and it's our top priority as well. We value your expertise as public safety officials, and we're committed to providing you with the information and training you need to respond in the unlikely event of an emergency involving our pipelines or facilities.

Although we immediately dispatch our emergency response teams upon notification, local 911 dispatch centers or other public safety officials typically receive the initial report. The following could indicate a potential pipeline emergency and may be reported by callers or emergency responders:

You might see:

- Dirt being blown or appearing to be thrown into the air
- A white vapor stream or mist-like cloud over the pipeline
- Dead or dying vegetation in an otherwise green area
- A dry area in a wet field
- Flames coming from the ground or appearing to burn above ground
- Liquid on the ground
- Continuous bubbling in wet or flooded areas

You might hear:

- A roaring, blowing or hissing sound

You might smell:

- An unusual sulfur or rotten egg odor

Steps for a Safe Response

If you suspect an emergency on an Enbridge pipeline, immediately call our toll-free, 24-hour emergency number for your area from a safe location. Our monitoring system may have already alerted us to the disruption, but always call to verify. The pipeline operator's name and emergency telephone number can be found on the pipeline marker.

Once onsite, Enbridge representatives will work with you to establish safe procedures for securing the area or other emergency measures. If our representatives have not arrived, there are some important steps you can take:

- Abandon any mechanized equipment and ignition sources in the suspected leak's vicinity
- Secure the site and determine a plan to evacuate or shelter-in-place
- Monitor for hazardous atmospheres
- Control and redirect traffic
- Provide immediate access to Enbridge representatives
- Implement your local emergency plan

We will work with emergency responders in the event of a pipeline emergency to resolve the situation safely and effectively. We value the knowledge and skills of emergency responders, and designed our guidelines to keep you, employees and the public safe.

What NOT to do During an Emergency Response

- Do not operate pipeline valves or extinguish any pipeline fires. Doing so may prolong or worsen an incident—or even cause another leak in the pipeline. Our control center personnel can shut some valves automatically, while trained employees must manually close others.
- Do not create a spark. Possible ignition sources include smoking materials, open flames, light switches, telephones, cell phones, pagers, flashlights, keyless entry remotes, motor vehicles and other electronic devices.
- Do not enter an Enbridge facility without our permission unless there is an immediate risk to safety. If a fire occurs at one of our facilities, unless lives are at risk we ask that fire crews stay outside of the property until Enbridge representatives arrive.

Contact Enbridge

If you have an emergency please contact the 24-hour emergency number in your area.

1-800-231-7794

Pipeline Safety and Emergency Information

for Emergency and Public Officials

$750

Fill out the response card survey for a chance to win a grant!

You have received this brochure because we have identified you as an Emergency or Public Official with responsibilities in the vicinity of Enbridge's natural gas pipelines or related facilities. This document has been designed to provide basic pipeline safety information including how to identify a leak, how to respond in the unlikely event of a leak or natural gas fire, how to determine where our pipelines are located, and how to contact us in an emergency or to obtain additional information. Please share this important information with other emergency and public officials with whom you work.

A HELPFUL TIP: Save the emergency phone number for your area in your list of contacts or cell phone for quick reference in an emergency.

ENBRIDGE
Life Takes Energy™

18GEPS

Pipeline Safety: A Shared Responsibility

Life takes energy: to heat our homes, to feed our families, to fuel our vehicles. Enbridge connects people to the energy they need to help fuel their quality of life.

—

As an Emergency or Public Official, you need to be aware of Enbridge pipelines in your area and how to respond safely and effectively to a pipeline emergency. At your request, we can provide additional Enbridge pipeline information including location, size and contents transported. For additional resources, details on emergency response drills in your area, to talk to an Enbridge representative or schedule an Enbridge presentation during your next meeting, please contact us at **888-293-7867** or email us at **USPublicawareness@enbridge.com.**

Pipeline Purpose and Reliability

The United States has the largest pipeline network in the world. Data collected by the U.S. Department of Transportation reports pipelines are one of the safest ways to move energy resources like the crude oil, natural gas and other petroleum products Enbridge Transports. We are committed to safe and reliable operation of our pipelines in your community. Every year our company invests in the latest technology and training to meet the high environmental and safety standards expected by those who live and work near our pipelines.

Contact Enbridge

If you have an emergency please contact the 24-hour emergncy number in your area.

1-800-231-7794

Types of Natural Gas

Hazard Awareness & Prevention Measures

Natural gas pipelines typically operate under high pressure and can move large volumes of gas, therefore accidents involving them can be hazardous. If an incident occurs on an Enbridge pipeline, our representatives will provide safety data sheets for the product in the pipeline to emergency responders.

The chart below provides general information about products transported through Enbridge pipelines. For more information, please see the Pipeline and Hazardous Material Safety Administration's "Emergency Response Guidebook." Request a free copy or download the mobile app at **phmsa.dot.gov/hazmat/library.erg.**

Product	Appearance	Odor	Special behavior	Hazards
Natural Gas	Combustible mixture of hydrocarbon gases that is odorless.	No odor will be detected unless an odorant is added for shipping.	Low density and lighter than air. In an open area, it rises into the atmosphere and dissipates. In an enclosed area, it collects first overhead.	Extremely flammable and explosive. Suffocation can occur if vapors displace the oxygen in an enclosed area.

Responding to a Natural Gas Incident

In the event of an emergency involving natural gas, evacuate all unnecessary personnel and wear appropriate personal protective equipment. Contact Enbridge immediately so we can stop the product flow and then allow any fire that may be present to burn out. **Do not operate pipeline valves!**

For detailed information on product hazards and appropriate response to a pipeline emergency, take our free online education program for emergency responders at **mypipelinetraining.com.**

Know What's Below

Enbridge maintains a Damage Prevention Program in accordance with state and federal guidelines. The purpose of this program is to prevent damage to our pipeline facilities from excavation activities, such as digging, trenching, blasting, boring, tunneling, or backfilling.

One-Call Requirements

811, the national "call before you dig" number, and **ClickBeforeYouDig.com** are free services designed to keep you safe when digging. Calling or clicking is always the safest option every time you dig, and in many cases it's the law. At least two to three business days before your project – any time you are disturbing the soil – (depending on state law), call **811** or visit **ClickBeforeYouDig.com.**

811 Know what's below. Call before you dig.

Click Before You Dig.com

Within two to three business days, professional locators will come to your location and mark underground utility lines—including pipelines (marked with yellow flags or paint)—so you can work around them, saving yourself from possible injury or property damage.

If you see someone digging or disturbing the soil and there are no flags or marks on the ground, please stop the activity and ask the person to call **811** before continuing. Do not rely on word-of-mouth, maps, memory or pipeline markers when planning a digging project.

Pipeline Right-of-Way and Pipeline Location

A pipeline follows a narrow, clear stretch of land called a right-of-way that allows our employees and contractors to access the pipeline for inspections, maintenance, testing and emergencies.

Pipeline rights-of-ways must be kept free from structures and other obstructions to provide access to the pipeline for maintenance or in the event of an emergency. Pipelines are patrolled from the air and the ground, and obstructions prevent proper inspections.

You can find the general location of an Enbridge pipeline near you by looking for a pipeline marker. The marker will typically provide the pipeline operator's name, the contents of the pipeline and an emergency phone number. If an emergency is suspected or discovered, call the number on the pipeline marker.

While markers play an important role in identifying pipelines, they are not used to give exact locations and should not be an alternative to dialing 811. Markers should never be removed or relocated by anyone other than a pipeline operator.

Enbridge and Spectra Energy merged early in 2017. If you call the emergency number located on a pipeline marker showing a Spectra Energy logo, you will be automatically connected to Enbridge personnel.

You can also find out where pipelines are in your area by going to the National Pipeline Mapping System website at **www.npms.phmsa.dot.gov** or by contacting one of our representatives at **1-888-293-7867.**

Know What's Near You

Above and Below Ground Facilities

While most Enbridge pipelines are buried underground, our system also includes additional facilities such as, compressor stations, metering stations and natural gas storage.

It's important that you know what to expect as part of normal operations at these facilities. If you notice any suspicious activity or abnormal odor near one of our above ground facilities, call 911 immediately, then call Enbridge's 24-hour emergency number for your area.

Facility and Purpose	Normal Operations
Compressor Stations move natural gas through the pipeline at a consistent pressure.	Each station has built-in safety features that detect problems and automatically shut down equipment. During normal operations, no significant odors should be detected.
Metering Stations measure, and valve sites control, the flow of products through the pipeline.	No significant odors should be detected during normal operations.
Natural Gas Storage helps balance supply and demand for natural gas. During periods when the need for natural gas is not as high, natural gas supplies are stored. When consumer demand increases, the supplies are put back into the interstate pipeline network for delivery.	Each facility has built-in safety features that detect problems and automatically shut down equipment. During normal operations, no significant odors should be detected.

Keeping Pipelines Safe

The objective of Enbridge's integrity management program is to improve pipeline safety through a systematic approach involving data gathering, risk assessment, integrity assessments, prevention and mitigation. The U.S. Department of Transportation has developed specific High Consequence Area (HCA) regulations for the operations and maintenance of natural gas transmission pipelines. These regulations are more rigorous than those for non-HCA locations and focus integrity management activities on populated areas and areas where it would be difficult to evacuate people. In most cases, we apply the more rigorous requirements to the operation of all our pipeline facilities, not just the HCAs.

Emergency and Public Officials like you can help us maintain a safe, secure and reliable pipeline system. If you observe any unusual or suspicious activity near our pipeline facilities, or in the event an emergency occurs, please call us immediately using the toll-free emergency number included in this brochure.

Our safety measures:

Safety is, and always will be, our number one priority. Our team devotes hundreds of thousands of hours every year to keep our systems running smoothly and without incident. We invest heavily in safety measures including:

- Inspection and preventative maintenance programs
- Round-the-clock monitoring for pipelines and facilities
- Emergency response training and drills for employees and local emergency responders
- Pressure tests on new and existing pipelines
- Aerial and ground patrols along the pipeline right-of-way
- Automatic shut-off and remote control valves
- High-quality pipeline material and protective coating

Enbridge has enhanced safety measures for pipelines that cross bodies of water and highly populated or environmentally sensitive areas. To read more about our pipeline safety efforts, see our Safety Report to the Community at **enbridge.com/safety.**

Pipeline Safety and Emergency Information

for Emergency and Public Officials

$750

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A HELPFUL TIP: Save the emergency phone number for your area in your list of contacts on your cell phone for quick reference in an emergency.

ENBRIDGE
Life Takes Energy™

19GTMEPE

Resources

Free Training Opportunity for Emergency Responders and 911 Dispatchers

Emergency responders and others responsible for public safety in our counties of operation – including 911 dispatchers – can access the National Association of State Fire Marshals' Pipeline Emergencies online training program at **mypipelinetraining.com.**

The trainings can be completed in one or multiple sessions, and a certificate is provided upon completion. This program may qualify for the following:

- Continuing education credits
- OSHA HAZMAT compliance
- Insurance Service Office Fire Suppression Rating Schedule Program

For more information, please contact us at **1-888-293-7867** or **ERinfo@enbridge.com.**

Safe Community Grant Program

Enbridge offers grants to emergency response agencies in the communities where we operate. These grants can be used for equipment or training that will help organizations respond effectively to pipeline emergencies. If your agency would respond in the unlikely event of an Enbridge pipeline emergency, you can visit **enbridge.com/safecommunity** to find more information on the program.

Emergency Response Action Plans

Our Emergency Response Action Plans are available to emergency response organizations in counties where we operate. These action plans provide information on the ways we'll work with emergency responders during the initial stages of a pipeline incident. Visit **emergencyresponderinfo.com** to register and request the action plan for your area. Your request for access will be reviewed within 10 business days.

Additional Resources

- mypipelinetraining.com
- emergencyresponderinfo.com
- phmsa.dot.gov/hazmat/library/erg
- npms.phmsa.dot.gov
- naturalgas.org
- ingaa.org
- gis2.rrc.state.tx.us/public
- pipeline101.org
- call811.com
- clickbeforeyoudig.com

Contact Enbridge

All of our pipelines are monitored 24/7. If you suspect a pipeline emergency, please find a safe place to call 911, and then call Enbridge's toll-free, 24-hour emergency number:

1-800-231-7794

If you have a non-emergency question regarding Enbridge's damage prevention program, integrity management program, or operations in your area, you can call Public Awareness at **1-888-293-7867** or visit **Enbridge.com/USpublicawareness.**

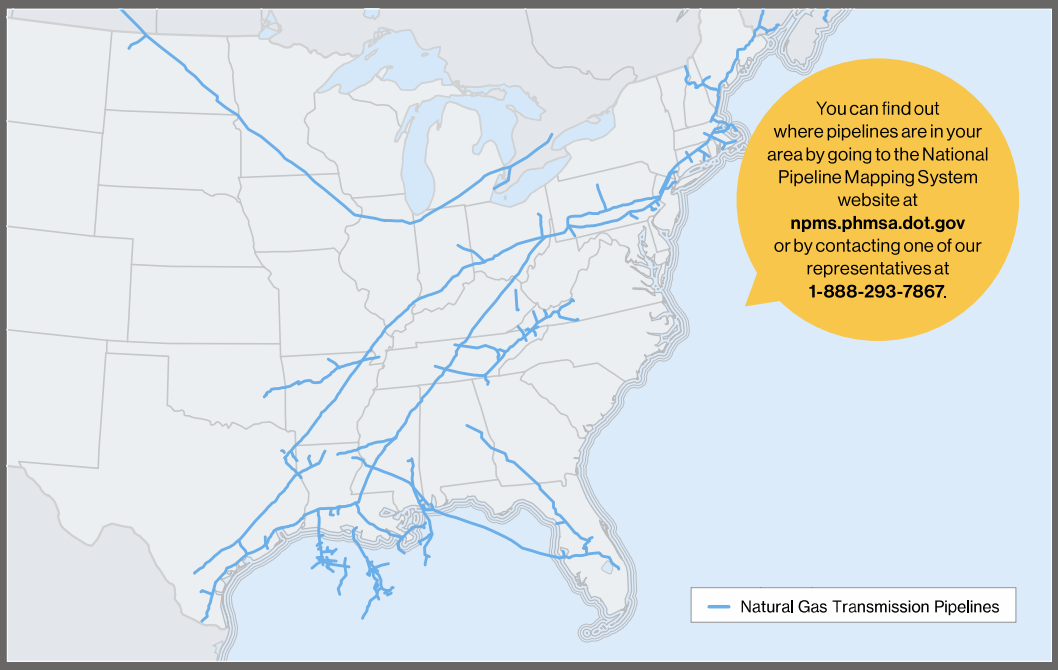
Email
USPublicawareness@enbridge.com

Mail
Public Awareness Department
5400 Westheimer Court
Houston, TX 77056

Website
Enbridge.com/USpublicawareness

Facebook
Facebook.com/Enbridge

Pipeline Safety:
A Shared Responsibility



Life takes energy: to heat our homes, to feed our families, to fuel our vehicles. Enbridge connects people to the energy they need to help fuel their quality of life.

As an Emergency or Public Official, you need to be aware of the Enbridge pipelines in your area and how to respond safely and effectively to a pipeline emergency. At your request, we can provide additional Enbridge pipeline information including the pipeline's location and size, and the contents transported. For additional resources, details on emergency response drills in your area, to talk to an Enbridge representative, or to schedule an Enbridge presentation during your next meeting, please contact us at **1-888-293-7867** or email us at **USPublicawareness@enbridge.com**.

Pipeline Purpose and Reliability

The United States has the largest pipeline network in the world. Data collected by the U.S. Department of Transportation reports pipelines are one of the safest ways to move energy resources like the crude oil, natural gas, and other petroleum products Enbridge transports. We are committed to the safe and reliable operation of our pipelines in your community. Every year our company invests in the latest technology and training to meet the high environmental and safety standards expected by those who live and work near our pipelines.

Contact Enbridge

If you have an emergency, please contact the 24-hour emergency number in your area:

1-800-231-7794

Types of Natural Gas

Hazard Awareness & Prevention Measures

Natural gas pipelines typically operate under high pressure and can move large volumes of gas, therefore accidents involving them can be hazardous. If an incident occurs on an Enbridge pipeline, our representatives will provide the emergency responders with safety data sheets for the product in the pipeline.

The chart below provides general information about products transported through Enbridge pipelines. For more information, please see the Pipeline and Hazardous Material Safety Administration's "Emergency Response Guidebook." Request a free copy or download the mobile app at **phmsa.dot.gov/hazmat/library.erg**.

Product	Appearance	Odor	Special behavior	Hazards
Natural Gas	Combustible mixture of hydrocarbon gases that is odorless.	No odor will be detected unless an odorant is added for shipping.	Low density and lighter than air. In an open area, it rises into the atmosphere and dissipates. In an enclosed area, it collects first overhead.	Extremely flammable and explosive. Suffocation can occur if vapors displace the oxygen in an enclosed area.

Responding to a Natural Gas Incident

In the event of an emergency involving natural gas, evacuate all unnecessary personnel and wear appropriate personal protective equipment. Contact Enbridge immediately so we can stop the product flow and then allow any fire that may be present to burn out.
Do not operate pipeline valves!

For detailed information on product hazards and appropriate responses to a pipeline emergency, we encourage you to take free online pipeline emergency response training at **mypipelinetraining.com**.

PHMSA-DANVILLE002703 PLD19FR002-Danville-NTSB002799

Know What's Below

Enbridge maintains a Damage Prevention Program in accordance with state and federal guidelines. The purpose of this program is to prevent damage to our pipeline facilities from excavation activities, such as digging, trenching, blasting, boring, tunneling, or backfilling.

One-Call Requirements

811, the national "call before you dig" number, and **ClickBeforeYouDig.com** are free services designed to keep you safe when digging. Calling or clicking is always the safest option every time you dig, and in many cases it's the law. At least two to three business days before your project – any time you are disturbing the soil – (depending on state law), call **811** or visit **ClickBeforeYouDig.com**.

811 Know what's below. Call before you dig.

Click Before You Dig .com

Within two to three business days, professional locators will come to your location and mark underground utility lines – including pipelines (marked with yellow flags or paint) – so you can work around them, saving yourself from possible injury or property damage.

If you see someone digging or disturbing the soil and there are no flags or marks on the ground, please stop the activity and ask the person to call **811** before continuing. Do not rely on word-of-mouth, maps, memory, or pipeline markers when planning a digging project.

Pipeline Right-of-Way and Pipeline Location

A pipeline follows a narrow, clear stretch of land, called a right-of-way, that allows our employees and contractors to access the pipeline for inspections, maintenance, testing, and emergencies.

Pipeline rights-of-way must be kept free from structures and other obstructions to allow access to the pipeline for maintenance or in the event of an emergency. Pipelines are patrolled from the air and the ground, and obstructions prevent proper inspections.

You can find the general location of an Enbridge pipeline near you by looking for a pipeline marker. The marker will typically provide the pipeline operator's name, the contents of the pipeline, and an emergency phone number. If an emergency is suspected or discovered, call the number on the pipeline marker.

While markers play an important role in identifying pipelines, they are not used to give exact locations and should not be an alternative to dialing 811. Markers should never be removed or relocated by anyone other than a pipeline operator.

PHMSA-DANVILLE002704

PLD19FR002-Danville-NTSB002800

Know What's Near You

Above Ground Facilities

While most Enbridge pipelines are buried underground, our system also includes additional facilities such as, compressor stations, metering stations, and natural gas storage. It's important that you know what to expect as part of the normal operations at these facilities.

If you notice any suspicious activity or abnormal odor near one of our above ground facilities, call 911 immediately, then call Enbridge's 24-hour emergency number for your area.

Facility and Purpose	Normal Operations
Compressor Stations move natural gas through the pipeline at a consistent pressure.	Each station has built-in safety features that detect problems and automatically shut down equipment. During normal operations, no significant odors should be detected.
Metering Stations measure, and valve sites control, the flow of products through the pipeline.	No significant odors should be detected during normal operations.
Natural Gas Storage helps balance supply and demand for natural gas. During periods when the need for natural gas is not as high, natural gas supplies are stored. When consumer demand increases, the supplies are put back into the interstate pipeline network for delivery.	Each facility has built-in safety features that detect problems and automatically shut down equipment. During normal operations, no significant odors should be detected.

Keeping Pipelines Safe

The objective of Enbridge's integrity management program is to improve pipeline safety through a systematic approach involving data gathering, risk assessment, integrity assessments, prevention, and mitigation. The U.S. Department of Transportation has developed specific High Consequence Area (HCA) regulations for the operations and maintenance of natural gas and liquids transmission pipelines. These regulations are more rigorous than those for non-HCA locations and focus integrity management activities on populated areas and areas where it would be difficult to evacuate people. In most cases, we apply the more rigorous requirements to the operation of all our pipeline facilities, not just the HCAs.

Emergency and Public Officials like you can help us maintain a safe, secure, and reliable pipeline system. If you observe any unusual or suspicious activity near our pipeline facilities, or if an emergency occurs, please call us immediately using the toll-free emergency number included in this brochure.

Our Safety Measures

Safety is, and always will be, our number one priority. Our team devotes hundreds of thousands of hours every year to keeping our systems running smoothly and without incident. We invest heavily in safety measures including:

- Inspection and preventative maintenance programs
- Around-the-clock monitoring of pipelines and facilities
- Emergency response training and drills for employees and local emergency responders
- Pressure tests on new and existing pipelines
- Aerial and ground patrols along the pipeline right-of-way
- Automatic shut-off and remote-control valves
- High-quality pipeline material and protective coating

Enbridge has enhanced safety measures for pipelines that cross bodies of water and highly populated or environmentally sensitive areas. To read more about our pipeline safety efforts, see our Safety Report to the Community at **enbridge.com/safety**.

Emergency Information

Information for 911 Dispatchers

After identifying a potential pipeline emergency and dispatching local responders, take the following actions to facilitate a safe, effective response:

- Reassure the caller that emergency response crews and Enbridge will be contacted and will arrive as soon as possible.
- Advise the caller of the following as the situation dictates:
  - Move as far away from the leak as possible (upwind if possible), avoiding contact with escaping liquids and gases
  - Do not drive into the area or start your car
  - Do not light a match
  - Do not turn on or off anything that may create a spark – including cell phones, telephones, light switches, vehicle alarms, vehicle keyless entry systems, and flashlights – until you are in a safe location
  - Do not operate pipeline valves
  - Do not remain in a building if the smell is stronger inside than outside
- If an evacuation center has been designated, advise the caller of the location
- Call Enbridge's toll-free, 24-hour emergency number for your area

It is important to contact the pipeline operator as soon as possible so we can stop product flow and make notifications as needed. Emergency numbers are located on the back cover of this brochure.

The Role of the Local Responder

Besides handling traffic control and evacuating, securing the site and fighting secondary fires, local responders often assist by:

- Making appropriate contacts if it appears that the pipeline incident impacts other agencies, facilities, or local authorities
- Handling search and rescue
- Providing medical aid
- Coordinating a community emergency response plan, determining whether evacuation is warranted (mandating an evacuation, if required) and designating an evacuation center

Enbridge Supports the ICS

We consider the Incident Command System (ICS) to be paramount to organizing and coordinating the response to emergency events. The pre-established structure, duties, and procedures among the various stakeholders responding to these events are important. Many Enbridge personnel have been trained in ICS and will be made available should they be needed. Additional information on ICS can be obtained on the FEMA webpage at **training.fema.gov/emiweb/is/icsresource/**.

Planning and Zoning Departments– Please Read!

Land development near pipelines

As rural areas become urbanized, more housing and commercial developments are built near pipelines and related facilities. Public officials involved in planning and zoning can help by verifying that land developers submit plans showing the accurate location of nearby pipelines and other buried utilities at the proposed site. If any exist, ask the developer:

- Have you consulted with the utility operator?
- Have you, working with the utility operator, considered the need for right-of-way access?
- Have you considered evacuation routes to be used in the unlikely event of an emergency?
- How will you prevent excavation damage to buried utilities during construction?
- Are there alternative uses for the pipeline right-of-way such as green spaces, parks, golf courses, trails, and other recreational spaces?

To access the Department of Transportation's recommended practices for developing land near existing pipelines and facilities, please visit **phmsa.dot.gov**.

Contact Enbridge

If you have an emergency, please contact the 24-hour emergency number in your area:

1-800-231-7794

Emergency Information

Recognizing a Pipeline Leak

In an emergency, protecting the public is your top priority – and it's our top priority as well. We value your expertise as public safety officials, and we're committed to providing you with the information and training you need to respond in the unlikely event of an emergency involving our pipelines or facilities.

Although we immediately dispatch our emergency response teams upon notification, local 911 dispatch centers or other public safety officials typically receive the initial report. The following items listed below could indicate a potential pipeline emergency and may be reported by callers or emergency responders.

You might see:

- Dirt being blown or appearing to be thrown into the air
- A white vapor stream or mist-like cloud over the pipeline
- Dead or dying vegetation in an otherwise green area
- A dry area in a wet field
- Flames coming from the ground or appearing to burn above ground
- Liquid on the ground
- Continuous bubbling in wet or flooded areas

You might hear:

- A roaring, blowing, or hissing sound

You might smell:

- An unusual sulfur or rotten egg odor

Steps for a Safe Response

If you suspect an emergency with an Enbridge pipeline, immediately call our toll-free, 24-hour emergency number for your area from a safe location. Our monitoring system may have already alerted us to the disruption, but always call to verify. The pipeline operator's name and emergency telephone number can be found on the pipeline marker.

Once onsite, Enbridge representatives will work with you to establish safe procedures for securing the area or other emergency measures. If our representatives have not arrived, there are some important steps you can take:

- Abandon any mechanized equipment and ignition sources in the suspected leak's vicinity
- Secure the site and determine a plan to evacuate or shelter-in-place
- Monitor for hazardous atmospheres
- Control and redirect traffic
- Provide immediate access to Enbridge Pipeline Representatives
- Implement your local emergency plan

In the event of a pipeline emergency, we will work with emergency responders to resolve the situation safely and effectively. We value the knowledge and skills of emergency responders, and designed our guidelines to keep you, our employees, and the public safe.

What NOT to do During an Emergency Response

- Do not operate pipeline valves or extinguish any pipeline fires. Doing so may prolong or worsen an incident, or even cause another leak in the pipeline. Our control center personnel can close some valves automatically, while trained employees must manually close others.
- Do not create a spark. Possible ignition sources include smoking materials, open flames, light switches, telephones, cell phones, pagers, flashlights, keyless entry remotes, motor vehicles and other electronic devices.
- Do not enter an Enbridge facility without our permission unless there is an immediate risk to safety. If a fire occurs at one of our facilities, unless lives are at risk, we ask that fire crews stay outside of the property until Enbridge representatives arrive.

Contact Enbridge

If you have an emergency, please contact the 24-hour emergency number in your area:

1-800-231-7794

Do not operate pipeline valves! It is against the law, and doing so may cause a pipeline leak, prolonging a pipeline incident, or cause injury or death to anyone who may be working on the pipeline nearby.

Exhibit 15. Enbridge GTM's Asset Integrity Program and Summary of Enbridge GTM's Safety Management System

This Exhibit is comprised of a copy of documentation, as made available to the investigation by Enbridge, describing the elements, methodologies, and measures of the Enbridge Safety Management Systems (SMS) Program, consisting of a document [digital filename] titled "DR115A Asset Integrity Program Transformation-c2".

COMPANY RESPONSE TO NTSB INFORMATION REQUEST NO. 115
May 8, 2020

NTSB Request: Provide a summary of changes to Enbridge GTM's Asset Integrity Program and a summary of Enbridge GTM's Safety Management System

Company Response: Enbridge GTM's historic approach to asset integrity decision making has primarily been driven by qualitative assessments and by benchmarking program and procedural requirements against the top decile/quartile of our Industry peers. In early 2019, Enbridge GTM determined that approach was not yielding the performance level consistent with our expectations and risk tolerance. Several pipeline failures in 2018 and 2019 made it clear that we had opportunities to improve our performance. We clarified the expectation that we will not have any more ruptures -- with confidence, driven by facts and data. We set definitive safety targets at significantly higher level of performance than Industry average performance (within 2 years 1.0E-5, within 5 years 1.0E-6, vs 5.0E-5 10-year historic Industry average)[1]. To achieve that step change in certainty regarding our safety performance, we needed make a significant shift in our mindset and approach to Asset Integrity. Rather than focusing on our peers, we modelled this shift after industries that have achieved superior performance levels (e.g., aviation, nuclear, and chemical/refining). Fundamental to this shift is that we be able to prove the integrity of our assets using a quantitative, as opposed to a qualitative, approach to risk assessments. This shift will entail a 3-5year, iterative transformation of the organization, programs, behaviors, data and support systems as structured by our Integrated Management System (see attached for overview of our Integrated Management System design which complies with API RP 1173, Pipeline Safety Management Systems).

As a first step in early 2019, we conducted an Independent Pipeline Integrity Program Review (IPIPR) and fitness for service assessment against critical threats led by Dynamic Risk and supported by our internal subject matter experts. Based on the findings from these assessments, we designed and launched the most profound transformation of our integrity program in GTM's history. One of the guiding principles in the mindset shift and this assessment was that fitness for service would not be assumed. If the state of risk could not be proven by facts and data, the risk was assumed to be present and actions were taken to mitigate or prove the condition state. As a result, we began instituting mitigation strategies including taking pressure restrictions for the highest risks and adopting other preventive measures when not enough information was available to prove that our assets were safe. Consequently, we have significantly increased our use of inspection and testing diagnostics and are generating much more data in our efforts to increase confidence. In order to achieve our safety targets, we have expanded our integrity inspection and risk assessment capabilities on the most prominent threats across the system. And, we have increased the consistency of our assessments through a deliberate quality control review process against our safety targets. In order to support this shift, we have significantly expanded our organizational capabilities and integrity budgets to support the strongest safety targets in the industry.

One year into our integrity transformation journey, we are encouraged by the results achieved to date. We have staffed our organization to protect the time needed for critical thinking. We have increased our staff from 50 to 113 team members and added new capabilities such as reliability and geohazards engineers. We have centralized our integrity organization and redefined our responsibilities and accountabilities to create a group that is focused exclusively on integrity and risk assessment activities.

From 2018 to 2019, we prioritized inspection, testing and pressure restrictions on the segments representing the highest risk likelihood for each threat across the system as identified by the IPIPR. We increased integrity activities between 1.5 and 4 times. We went from 86 to 371 pipeline in-line inspection tool runs and subsequently increased anomaly digs from 655 to 980. To ensure the interim safety of the

[1] 1.0E-5 is equivalent to 1 incident per 100,000 miles/year; 1.0E-6 is equivalent to 1 incident per 1,000,000 miles/year; 5.0E-5 is equivalent to 5 incidents per 100,000 miles/year.

system while we were collecting the needed facts and data, we imposed an unprecedented number of pressure restrictions. We restricted pressure on 101 pipeline segments, equivalent to 3,189 miles. In addition, we restricted pressure on 45 segments with A.O. Smith pipe corresponding to 2,290 miles – representing 28% of our 19,500 system miles.

Our Integrated Management System (IMS) defines the framework and structure for our asset oversight and drives continuous improvement across the organization. The IMS defines eight protection programs (including the three asset integrity programs) as well as the eleven program elements that provide the structure for each program. In the interest of continuous improvement, during 2019 and early 2020, we completed a comprehensive overhaul of our Integrity Management Programs (IMPs). We converged multiple Pipeline IMPs from our operating companies into one consolidated Pipeline IMP that addresses the findings of the IPIPR and incorporates best practices from across Industry. We developed a new Facilities IMP, increased facility inspections and updated our Storage IMP. To facilitate consistency across the integrity programs and create more tangibility of the IMS in the day to day application of the IMS within the programs, we created a group within Asset Integrity with a dedicated focus on clarifying accountabilities, work processes and applying the program elements within the Integrity Management Programs. The new and converged IMPs will be fully implemented in the second quarter of 2020.

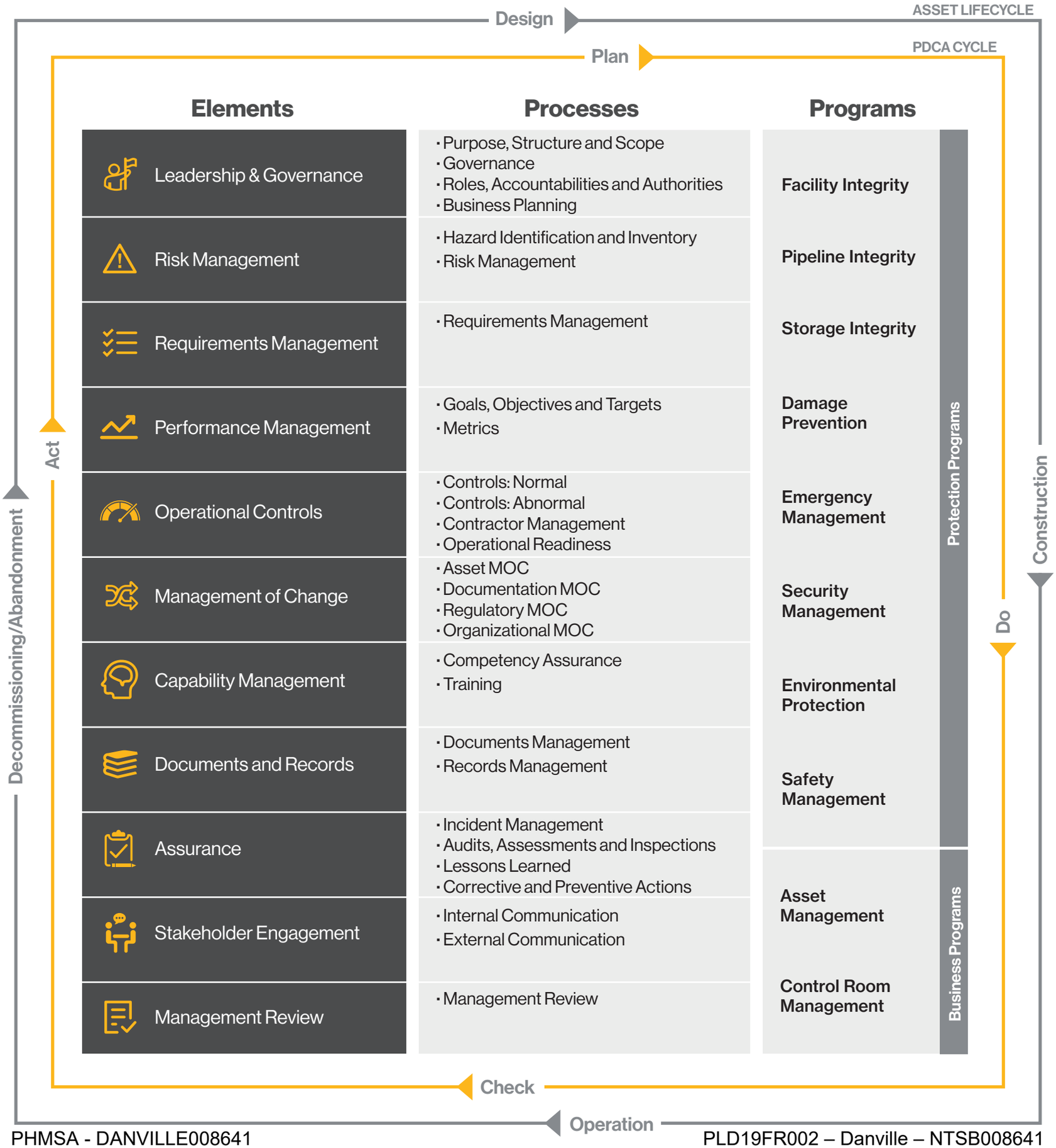
We have made significant improvements in our processes and the use of digital tools to conduct inspections and determine and assess operational and health and safety risks. We have improved our data acquisition and management processes leveraging artificial intelligence and machine learning technologies to support our goal of increased confidence in the integrity of our assets and more rigorous assessments.

All these accomplishments have been supported by a 300% budget increase from 2018 levels.

In conjunction with our IMS, we have established several long-range strategies to build sustainable organizational capabilities in order to achieve our strategy and goal of zero ruptures with confidence. Some of the areas in which we will iteratively focus to evolve our capabilities include:

- Foster awareness and reinforce shift in key behaviors to support applying conservatism in the absence of certainty, chronic unease and continuous improvement
- Expand Asset Long Range Plan to provide the structure and guidelines to establish integrity plans for all assets or segments which will be reviewed on an annual basis
- Improve data availability and accuracy, including incorporating automated data handling, quality control, analyses and machine learning
- Expand validation of tool capabilities, quality control of vendor assessments and deliberate efforts to advance diagnostic tool capabilities
- Improve confidence in our Risk Assessments through the expanded use of quantitative risk assessments and by expanding capabilities to perform statistical uncertainty quantification, conduct probabilistic fitness for service assessments and determine explicit integrity reliability targets
- Expand the detail of our hazard and threat matrix and achieve a more fulsome risk registry
- Expand and deepen the use of documented Safety Cases for all assets through the use of system-wide assessments and defense-in-depth to drive certainty.
- And lastly, better use of and line of sight to meaningful metrics to drive awareness and continuous improvement

GTM Integrated Management System



Elements	Processes	Programs	
Leadership & Governance	· Purpose, Structure and Scope · Governance · Roles, Accountabilities and Authorities · Business Planning	Facility Integrity	Protection Programs
Risk Management	· Hazard Identification and Inventory · Risk Management	Pipeline Integrity	
Requirements Management	· Requirements Management	Storage Integrity	
Performance Management	· Goals, Objectives and Targets · Metrics	Damage Prevention	
Operational Controls	· Controls: Normal · Controls: Abnormal · Contractor Management · Operational Readiness	Emergency Management	
Management of Change	· Asset MOC · Documentation MOC · Regulatory MOC · Organizational MOC	Security Management	
Capability Management	· Competency Assurance · Training	Environmental Protection	
Documents and Records	· Documents Management · Records Management	Safety Management	
Assurance	· Incident Management · Audits, Assessments and Inspections · Lessons Learned · Corrective and Preventive Actions	Asset Management	Business Programs
Stakeholder Engagement	· Internal Communication · External Communication	Control Room Management	
Management Review	· Management Review		

Exhibit 16. Summary Emergency Services Activity Chronology (Timeline) Documentation[1]

Based upon Timeline data of the Survival Factors investigation and supplementary evidentiary data obtained[2], a tabulation was compiled, as presented below, which describes a summarization of relevant key / significant activities that occurred in the emergency services response to the accident.

Tabulation legend - data source nomenclature / abbreviations

~	approximate, or approximately
214	NIFRS form 214, as compiled for this incident by LCFPD
Bluegrass 911	Bluegrass 911 Central Communication Center [PSAP]
CAD	Bluegrass 911 Computer Aided Dispatch report (of the incident)
EOC	Emergency Operations Center
EMS	emergency medical services (generic)
ET	Enbridge document ICS 201-2 Summary of Current Actions (filename)
IC	Incident Command
LCFPD	Lincoln County Fire Protection District
LCEMA	Lincoln County Emergency Management Agency
LCEMS	Lincoln County EMS
LCSO	Lincoln County Sheriff's Office
LE	law enforcement (generic)
MP	Texas Eastern - Line 15 [transmission pipeline] milepost
NIFRS	National Fire Incident Reporting System ([Internet] https://www.nfirs.fema.gov/)
NS	Norfolk Southern Railway
NTSB	On-scene NTSB / SF - debriefing of emergency services; Field Notes notations
PSAP	Bluegrass 911 Central Communication Center – agency data
PSAP CL	Bluegrass 911 – Call Log report
SCVR	Timestamp of security camera video recordings (recovered / reviewed by NTSB)
Source	source of the data element as cited for that specific Timestamp activity described
Timestamp	the time at which the described activity had occurred

[1] Source: on-scene observations of, and field notations recorded by the SF Group Chair, and as further described.

[2] Data source of the tabulation were the individual Timeline data [documentation] of Bluegrass 911 Central Communication Center, obtained during the Emergency Response Debriefing with the Lincoln County emergency services agencies (i.e., LCFPD, Bluegrass 911, LCEMA, LCEMS, and LCSO), and as further described.

Timestamp[3]	Activity Summary	Source
01:23:23 a.m.	Explosion and natural gas fire, resulting from a breach of Enbridge Line 15 transmission pipeline at MP 423.40	SCVR
01:23:34 a.m.	First [incoming] 911 call was received by the local PSAP (Bluegrass 911), from a motorist traveling [on what appeared to be U.S. Route 127] near the accident site, to report the incident. [call duration 01:02]	PSAP CL
01:24:23 a.m.	A 2nd [incoming] 911 call was received to report the incident, from a caller at an address on Carter School Road (later measured to be over 4½ miles from the accident site), in which it was indicated that the caller believed that an airplane crash had occurred.	PSAP CL
01:25:58 a.m.	Initial 'tone-out' [request to respond], radio-issued dispatch call to the jurisdictional emergency services agencies (i.e., fire department [LCFPD, Station 3], EMS, LE), by the PSAP; a request to response resources to the scene.	CAD, 214
01:28:00 a.m.	EMA 969 notified via text message from Boyle County Fire Fighter	214
01:34:43 a.m.	Lincoln County Engine 3 [is] en route	214, NTSB
01:35:01 a.m.	Lincoln County Rescue 1 (Station 1) [is] en route	214
01:36:00 a.m.	Lincoln County Sheriff [is] notified via private citizen	214
01:36:55 a.m.	Assistant Chief (LCFPD - Station 3) arrives at the scene.	CAD, 214
01:38:38 a.m.	A 3rd [incoming] 911 call was received to report the incident, in which the caller indicated that they believed that an airplane crash had occurred.	PSAP CL
01:38:02 a.m.	Hustonville Fire Engine 11 [is] en route	214
01:38:10 a.m.	Lincoln County Rescue 3 [is] en route	214
01:38:44 a.m.	Bluegrass 911 [outgoing] call to NS; placed a request to the railroad, not to allow any trains to travel through the incident site, in which the railroad advised that they had a train in that area earlier in which the train crew thought they saw a plane crash, in which also the railroad said that they think it's a gas line.	PSAP CL
01:39:11 a.m.	Assistant Chief LCFPD requests that Bluegrass 911 contact the Norfolk Southern Railway (NS), to advise the railroad not to allow any trains to travel through the incident site. Request also placed to have blockades placed on select local roads.	CAD, 214

[3] All activities occurred on August 1, 2019.

~ 01:40 a.m.	Command [post is] set up at [intersection of] Indian Camp Road and Route127 intersection. Assistant Chief recognized it was a gas line fire.	214
01:44:33 a.m.	LCFPD unit 305 advises Bluegrass 911 that the IC Post is established at Indian Camp Road.	CAD
01:46:08 a.m.	Lincoln County Engine 5 [is] en route	214
01:46:39 a.m.	Lincoln County Engine 1 [is] en route	214
01:53:45 a.m.	Bluegrass 911 dispatch to on-scene units; the railroad advised that they had a train in that area earlier in which the train crew thought they saw a plane crash, in which also the railroad indicated that they think it's a gas line. "units on scene report gas line rupture"	CAD, 214
01:57:40 a.m.	Assistant Chief 302 advises to notify Bluegrass Airport to make it a no fly zone.	CAD, 214
02:03:28 a.m.	Bluegrass 911 [outgoing] call to gas company [Enbridge], to provide a notification of the incident, and advised that they had received additional calls in this incident.	CAD, 214
02:17:44 a.m.	A supervisor from the gas company [Enbridge] called Bluegrass 911 to advise that it is a Texas Eastern pipeline, and that the company has "units" enroute.	CAD, 214
02:18:17 a.m.	Another employee from the gas company [Enbridge] called Bluegrass 911 to advise that he is a point of contact.	CAD, 214
02:19:30 a.m.	An LCSO deputy advised IC that he had pulled 2 victims from a burning structure, in which there was one fatality, on the ground, at the scene.	CAD, 214
02:27:20 a.m.	Radio transmission from the scene, advising that the Boyle County Command Post [incident command vehicle] will be on scene.	CAD, 214
02:29:36 a.m.	Radio transmission from Dispatch, advising that Air Traffic Control, in Indianapolis, is inaugurating temporary flight restrictions (TFR), for 10 miles [radius] around the smoke plume, for the Louisville flight pattern; airplanes are seeing smoke / fire plume as high as 16,000 feet, and are already diverting air traffic around it at this time.	CAD, 214
02:30:31 a.m.	Radio transmission from Dispatch; per LCEMS Director, all EMS [ambulance] units that are north of the scene are to stage [temporarily hold] at Don's Food mart, and all EMS units that are south of the scene are to stage at LCFPS Station 3.	CAD, 214
02:32:22 a.m.	Request from LCEMS Director, for the PSAP to contact the coroner's office, with a request to respond to either EMS staging area at the scene.	CAD, 214

02:36:06 a.m.	Radio transmission from Dispatch; the coroner's office [staff] indicates that he is responding, and will advise further.	CAD, 214
02:36:54 a.m.	Radio transmission from Dispatch; the gas company advises that they shut the gas line down about 38 minutes ago (i.e., at 1:59 a.m.)	CAD, 214
~ 02:40 a.m.	IC noted that the gas release fire (flare) appeared to be visibly diminishing at that time, in which it had taken ~ 20 minutes for the fire at the crater to subside	NTSB
02:41:31a.m.	IC advises that there are structures located within 100 yards of the pipeline.	CAD, 214
02:44:06 a.m.	Radio transmission advising that the New Hope Baptist Church is open for shelter.	CAD, 214
~ 02:56 a.m.	Enbridge personnel at the IC post gave [verbal] authorization to the FD to commence grass fire extinguishment	NTSB
02:57:20 a.m.	Radio transmission from Dispatch, advising that Norfolk Southern police called and requested an update, in which Dispatch gave them staging area information and advised them that that this is a gas line explosion	CAD, 214
~ 03:00 a.m.	LCFPD commenced house-to-house searches (of those dwellings not burning in the evacuation zone)	NTSB
03:12:58 a.m.	The Assistant Chief advised Dispatch, to notify Boone Center [KY Emergency Management] EOC, that US Highway 127 will be shut down	CAD, 214
03:18:33 a.m.	Radio transmission advising that the gas company has cleared LCFPD to attack [extinguish] the structure fires at this time	CAD, 214
03:18:45 a.m.	Radio transmission advising that LCFD has commenced external structure fire suppression operations, and initiated a victim search (in an attempt to determine if any victim had not been located)	214, NTSB
~ 03:20 a.m.	Fire suppression of grass fire areas completed	NTSB
03:23:55 a.m.	Radio transmission advising that Red Cross has been contacted for assistance	CAD, 214
03:29:00 a.m.	Personnel of Engine 3 "meters" the area [utilizes natural gas detection equipment, as a prelude] to commence fire suppression operations, in which multiple FD units followed	214, NTSB
03:29:40 a.m.	Radio transmission requesting that RECC [the local electrical utility] be notified to shut off electric [to the area], and to communicate with the command post	CAD, 214
03:39:41 a.m.	Radio transmission advising that the TFR has been revised to a 20-mile radius and a 5,000-foot altitude	CAD, 214

03:55:50 a.m.	Radio transmission advising that there were ~ 50 persons at the [church] evacuation shelter, in which more EMS resources were needed at that location	CAD, 214
03:56:34 a.m.	Radio transmission advising that the [FD] Engine Company was authorized to proceed with extinguishing all structure fires and not to enter those structures; at daybreak, the structures will be searched one at a time. The IC commented [to NTSB] that the scene had essentially stabilized at that time (i.e., the fire was effectively under control, with only a small flame remnant at the crater), which thus allowed structure fire suppression operations to proceed.	CAD, 214, NTSB
04:05:57 a.m.	Radio transmission, in which the Assistant Chief requested that the Red Cross be contacted, and a request that a 'Rehab Unit' respond to the IC command center	CAD, 214
04:13:45 a.m.	Radio transmission advising that the Hustonville Water Company was notified [that the water pressure could be reduced, due to the suspension of fire suppression operations that required a volume of water flow]	CAD, 214, NTSB
04:29:20 a.m.	Radio transmission advising that Indianapolis Air Traffic Control had called and requested an ETA for cancellation of rerouting of air traffic.	CAD, 214
~ 04:45 a.m.	Evacuee accounting activity initiated (i.e., the list of Evacuees at the church compared with the list of water bill customers)	NTSB
04:45:52 a.m.	Radio transmission advising that EMS command reported that was fire [damage] on the railroad ties and [the] tracks have been bowed and damaged	CAD, 214
04:46:52 a.m..	Radio transmission advising that the [railroad] has been notified about the track damage.	CAD, 214
04:51:23 a.m.	Radio transmission advising that Norfolk Southern is going to send personnel to Command Center at Indian Camp and [highway route] 127 to survey damage when appropriate	CAD, 214
04:51:46 a.m.	Radio transmission advising that the RECC [electric utility company] was on-site.	CAD, 214
05:27:16 a.m.	Radio transmission advising that the KY [Emergency Management] EOC was notified that highway route 127 was being routed to [local road number] 2141	CAD, 214
09:31:16 a.m.	Radio transmission advising that Command is advising that all evacuees are accounted for.	CAD, 214

-- End of Tabulation --

Exhibit 17. Texas Eastern Response Activity Chronology (Timeline)

This Exhibit is comprised of a copy of documentation[1], as made available to the investigation by Enbridge, describing a summarization of activities, as engaged by personnel and equipment resources of Texas Eastern, that occurred in response to the accident.

[1] The investigation observed that the original copy of the subject documentation, as made available to the investigation by Enbridge, contained *personally identifiable information* (PII) (e.g., surnames, addresses, telephone numbers, etc.), in which, pursuant to NTSB investigative practice, this PII has been redacted in this copy of the document (see further [Internet] https://www.gsa.gov/reference/gsa-privacy-program/rules-and-policies-protecting-pii-privacy-act).

ICS 201-2 - Summary of Current Actions	Version Name: Initial Response (Time in ET)
Incident Name: Lincoln County Incident	Period: Initial Response [08/01/2019 02:45 - 08/12/2019 17:00]

Initial Response Objectives

Ensure the Safety of the Public and Response Personnel
Secure the Site
Support NTSB Investigation
Keep public and stakeholders informed of response activities
Maximize Protection of Environmentally-Sensitive Areas

Current and Planned Actions

Date/Time	*Action/Event/Notes*
08/01/2019 01:23	At approximately 12:23am CST Line 15 ruptured resulting in a fire, approximately 3.5 miles south of Danville Station in Lincoln County, Kentucky
08/01/2019 01:23	Hunter H[redacted] - Called 911 line and it was busy
08/01/2019 01:25	12:25am CST – John V[redacted] (Desk D) received a Rate of Change alarm at Danville Station (southbound) discharge for Line #15
08/01/2019 01:25	12:25am CST – John V[redacted] (Desk D) acknowledged alarm for drastic pressure drop at Danville (southbound) discharge, Line #15
08/01/2019 01:25	Mike C[redacted] heard the Turbine Alarms. Identified the pressure drop on the screen and also noticed the orange glow out of the window. (Time Estimated)
08/01/2019 01:26	12:26am CST – John V[redacted] (Desk D) tried to contact the Danville Station operator
08/01/2019 01:26	Hunter H[redacted] called Barry H[redacted] to notify him of rupture
08/01/2019 01:27	12:27am CST – John V[redacted] (Desk D) received call from homeowner, Vicky H[redacted] reporting a roaring sound and fire from her location. Address: [redacted]Harris Creek Rd. Stanford, Kentucky 40484, phone: (606) [redacted]
08/01/2019 01:28	12:28am CST – Mike F[redacted] (Desk A) notified Mike N[redacted] (Gas Control Manager) of the significant pressure drop downstream (south) of Danville Station. Fletcher also mentioned there are multiple calls coming in reporting a fire in that area. N[redacted] requested F[redacted] to block gas flow to that area by any means necessary.
08/01/2019 01:28	Barry H[redacted] dispatched Jordan C[redacted] to HWY 49 valves
08/01/2019 01:28	Hunter H[redacted] called telling Mike C[redacted] that he saw the orange glow and asked if he wanted help. Mike C[redacted] told him yes to come to the station.
08/01/2019 01:29	Mike C[redacted] called Gas Control on the landline
08/01/2019 01:29	12:29am CST – Marlon B[redacted] (Desk C), Mike, operator at Danville called into Gas Control stating he could see fire on the discharge of the station and thought it was from Line #15. Operator was asked if Jim M[redacted] had been notified and confirmed Gas Control had not notified him. Marlon told the operator we had notified others of the event.
08/01/2019 01:30	12:30am CST – Jesus G[redacted] (Desk E), Barry H[redacted] (Area Supervisor) states they (station personnel) needed to close valve 15-393 to isolate line #15 at Danville station. Additionally, he was sending personnel to Hwy. 49 to close valve 15-382 to isolate LN 15 at VS 4.
08/01/2019 01:30	12:30am CST – John V[redacted] (Desk D) fast stopped Owingsville Station
08/01/2019 01:30	Mike C[redacted] (approximate) received call from Barry H[redacted] about the rupture. Discussed the blow out and discussed which valve to close.
08/01/2019 01:31	Mike C[redacted] called Jim M[redacted] to tell him about the rupture
08/01/2019 01:31	12:31am CST – John V[redacted] (Desk D) initiated a close command for 15-438.
08/01/2019 01:32	12:32am CST – John V[redacted] (Desk D) notified Jim M[redacted] (Stanford Area Manager) of the situation and M[redacted] confirmed he was aware
08/01/2019 01:32	12:32am CST – Jesus G[redacted] (Desk E) received a call from homeowner, Debra Y[redacted] asking should she evacuate. Jesus advised her to do so if it appeared she was in danger. Address: [redacted] Bowen Rd., Stanford, Kentucky, Lincoln County. Phone: (851) [redacted]

08/01/2019 01:33	12:33am CST – Marlon B[redacted] (Desk C) notified Wheelersburg Station and requested the station be staffed. Contact was Justin H[redacted]
08/01/2019 01:33	12:33am CST – RCV 15-438 confirmed closed
08/01/2019 01:33	12:33am CST – Mike N[redacted] notified Barry H[redacted]. He was aware of the situation and sending personnel to close in Line #15, vs4 south of the station due to the pressure drop
08/01/2019 01:33	12:33am CST – Gas Control attempted to call Danville Station but no answer
08/01/2019 01:33	12:33am CST – Razvan P[redacted] (Desk F) called Berne Station operator three times with no success
08/01/2019 01:33	12:33am CST – Dillon S[redacted] (Desk B) called Dominion to request 600 Mdth/d injection request at Oakford Storage facility
08/01/2019 01:33	Mike C[redacted] called Tim M[redacted] to have him report to the station
08/01/2019 01:34	Mike C[redacted] called the hotline to inform them of the rupture
08/01/2019 01:34	12:34 am CST - John V[redacted] (Desk D) initiated a close command for 15-446
08/01/2019 01:34	12:34 am CST - Berne called into Gas control and wast told to standby for further orders.
08/01/2019 01:34	12:34am CST – Mike N[redacted] notified Tom A[redacted] (Director of Gas Control)
08/01/2019 01:34	12:34am CST – John V[redacted] (Desk D), left a message with Tompkinsville On Call to call back due to an emergency
08/01/2019 01:35	12:35am CST – Dillon S[redacted] (Desk B) received a call from Bill B[redacted], operator at Tompkinsville Station replying to our earlier call. Dillon requested Bill to bring on a unit pumping southbound.
08/01/2019 01:35	12:35am CST – Marlon B[redacted] (Desk C) confirmed the Berne Operator dropped a bank of horsepower
08/01/2019 01:35	Barry H[redacted] talked to Mike C[redacted] to verify the valve number to close at Danv CS for isolation 15-393
08/01/2019 01:35	Hunter H[redacted] - Shut valve 15-393 **Revision: Mike C[redacted] - Shut valve 15-393**
08/01/2019 01:35	12:35 am CST – John V[redacted] (Desk D) commanded close for (Confirmed closed at 12:35am)
08/01/2019 01:35	12:35 am CST – John V[redacted] (Desk D) commanded close for 10-316 (Failed to close)
08/01/2019 01:35	12:35 am CST – John V[redacted] (Desk D) commanded close for 25-551 (Confirmed closed at 12:35 am)
08/01/2019 01:35	12:35 am CST – John V[redacted] (Desk D) commanded close for 25-1449 (Confirmed closed at 12:38 am)
08/01/2019 01:36	12:36am CST – Jesus G[redacted] (Desk E) reported the Athens Operator (Barney) dropped two units after Gas Control requested to do so
08/01/2019 01:37	12:37am CST – RCV 25-1449 trouble alarm
08/01/2019 01:37	Barry H[redacted] talked to Hunter H[redacted] and instructed him to get Tim M[redacted] to site for additional support
08/01/2019 01:38	Barry H[redacted] called Jim M[redacted] to notify of rupture
08/01/2019 01:38	12:38am CST – RCV 25-1449 closed
08/01/2019 01:39	12:39am CST – RCV 15-393 closed
08/01/2019 01:39	Barry H[redacted] dispatched Daniel L[redacted] to HWY 49
08/01/2019 01:40	Mike C[redacted] called Jordan C[redacted] regarding going to the valve site. Jordan wanted to make sure that the gate was open at the station so he wouldn't be delayed in getting his company truck.
08/01/2019 01:40	12:40am CST – Mike N[redacted] notifies Barry B[redacted] (Gas Control Manager)
08/01/2019 01:41	12:41am CST – John V[redacted] (Desk D) reported all horsepower off at Wheelersburg
08/01/2019 01:41	12:41am CST – DOT Drug Testing was initiated and 3rd party vendor was notified
08/01/2019 01:42	12:42am CST – Dillon S[redacted] (Desk B) called the Delmont operator (J.R.) to hold a 900 psig discharge pressure
08/01/2019 01:42	12:42am CST – Dillon S[redacted] (Desk B) called Dominion to request max injection rates at Oakford Storage facility

08/01/2019 01:45	12:45am CST – Mike N[redacted] arrives in Gas Control center
08/01/2019 01:45	Tim M[redacted] - Arrived at Danville CS
08/01/2019 01:45	Mike C[redacted] called Casey R[redacted] to tell him to come into the station
08/01/2019 01:45	Barry H[redacted] dispatched Mark H[redacted] to HWY 49
08/01/2019 01:47	12:47 am CST - John V[redacted] (Desk D) valve 15-446 indicated a "troubled" status
08/01/2019 01:47	12:47am CST – John V[redacted] (Desk D), Vicky H[redacted], the same homeowner who called earlier was told to evacuate if she felt the need to
08/01/2019 01:48	12:48am CST – Marlon B[redacted] (Desk C), Called Berne Station to shut down a bank of horsepower
08/01/2019 01:48	12:48am CST – Razvan P[redacted] (Desk D), received a call from Tim (Station operator) at Danville and Tim asked if gas control wanted the station isolated. Razvan placed Tim on speaker where Mike N[redacted] could speak directly to him. Mike requested Tim to drop the horsepower and isolate all lines leaving the station
08/01/2019 01:48	12:48am CST – Razvan P[redacted] (Desk F) called Danville to inform they need to shut off all horsepower and shut in the station valves
08/01/2019 01:49	12:49am CST – John V[redacted] (Desk D) received a call from Columbia Gulf controller stating he saw a drastic pressure drop in the area of their interconnect with TETCO
08/01/2019 01:50	12:50am CST – Danville units 1T and 2T shut down
08/01/2019 01:50	12:50am CST – Barry B[redacted] arrives in Gas Control center
08/01/2019 01:50	Barry H[redacted] - Arrived at Danville CS
08/01/2019 01:50	Tyler S[redacted] & Harold D[redacted] - Dispatched to Green River
08/01/2019 01:51	Barry [redacted] - All horsepower off at Danville CS
08/01/2019 01:51	12:51am CST – Danville units 3T and 9 shut down
08/01/2019 01:53	12:53am CST – Jesus G[redacted] (Desk E) places call into our Public Relation Hotline and leaves message about possible rupture
08/01/2019 01:55	12:55am CST – John V[redacted] (Desk D) receives a call from Kourtney with Blue Grass 911. She reported receiving several calls about explosion and fire in Lincoln County
08/01/2019 01:56	Jim M[redacted] - Arrived at Danville CS
08/01/2019 01:56	Ricky K[redacted] - Arrived at Danville CS
08/01/2019 01:57	12:57am CST – Danville Station, SCO-2 travel
08/01/2019 01:59	12:59am CST – John V[redacted] (Desk D) confirms Operator arrives at Athens Station (Barney)
08/01/2019 01:59	Mark H[redacted] - Dispatched to HWY 49 Valves
08/01/2019 02:00	1:00am CST – John V[redacted] (Desk D) reports Devin H[redacted] from Public Affairs calls to obtain more information (281)851-[redacted]
08/01/2019 02:00	1:00am CST – Razvan P[redacted] (Desk F) notified Chuck B[redacted] with Kentucky Utilities, MR 72926 to let them know we have had a line rupture and they will experience lower pressures
08/01/2019 02:00	Jim M[redacted] contacted Bart J[redacted] to come to Danville CS for additional support
08/01/2019 02:02	1:02am CST – Jesus G[redacted] (Desk E) reports Moss B[redacted] storage facility is now at 200 Mdth/d injection rate request
08/01/2019 02:03	1:03am CST – Dillon S[redacted] (Desk B) reports the Delmont operator wanted to confirm the 900 psig hold was still a good target. Dillon confirmed.
08/01/2019 02:04	1:04am CST – John V[redacted] (Desk D) notified Brandon R[redacted] to go to VS 78878. Valve 15-446 was showing trouble and 10-316 never closed.

08/01/2019 02:05	1:05am CST – John V[redacted] (Desk D) reports Barry B[redacted] contacts Mike G[redacted] (Central Region – Manager of Technical Operations)
08/01/2019 02:06	1:06am CST – John V[redacted] (Desk D) reports Dustin H[redacted] arrives at Wheelersburg Station
08/01/2019 02:08	1:08am CST – John V[redacted] (Desk D) calls Athens Station operator (Barney) to manipulate HP as needed with the isolations south of his station
08/01/2019 02:09	1:09am CST – Dillon S[redacted] (Desk B) reports Joey H[redacted] from Atmos Energy in Moreland, Kentucky contacted our control center to see if we were aware of the fire/rupture. Dillon stated we were and had transmission personnel contacted and working to alleviate the situation.
08/01/2019 02:09	1:09am CST – John V[redacted] (Desk D), homeowner Cliff B[redacted] calls Gas Control to report the line rupture. Address: [redacted] Kentucky Highway 300, Stanford, Kentucky. Phone: (859)[redacted]
08/01/2019 02:09	1:09am CST – Mike N[redacted] spoke with Mike G[redacted] and G[redacted] told him he was aware of the situation and wanted to make sure 911 was notified in the area
08/01/2019 02:10	1:10am CST – Jesus G[redacted] (Desk E) reports Tennessee Gas (Kinder Morgan) wants to verify fire in Kentucky is on the TETCO system
08/01/2019 02:11	1:11am CST – John V[redacted] (Desk D) called Danville Station and spoke with Tim to get status on closure of valve 15-382
08/01/2019 02:12	1:12 am - Nickel calls Barry H[redacted] to get an update on line isolation
08/01/2019 02:13	Jordon C[redacted] - Arrived at HWY 49
08/01/2019 02:14	1:14am CST – John V[redacted] (Desk D) called Bill B[redacted] at Tompkinsville to start a unit
08/01/2019 02:14	Barry H[redacted] notified Lincoln Co. Non Emergency 911 because regular 911 line was busy
08/01/2019 02:15	1:15am CST – Danville, DCO-3 travel
08/01/2019 02:15	Jordon C[redacted] - Began closing 15-382
08/01/2019 02:15	Barry H[redacted] - Called 911
08/01/2019 02:18	Barry H[redacted] notified Billy Brown at TOMP Station about rupture
08/01/2019 02:18	1:18am CST – Danville, DCO-3 closed
08/01/2019 02:19	Jordon C[redacted] - 15-382 closed
08/01/2019 02:19	1:19am CST – John V[redacted] (Desk D) received call from Barry H[redacted] confirmed valve 15-382 is closed (southbound)
08/01/2019 02:19	1:19am CST – Mike N[redacted] relayed the 911 dispatch number to Mike G[redacted] in case he needed it
08/01/2019 02:20	Mark H[redacted] - Arrived @ HWY 49 Valves
08/01/2019 02:20	Mark H[redacted] - Mainline 15-382 - Mark verified closed
08/01/2019 02:20	1:20am CST – Jesus G[redacted] (Desk E) confirmed with Garrett H[redacted] at Kentucky Utilities that previous notifications had been made to Chuck B[redacted] and Kevin P[redacted]
08/01/2019 02:21	1:21am CST – John V[redacted] (Desk D) receives call from Athens operator stating he lost a unit
08/01/2019 02:21	1:21am CST – Mike F[redacted] (Desk A) confirms with Bart at Owingsville the scheduled pig run has been cancelled
08/01/2019 02:22	Hunter H[redacted] - 10-292 block valve closed
08/01/2019 02:23	Hunter H[redacted] - 25-512 block valve closed
08/01/2019 02:23	1:23am CST – Danville, 10-292 and 25-512 trouble

08/01/2019 02:23	1:23am CST – John V[redacted] (Desk D) reports Devin H[redacted] (Public Relations) called into Gas Control for further updates
08/01/2019 02:24	Mark H[redacted] - Mainline 15-382 - Mark verified closed
08/01/2019 02:24	1:24am CST – Danville, 10-292 and 25-512 closed
08/01/2019 02:25	1:25am CST – Mike N[redacted] notifies Wayne P[redacted] (Manager of Gas Control) of the event
08/01/2019 02:25	Mark H[redacted] & Jordon C[redacted] - Put on handwheel and turned it 1/2 turn - Mainline 15-382 was check closed
08/01/2019 02:29	1:29am CST – John V[redacted] (Desk D) received a call from the Tompkinsville operator (Bill) stating he didn't want to open line 15 into the suction of station. Stated he heard from Howard that line 15 was not isolated yet.
08/01/2019 02:33	Gas control dispatched Billy G[redacted] to OWSV CS to man the station
08/01/2019 02:36	1:36am CST – Razvan P[redacted] (Desk F) reports Courtney with Lincoln County Police wanted confirmation the gas line was shut in
08/01/2019 02:38	1:38 am CST - N[redacted] received a call from H[redacted] that lines 10 and 25 will not go back into service today.
08/01/2019 02:41	1:41am CST – Razvan P[redacted] (Desk F) left message with Brandon R[redacted] that gas control will remotely open RCV valves at site 78878 which include 25-1449, 10-316 and 15-446. He was also instructed to go to site 78879 to open 10-311 and 25-551
08/01/2019 02:43	1:43am CST – Razvan P[redacted] (Desk F) requested Brandon R[redacted] open the double blocked valves at VS 78878
08/01/2019 02:48	1:48am CST – John V[redacted] (Desk D) called Gladeville Station operator to drop horsepower and equalize station
08/01/2019 02:49	1:49am CST – John V[redacted] (Desk D) called Tompkinsville Station operator to drop horsepower and equalize station
08/01/2019 02:55	1:55am CST – Jesus G[redacted] (Desk E) requests Egan operator to shut in injection rates
08/01/2019 02:56	1:56am CST – Marlon B[redacted] (Desk C) received a question from Berne operator if we were going to open up other lines and place back in service.
08/01/2019 02:58	1:58am CST – John V[redacted] (Desk D) requested the Barton operator to knock all units offline
08/01/2019 02:59	Randy Thomas - Received call from Barry H[redacted] to go to HWY 39 to open crossover on Lines 10 & 25 - Others at site were Ricky K[redacted], Brandon R[redacted], Casey [redacted]
08/01/2019 03:02	Mark H[redacted] - 15-3022 closed and locked @ Tenn Gas
08/01/2019 03:03	Mark H[redacted] - 25-3016 Open
08/01/2019 03:11	Bart J[redacted] arrived at Danville CS
08/01/2019 03:22	2:22am CST – DOT drug testing 3rd party arrived
08/01/2019 03:24	Ralph T[redacted] - 25-456 closed @ HWY 70 .
08/01/2019 03:25	2:25 AM (CST) Michele H[redacted] called Aaron J[redacted] to inform about the incident and prepare to activate GTM Incident Support Team
08/01/2019 03:30	Bart J[redacted] dispatched Barry B[redacted] to Cassius Clay and report upon arrival for further instructions
08/01/2019 03:30	2:30am CST – Wayne P[redacted] arrives
08/01/2019 03:32	Mike C[redacted] called Randy T[redacted] checking to see where he was at
08/01/2019 03:38	Bart J[redacted] dispatched Dustin B[redacted] to bring light plant to Danville CS

08/01/2019 03:40	Bart J[redacted] dispatched Joey G[redacted] to Cassius Clay
08/01/2019 03:40	Ralph T[redacted] - 15-3090 closed - power gas unhooked
08/01/2019 03:40	Ralph T[redacted] - 15-3091 closed
08/01/2019 03:40	The station was shut-in and employees were dispatched to close the manual isolation valves on the north side of the rupture.
08/01/2019 03:40	All three pipelines were isolated as a precaution.
08/01/2019 03:43	Randy T[redacted] - Open HWY 39 LN 10 crossover
08/01/2019 03:43	Dan B[redacted] called Mike C[redacted] to discuss closing cross-over valves/shutting units down
08/01/2019 03:44	Randy T[redacted] - Open HWY 39 Ln 25 crossover
08/01/2019 03:48	Tyler S[redacted] & Harold D[redacted] - 15-368 LO/TO
08/01/2019 03:49	Tim M[redacted] called Mike C[redacted]
08/01/2019 03:52	Ralph T[redacted] - 15-3095 closed - Power gas unhooked
08/01/2019 03:52	Ralph T[redacted] - 15-3096 closed
08/01/2019 04:05	Barry B[redacted] & Joey G[redacted] - Arrived @ Cassius Clay Terminal - on standby
08/01/2019 04:05	Ann B[redacted] called Mike C[redacted] to remind them to start writing stuff down so they could remember it
08/01/2019 04:08	Tyler S[redacted] & Harold D[redacted] - 15-370 LO/TO
08/01/2019 04:10	Barry B[redacted] and Joey G[redacted] arrived at Cassius Clay
08/01/2019 04:15	Dan B[redacted] - Call from Barry H[redacted] to verify valve positions in Danville CS yard
08/01/2019 04:15	Dan B[redacted] - 15-409 by-pass valve check closed lock closed
08/01/2019 04:15	Dan B[redacted] - 15-418 Pig Trap valve north check closed/lock closed
08/01/2019 04:15	Dan B[redacted] - 15-421 Main Line north close/lock close
08/01/2019 04:32	Dan B[redacted] - 15-393 M/L valve check closed & locked
08/01/2019 04:32	Ralph T[redacted] - South Side Ad Hoc 33 15-387 Pig trap valve check close; turn off supply gas to pig trap valve
08/01/2019 04:33	Dan B[redacted] - Need to remove power gas Ralph's lock on it
08/01/2019 04:35	3:35am CST – Wayne P[redacted] notifies Randy P[redacted](Uniontown Area Manager) about AO pressure related events in the Marcellus Shale region due to rising pressures from the downstream isolations.
08/01/2019 05:20	Barry H[redacted] informed EMA Director Donnie G[redacted] that it was safe to go onsite.
08/01/2019 05:42	Hunter H[redacted] - Confirmed closed
08/01/2019 05:43	Bart J[redacted] called Mike C[redacted]

08/01/2019 05:45	We are currently reducing that pressure by approximately 70psig as an added safeguard while we assess those pipes.
08/01/2019 05:45	Operations isolated lines 10 and 25 at 713psig.
08/01/2019 05:48	Bart J[redacted] - Bart J[redacted] called Mike C[redacted] and told him to verify by pass valves and south side station block valves are locked and tagged
08/01/2019 05:48	Bart J[redacted] called Mike C[redacted]
08/01/2019 05:50	Bart J[redacted] - Bart J[redacted] called Mark H[redacted], who was at HWY 49, to inform Mark that the valves are shut @ Danville and to begin the 10% reduction @ HWY 49
08/01/2019 06:03	Ralph T[redacted] - Closed 10-280
08/01/2019 06:03	Ralph T[redacted] - Closed 25-477
08/01/2019 06:03	Ralph T[redacted] - Check closed and locked
08/01/2019 06:03	Ralph T[redacted] - 25-518 Bypass Valve check closed and locked
08/01/2019 06:03	Ralph T[redacted] - 10-294 Bypass Valve check closed and locked
08/01/2019 08:15	No significant updates from site as crews are now using daylight to assess situation.
08/01/2019 08:15	Pressure on Line 10 and 25 has been confirmed to be lowered to 615psig.
08/01/2019 08:19	Ann B[redacted] called Mike C[redacted] to remind again about writing things down
08/01/2019 08:32	Hunter H[redacted] called Mike C[redacted]
08/01/2019 08:58	Hunter H[redacted] called Mike C[redacted]
08/01/2019 09:33	Jim M[redacted] called Mike C[redacted] about the drug test
08/01/2019 10:33	Missed call from Barry H[redacted] to Mike C[redacted]
08/01/2019 10:35	Barry H[redacted] informed Mike C[redacted] that he needed to take the alcohol test
08/01/2019 15:30	IST Meeting 2:30 CT (See ICS 231 Meeting Minutes)
08/01/2019 16:00	CMT Meeting 15:00 CT
08/02/2019 07:30	1 – AFE has been setup and communicated to the Incident Command. At the front end one code is used for O&A and Captial 2 – Claims coordination between : Insurance, HR, legal, Treasury, PAC, GTM Finance has been put in place.
08/02/2019 07:30	IMT Update meeting (See ICS 231 Meeting Minutes)
08/02/2019 14:30	IMT Update meeting (See ICS 231 Meeting Minutes)
08/03/2019 09:00	IMT Update meeting (See ICS 231 Meeting Minutes)
08/03/2019 13:30	Approved plans uploaded to IAP Software (Safety, Security, Access Control, Medical)
08/03/2019 13:40	Confirmed with Security Officer that 462' radius safety perimeter is not longer in effect.
08/03/2019 14:30	IMT Update meeting (See ICS 231 Meeting Minutes)
08/03/2019 17:00	IST Update Meeting 17:00 ET (See ICS 231 Meeting Minutes)
08/04/2019 09:00	IMT Update meeting (See ICS 231 Meeting Minutes)
08/04/2019 11:00	LIDAR Flights occurring at incident site
08/04/2019 16:00	IMT Update meeting (See ICS 231 Meeting Minutes)
08/04/2019 17:00	IST Update Meeting 17:00 ET (See ICS 231 Meeting Minutes)

Exhibit 18. Mutual Aid Support and Other Response Organizations in the Incident

This Exhibit is comprised of a copy of documentation, as made available to the investigation by the LCFPD, consisting of the list of mutual aid support organizations that provided a personnel and equipment response to the incident, and other organizations that had a role in the response to the incident.

ENBRIDGE PIPELINE EXPLOSION 8/1/2019

RESPONDER AGENCIES:

1. **BLUEGRASS 911 COMMUNICATIONS**
2. **BOYLE COUNTY EMERGENCY MANAGEMENT**
3. **BOYLE COUNTY EMS**
4. **BOYLE COUNTY SHERIFF'S OFFICE**
5. **BUREAU OF ALCOHOL, TOBACO, FIREARMS AND EXPLOSIVES**
6. **CASEY COUNTY EMERGENCY MANAGEMENT**
7. **CASEY COUNTY EMS**
8. **CRAB ORCHARD POLICE DEPARTMENT**
9. **DANVILLE POLICE DEPARTMENT**
10. **FEDERAL BUREAU OF INVESTIGATION**
11. **GARRARD COUNTY EMS**
12. **KENTUCKY EMERGENCY MANAGEMENT**
13. **KENTUCKY ENVIRONMENTAL PROTECTION AGENCY**
14. **KENTUCKY STATE POLICE**
15. **LINCOLN COUNTY CORONER'S OFFICE**
16. **LINCOLN COUNTY EMERGENCY MANAGEMENT**
17. **LINCOLN COUNTY EMS**
18. **LINCOLN COUNTY FIRE DEPARTMENT**
19. **LIINCOLN COUNTY FISCAL COURT**
20. **LINCOLN COUNTY SHERIFF'S OFFICE**
21. **RUSSEL COUNTY EMS**
22. **SOMERSET-PULASKI COUNTY EMS**
23. **SOMERSET-PULASKI COUNTY SRT/HAZ-MAT 12**
24. **STANFORD FIRE DEPARTMENT**
25. **STANFORD POLICE DEPARTMENT**

SUPPORT AGENCIES:

1. **AMERICAN RED CROSS**
2. **ENBRIDGE**
3. **EPHRAIM McDOWELL FORT LOGAN HOSPITAL**
4. **EPHRAIM McDOWELL REGIONAL MEDICAL CENTER**
5. **HUSTONVILLE OFFICE OF THE MAYOR**
6. **HUSTONVILLE WATER DEPARTMENT**
7. **INTER COUNTY ENERGY**
8. **KY DEPARTMENT OF PUBLIC HEALTH**
9. **KY DEPARTMENT OF TRANSPORTATION**
10. **LINCOLN COUNTY HEALTH DEPARTMENT**
11. **LINCOLN COUNTY FAMILY RESOURCE CENTERS**
12. **LINCOLN COUNTY SCHOOL SYSTEM**
13. **MORELAND CHRISTIAN CHURCH**
14. **NATIONAL TRANSPORTATION SAFETY BOARD**
15. **NEW HOPE BAPTIST CHURCH**

16. **NORFOLK-SOUTHERN RAILROAD**
17. **PIPELINE AND HAZARDOUS MATERIALS SAFETY ADMINISTRATION**
18. **SALVATION ARMY-DANVILLE**
19. **SOUTHERN BAPTIST DISASTER RELIEF**
20. **WILLOW GROVE BAPTIST CHURCH**
21. **LINCOLN COUNTY PVA**

MEDIA OUTLETS

1. **ADVOCATE MESSENGER – BOBBIE CURD, BEN KLEPPINGER**
2. **ASSOCIATED PRESS – REBECCA YONKER**
3. **BLOOMBERG NEWS - ANDRES**
4. **CBS NEWS NATIONAL – MEG OLIVER**
5. **CNN – JOE SUTTON**
6. **COURIER JOURNAL – BILLY KOBIN**
7. **DAILYMAIL.COM - LEAH**
8. **DOW JONES CORPORATION**
9. **NBC NATIONAL NEWS NEW YORK – CURT**
10. **NEW YORK DAILY NEWS – TIM BALK**
11. **FOX NEWS – SHEPARD SMITH, MATT FINN**
12. **THE INTERIOR JOURNAL**
13. **WALL STREET JOURNAL – TALAL ANSARI**
14. **WAVE-TV**
15. **WKYT-TV**
16. **WLEX-TV**
17. **WLKY-TV**
18. **WPBK-FM RADIO**

Exhibit 19. LCEMA – After-Action Review Activity Documentation, and Advocacy Measures and/or Initiatives Implemented

This Exhibit is comprised of a copy of documentation[1], as made available to the investigation by the LCEMA [agency], describing the *advocacy measures* and/or *initiatives* that were implemented by the agency, and affiliated organizations, as a result of the After-Action Review of the incident that was conducted by the agency.

[1] The investigation observed that the original copy of the subject documentation, as made available to the investigation by the LCEMA, contained *personally identifiable information* (PII) (e.g., surnames, original signatures), in which, pursuant to NTSB investigative practice, this PII has been redacted in this copy of the document (see further [Internet] https://www.gsa.gov/reference/gsa-privacy-program/rules-and-policies-protecting-pii-privacy-act).

HOTWASH-PIPELINE EXPLOSION: 01AUGUST2019 (NOTES)

1. **WORST THING ABOUT RURAL RESPONSE AGENCIES IS NOT ENOUGH RESOURCES: MANPOWER, EQUIPMENT, MONEY**
   BEST THING ABOUT RURAL RESPONSE AGENCIES IS MUTUAL AID; GOOD NEIGHBORS; EVERYONE COMES TO HELP
2. **EACH AGENCY HAS ITS OWN GOALS ACHIEVED THROUGH THEIR OWN AGENDA WHETHER IT BE FIRE, POLICE, EMS, HEALTH, PRIVATE OR CHURCHES, ETC.**
3. **OVERVIEW: (UNOFFICIAL)**
   185 FIRST RESPONDERS FROM 36 RESPONDER AGENCIES
   REPRESENTING 6 COUNTIES
   7 CITIES; 3 STATE AGENCIES; 2 FEDERAL AGENCIES
   I INJURED
   83 SUPPORT RESPONDERS FROM 22 SUPPORT AGENCIES
   REPRESENTING 4 STATE AGENCIES; 2 FEDERAL AGENCIES
   2 CITY; 2 COUNTY; 10 PRIVATE AGENCIES
   18 MEDIA OUTLETS 8 LOCAL; 10 NATIONAL
4. **EVACUEES: 70-75; 1 DEATH; 6 INJURED UPDATES?**
5. **HEALTH ISSUES: DEPT. FOR PUBLIC HEALTH (CDC) Awaiting decision for investigation**
6. **STRENGTHS:**
   a. **Manpower**
   b. **Agency response**
   c. **Shelter location**
   d. **Mutual Aid**
   e. **Hotwash**
   f. **Coordination at scene**
   g. **Rehab of responders**
   h. **Rapid assessment**
   i. **Community support**
   j. **Enbridge funding response/recovery**
   k. **Needs of survivors met rapidly**
   m. **Media needs met**
7. **NEEDS IMPROVEMENT:**
   a. **Communications**
   b. **Establishment of Unified Command**
   c. **Establishment of Agency Command Post**
   d. **Donations/Volunteers**
   e. **Shelters: checklist, manpower**
   f. **County Fire Departments uncooperative**
   g. **Additional training & pre-planning**
   h. **Accountability of responders: SIGN IN/OUT**
   i. **Staging of responders and apparatus**
   j. **Mass Notification of community residents**

k. **Official request for resources**
l. **Designated Media location away from site**

8. **ISSUES:**
   a. **Some responders showed up on scene without calling 911 or checking in at Command Post**
   b. **Issues with Command Post location and control**
   c. **Failure to notify community in a timely manner**
   d. **Complaint regarding Health Department notification and response**
   e. **Enbridge response? Could it be faster?**
9. **RECOMMENDATIONS:**
   a. **All local responders should utilize issued radios to contact 911 and advise of response, arrival and departure. Once on scene, responders should notify their agency command structure of their availability. In the event a UNIFIED COMMAND is established, all agencies should designate someone to attend to Command updates.**
   b. **A backup plane should be developed in the event our County Mobile Command Trailer is unavailable.**
   c. **Even though this was an overwhelming event, someone needs to be in charge of issuing notifications to the general public by LincolnAlert mass notification or by social media (Facebook).**
   d. **The Health Dept. is tasked with the responsibility to ensure food/conditions at an established shelter are safe. They need to be notified when a shelter is established and in operation, especially if food is prepared and/or served.**
   e. **Enbridge responded within minutes of the explosion. The time necessary to limit/stop the transmission of the substance involved unofficially took about 50 minutes. This was due primarily to the need to manually travel near the site to shut off one of the valves. Enbridge is researching the use of 'remote' controlled valves.**

HOT WASH: PIPELINE EXPLOSION (01AUG2019)

August 26, 2019

SIGN-IN ROSTER

NAME	AGENCY
[redacted]	LINCOLN EMA
	LINCOLN EMA
	Lincoln Fire
	New Hope Baptist
	Enbridge
	Enbridge
	KDPH
	Helping Hands FRC
	Stanford Fire Dept.
	Boyle County EMS
	Boyle Co. EMS
	KY State Police
	Lincoln Co Schools
	Lincoln Co Schools
	Lincoln Co. Health Dept.
	" " " "
	Lincoln Co Health Dept.
	Lincoln Co. EMS

HOT WASH: PIPELINE EXPLOSION (01AUG2019)

August 26, 2019

SIGN-IN ROSTER

NAME	AGENCY
[redacted]	Bluegrass 911
[redacted]	KyEM
	LCSO
	KyEM

Exhibit 20. Enbridge – After-Action Review Activity Documentation, and Advocacy Measures and/or Initiatives Implemented

Enbridge was afforded an opportunity to document to the investigation[1], that the company had participated in After-Action Review activities, relative to the company response in the incident. Responsive to this, Enbridge reported that the company had participated in an After-Action Review as conducted by the LCEMA, and Enbridge had also conducted its own internal After-Action Review activity, both activities of which resulted in actions that were implemented by Enbridge. Documentation for both activities, describing *advocacy measures* and/or *initiatives* that were implemented by the company, was made available to the investigation, as follows (i.e., included in this Exhibit, as described).

[1] email correspondence from the Enbridge SF Group - Party representative, to the SF Group Chair, dated 6/04/2020,

[2] "Lincoln County Incient [sic] Internal Hot Wash Executive Summary" document,

[3] "Hotwash-Pipeline" document[2],

[4] "Pipeline - Hot Wash Signin [sic] 082619" document[3].

[1] Ref: email correspondence between the SF Group Chair, and the Enbridge SF Group - Party representative, dated 5/07/2020 to 6/04/2020, inclusive.

[2] This document is redundant to the content of Exhibit 19; see Exhibit 19.

[3] Ibid.

Downs Richard

From: Thanh Phan <[redacted]>
Sent: Thursday, June 4, 2020 6:47 PM
To: Downs Richard
Subject: RE: Danville, KY (PLD19FR002) / SF data feedback solicitation: 'After-Action' report documentation
Attachments: Pipeline - Hot Wash Signin 082619.pdf; Lincoln County Incient Internal Hot Wash Executive Summary.pdf; Hotwash-Pipeline.pdf

Rick,

Enbridge participated in an after-action incident debriefing ("hot wash") with all local emergency responding agencies following the incident under the coordination of Don Gilliam of Lincoln County Emergency Management Agency(LCEMA). This hot wash took place on August 26th, 2019 and included members from 16 different agencies including Enbridge (Sign-in sheet attached). The LCEMA's hot wash notes are attached(Hotwash-Pipeline.pdf). One of the after-action item takeaways identified for Enbridge was to investigate opportunities to reduce response time to valve closure. Which is captured in our initiatives at the bottom of this email.

Enbridge also conducted our own internal hot wash debriefing with our employees during this same time. Attached is our Lincoln County Internal Hot Wash Executive Summary.pdf document from this internal meeting. Two areas of improvement with recommendations were identified:

- Internal Notifications
  - An area of improvement identified was the notification of Public Awareness & Communications (PAC) personnel. The PAC personnel were contacted directly instead of the PIO hotline number.
  - Recommendations - Ensure the PIO hotline number is called every time vs. calling the individual. Region is accountable. This task has been added to our process.
- Resources Areas for Improvement
  - Response time could be improved with the installation of additional Remote Control Valves(RCVs)
    - Recommendation - Complete a risk evaluation on response time and current RCV placement
  - More timely deployment of portable offices to accommodate the Incident Management Team
    - Recommendation - Work with Supply Chain to establish a Standing Agreement with vendor for a more timely deployment of portable offices.

Finally, Enbridge also undertook some initiatives resulting from these hot wash debriefings as part of our efforts for continual improvement in the areas of Public Awareness Program and Emergency Response. Here are some initiative items we under took that have either been completed or are in progress.

<u>Public awareness program improvements:</u>

- The baseline mailing program for 2020 Enbridge affected public audience will be mailed based on a buffer zone of 660' or PIR(Potential Impact Radius), whichever is greater, this will continue for future mailings. Prior to 2020, the buffer zone was 660', PIR was only mailed in HCAs(High Consequence Areas). [Completed for 2020]
- Returned baseline mailers for emergency officials will be cross-checked against other outreach; if no outreach has taken place the field will be contacted to initiate a follow-up visit [June 2020 PA Plan update complete and in effect for 2020 mailings]
- Emergency Official lists (fire and 911 centers) are being formalized for Enbridge US (2 of 3 Regions completed). Lists will be utilized to employ a consistent tracking of emergency official outreach through multiple methods including liaison meetings, individual/group meetings, online emergency training, grant

presentations and exercise/drill participation; lists will be utilized not only to track, but also in the identification of potential gaps in outreach efforts.[Target completion end of 3rd Qtr 2020]

- Full program effectiveness evaluation is being completed by a third party firm, applicable to all US-based assets [Completion – June 2020]
- Enbridge initiated a review following the incident of our above ground pipeline marker/signage. All pipeline marker signage along the ROW and at crossings are being checked and updated with new stickers where needed to ensure proper company information and emergency contact number is legible. [Target completion by year end 2020. 99% complete with remaining remote locations to be finished in the course of normal pipeline inspection frequencies]
- Enbridge is currently working to continually improve its corporate website to ensure public emergency response information and 24hr contact information is readily available to the public. [In progress]
- Danville Compressor Station personnel are currently engaged with other emergency response agencies to schedule additional site tours this summer 2020 and on a go forward basis as part of our public awareness outreach program. [In progress]

<u>Emergency Response action-items/initiatives reviewed by Enbridge as a follow up to the Lincoln County Incident:</u>

- Expediting valve closure, at the mainline valve off Hwy 49:
  1. law enforcement escort may have shorten the transit time to the mainline valve, but total response time to get to the valve would have been increased. Employees would have needed to meet the law enforcement at a specific location to be escorted and this would have caused more precious time to be expended.
  2. After the Lincoln County incident emergency response review, Enbridge revisited making company vehicles available to employees for emergency response scenarios. In the case of the employee that was the first responder to the HWY 49 valve, he has been assigned a company vehicle for commuting to/from work and emergency response, negating any need to drive to the station first to get a vehicle for emergency response.
  3. The specialized tool needed for valve closure during emergency response has been purchased and added to all company field vehicles used for emergency response.
- Enbridge is advancing our remote control valve(RCV) program, to increase the number of RCVs upgraded on the pipeline system to shorten response times for valve closures at difficult to reach locations. In addition, all new pipelines projects built and being constructed by Enbridge are built with 100% RCV on its mainline valves.
- Updated Emergency Response Plan(ERP) for Stanford KY Area Compressor stations:
  1. New ERP manuals were developed and distributed to subject field locations in February 2020.
  2. The training for the new ERP manuals was given to all affect field employees in March 2020 via Skype meetings due to Covid-19.
     a. ERP manuals were updated again in May 2020 with update employee information due to contact information being out of date.
     b. Completing group emergency evaluations on all future incidents.
- During this incident, Enbridge technical rep could not get through to Bluegrass911 due to the call center lines being overwhelmed. As a result of the after action initiative, Enbridge now has a back door phone number for Bluegrass 911 in the event of an emergency.
  1. Thoughts were offered that it may be beneficial for LCEMA to look into a ‘response plan element’ involving the Enbridge/Danville Pipeline Compressor Station, in which, if a fire emergency occurs inside the plant, responding LCFPD resources might not be able to advance beyond the entrance gate? Local Danville station personnel are working with LCEMA for a LCFPD response plan for Danville Station. Area employees supplied multiple site tour of Danville Compressor Station after the incident to LCEMA and emergency response teams. At the present time, no plans have been completed to allow LCFPD to enter our facility beyond the gates in an emergency fire. Area personnel would assess each situation separately prior to allowing LCFPD on site. Example of immediate access would be a man down scenario. In most all cases, a station incident would initiate an Emergency Shut Down(ESD) of the station, evacuating all gas source and isolating the station.

Thank you for the opportunity to provide our after action report and share our initiatives undertaken since the incident. If you have any question, please let me know.

Thanh V. Phan
MTO – Southeast Region Operations
—
ENBRIDGE
713[redacted] office | 713-[redacted] mobile | 713-[redacted] fax | [redacted]
5400 Westheimer Court, Houston TX 77056
enbridge.com
Integrity. Safety. Respect.

From: Downs Richard <[redacted]>
Sent: Tuesday, May 19, 2020 4:07 PM
To: Thanh Phan <[redacted]>
Subject: [External] FW: Danville, KY (PLD19FR002) / SF data feedback solicitation: 'After-Action' report documentation

Mr Thanh V. Phan / Enbridge – further to this (original / prior msg, below), this as a follow-up, to check on the prospect that you might have some documented After-Action critique points / observations and resolutions, that might be available to the investigation ?

Notations in my Field Notes - Log Book, involving prospective action-items / initiatives to be pursued as a result of the investigation, as had been noted to be relative to Enbridge, include the following (in no particular sequence of priority / importance) …

- Expedited valve closure, at the 'southern' valve location, by Enbridge ? … perhaps this might have been completed faster, if a law enforcement escort had been made available to the 'closure mechanic' (who had to drive a company vehicle from the Compressor Station to the valve site) ?
- An expedited valve closure, at the 'southern' valve location, may have been possible, if the closure mechanic was able to dispatch from his residence, and proceed directly to the 'southern' valve location, instead of having to travel to the Compressor Station (… for specialized tools, authorization to proceed with the valve closure ?)
- Might have been helpful to Incident Command, if Enbridge, upon initiating the pipeline valve closure actions, was able to provide an estimated 'draw-down' time ?
- It appears that Enbridge may not have offered a 'PSAP presence' (i.e., having an Enbridge technical rep situated at Bluegrass911, until the *initial response* to the incident 'stabilized') ? .. although as the PSAP was overwhelmed, and without a 'backdoor phone line' (which is now remedied), Enbridge may not have been able to get a call through to address this.
- Thoughts were offered that it may be beneficial for LCEMA to look into a 'response plan element' involving the Enbridge / Danville Pipeline Compressor Station, in which, if a fire emergency occurs inside the plant, responding LCFPD resources might not be able to advance beyond the entrance gate (resulting in a signif response delay) ?

As potential supportive action in this, in my similar message today to Mr. Don M. Gilliam / Director / LCEMA, on the action-item(s) follow-up, the above topic-points were also noted to him, in which it may be beneficial / advantageous, for the two of you to confer on / collaboratively review the above, potentially to advance toward the successful resolution thereof ?

Many thx in advance, and I welcome your call if it might be advantageous to confer on the above.
-- Richard Downs, Jr., PE / SF - Technical Working Group Chairperson (cell phone 202[redacted])

From: Downs Richard
Sent: Thursday, May 7, 2020 2:19 PM
To: Thanh Phan <[redacted]>; Don M. Gilliam [redacted]>; Danny Glass <[redacted]>; Kelly, James (PHMSA) <[redacted]>
Cc: Colletti Alexandria <[redacted]>
Subject: Danville, KY (PLD19FR002) / SF data feedback solicitation: 'After-Action' report documentation

May 7, 2020

To the *Parties of the Investigation* (Distribution, below) of the Survival Factors (SF) / Emergency Preparedness and Emergency Response - Technical Working Group –

To follow-up on my prior brief mention of this topic (during the on-scene phase of the investigation), this is to afford an opportunity for the Party-to-the-Investigation participants to provide information feedback to the investigation, as to **'After-Action Review' documentation**, or similar post-event critique / debriefing report(s)**,** as might have been compiled by your agency / organization, as a result of the tactical response to the incident.

A copy of the received documentation, as appropriately redacted to obscure PII, or other *security sensitive* / *confidential* data, will be included as an Exhibit in the SF - Factual Report of the Investigation (presently in the final stages of compilation).

As the investigation needs to be proceeding toward a timely conclusion, a response in this would be appreciated by NLT the **CoB** of **May 14**, 2020.

Many thanks in advance, to you and your organization, for your response here, and for supporting the investigation, and please don't hesitate to contact me (RSVP here, or via cell phone), if there should be any further thoughts or questions on this. -- Richard Downs, Jr., PE / SF - Technical Working Group Chairperson (cell phone 202-[redacted])

Distribution

Mr. Thanh V. Phan / Enbridge, Inc. (Enbridge)
Mr. Don M. Gilliam / Director, Lincoln County Emergency Management (LCEMA)
Chief Danny Glass / Lincoln County Fire Protection District (LCFPD)
Mr. James A. Kelly / Pipeline and Hazardous Materials Safety Administration (PHMSA)

Internal Debrief Report

September 12, 2019

Enbridge

Subject: Summary Enbridge Internal Lincoln County Incident Debrief

On August 26, 2019 Enbridge Inc. conducted a formal Emergency Response debrief of the Lincoln County Pipeline Rupture with internal employees and leadership.

Objective and Scope

The objective was to conduct a full debrief of the incident with an emphasis on facts, and recommended solutions; not impressions, feelings, or individual shortcomings.

Methodology

The debriefing was held at the Stanford Area Office in Danville, KY. The discussion was facilitated by the Supervisor, Emergency Response & Security. The format of the debriefing sessions included an open forum and series of facilitated questions. The questions were organized into sections. Section 1 focused on the initial response to the incident, from detection through the first eight hours. Section 2 focused on the continued response from Day 2 through Day 10.

Enclosures:

(1) Executive Summary
(2) Initial and Day 2 - Day10 Response Debrief Report

Internal Debrief Report

Executive Summary

On August 26, 2019 Enbridge Inc. conducted a debriefing session focused on the response to the August 1, 2019 Pipeline Failure/Rupture. The primary objective of these briefings was to capture strengths and areas of improvement identified during the response, and identify recommended paths forward.

Summary of High Level Findings

Upon reviewing the discussion and recommendations from all debrief sessions, two core areas were identified for essential lessons learned for success during future events. These core areas include:

- Internal Notifications
- Resources

The following sections outline the successes, areas of improvement, and recommended actions for each of the core areas identified.

Internal Notifications

Success

The initial notifications for this event were nearly immediate. Houston Gas Control fielded public calls and internal calls identifying a potential issue. Public witnesses initiated emergency services through 9-1-1 dispatch. Validation of issues with the pipeline and the dispatch of Field Emergency Response Team Members occurred within the first five minutes of the initial notifications to Gas Control. Internal response notifications were quickly established with employees in the vicinity of the incident location and senior management.

Areas for Improvement

An area of improvement identified was the notification of Public Awareness & Communications (PAC) personnel. The PAC personnel were contacted directly instead of the PIO hotline number.

Recommendations

Ensure the PIO hotline number is called every time vs. calling the individual. Region is accountable but may delegate it to Gas Control.

Resources

Success

The resource ordering process worked well, and was managed by the Logistics Section Chief. Required resources were quickly identified, ordered, acquired, and tracked throughout the duration of the response.

Areas for Improvement

1. Response could be improved with the installation of additional Remote Control Valves (RCVs)
2. More timely deployment of portable offices to accommodate the Incident Management Team.

Recommendations

- Complete a risk evaluation on response time and current RCV placement
- Work with Supply Chain to establish a Standing Agreement with Willscott for a more timely deployment of portable offices.

– End of Exhibits –