

Pipeline Failure Investigation Report

Pipeline System: Aberdeen Distribution System **Operator:** NorthWestern Energy
Operator ID: 31632 **Unit Number:** _____ **Activity Number:** _____
Location: 507 N 2nd St, Aberdeen, SD **Date of Occurrence:** 2/6/2018
Material Released: Natural gas **Quantity:** 5 MCF
PHMSA Arrival Time & Date: 1:15 pm 2/7/18 **Total Damages \$:** \$110,000
Investigation Responsibility: State PHMSA NTSB Other _____

	Company Reported Apparent Cause:	Company Reported Sub-Cause (from PHMSA Form 7000-1/7100.2):
	Corrosion	
	Natural Force Damage	
	Excavation Damage	
x	Other Outside Force Damage	Other – Structural movement of building wall.
	Material Failure (Pipe, Joint, Weld)	
	Equipment Failure	
	Incorrect Operation	
	Other	

	Accident/Incident Resulted in (check all that apply):	Comments:
	Rupture	
x	Leak	
x	Fire	
x	Explosion	
x	Evacuation	Number of Persons: <u>2</u> Area: _____

<i>Narrative Summary</i>
<p>Short summary of the Incident/Accident scenario</p> <p>House was vacant at time of incident and being remodeled. There was an explosion and then a fire. Service was dug up and squeeze off was installed on the steel service approximately 30 feet from the house. During the fire the operator found no indication of gas leakage but were unable to get close to the house because of the fire.</p> <p>Because of the circumstances of having no leak indication outside the home it was initially expected to be cause by customer piping rather than the service line.</p> <p>Due to the extreme frost conditions it took some time to get the area exposed. At the riser, there was 2 levels of concrete. The top layer of concrete was approximately 4 inches thick and a second layer below the first layer was approximately 2 inches thick. The concrete was poured all the way to foundation of the house. There was no sleeve around the riser to allow for movement.</p> <p>The riser consisted of a 1” steel pipe with an reducing elbow fitting connecting to the 1 ¼” steel service line. The failure was at the point of connection of the riser pipe with the elbow. The break was at the threads.</p>

Region/State: Central / South Dakota **Reviewed by:** _____
Principal Investigator: Mary Zanter, Pipeline Safety Program Manager **Title:** _____
Date: _____ **Date:** _____

Pipeline Failure Investigation Report

<i>Failure Location & Response</i>			
Location (City, Township, Range, County/Parish): Aberdeen, Brown County, SD			(Acquire Map)
Address or M.P. on Pipeline: 507 N 2nd St	(1)	Type of Area (Rural, City): city	(1)
Coordinates of failure location (Latitude): 45.470957 (Longitude): -98.490929			
Date: 2/6/18	Time of Failure: 10:14		
Time Detected: 10:14	Time Located: 10:14		
How Located: Explosion.			
NRC Report #: 1203737	(Attach Report)	Time Reported to NRC: 14:25	Reported by: Devin McCarthy, NorthWestern Energy
Type of Pipeline:			
Gas Distribution	Gas Transmission	Hazardous Liquid	___ LNG
<input type="checkbox"/> LP	<input type="checkbox"/> Interstate Gas	<input type="checkbox"/> Interstate Liquid	
<input type="checkbox"/> Municipal	<input type="checkbox"/> Intrastate Gas	<input type="checkbox"/> Intrastate Liquid	
<input checked="" type="checkbox"/> Public Utility	<input type="checkbox"/> Gas Gathering	<input type="checkbox"/> Offshore Liquid	
<input type="checkbox"/> Master Meter	<input type="checkbox"/> Offshore Gas	<input type="checkbox"/> Liquid Gathering	
	<input type="checkbox"/> Offshore Gas - High H ₂ S	<input type="checkbox"/> CO ₂	
		<input type="checkbox"/> Low Stress Liquid	
		<input type="checkbox"/> HVL	
Pipeline Configuration (Regulator Station, Pump Station, Pipeline, etc.): Service line riser.			

<i>Operator/Owner Information</i>			
Owner: NorthWestern Corporation Address: 3010 W 69th St. Sioux Falls, SD 57108		Operator: Address:	
Company Official: Mr. Curt Pohl, Vice President – Retail Operations NorthWestern Energy 40 E. Broadway Butte, MT 59701-9394 curtis.pohl@northwestern.com		Company Official:	
Phone No.: (406) 497-2119	Fax No.:	Phone No.	Fax No.

1 Photo documentation

Pipeline Failure Investigation Report

Operator/Owner Information	
<u>Drug and Alcohol Testing Program Contacts</u> <input checked="" type="checkbox"/> N/A	
Drug Program Contact & Phone:	
Alcohol Program Contact & Phone:	

Damages		
Product/Gas Loss or Spill ⁽²⁾	Natural gas	Estimated Property Damage \$85,000
Amount Recovered	None	Associated Damages ⁽³⁾ \$ 26,650
Estimated Amount \$	\$50	(Total Damages of \$110,650)
Description of Property Damage: Primary residence was total loss due to fire. Neighbor to south had some damage to the side of the house. Neighbor to the north had some damage to the side of the house.		
Customers out of Service:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Number: 1
Suppliers out of Service:	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Number:

Fatalities and Injuries						<input checked="" type="checkbox"/> N/A
Fatalities:	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	Company:	Contractor:	Public:	
Injuries - Hospitalization:	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	Company:	Contractor:	Public:	
Injuries - Non-Hospitalization:	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	Company:	Contractor:	Public:	
Total Injuries (including Non-Hospitalization):			Company:	Contractor:	Public:	
Name	Job Function	Yrs. w/ Comp.	Yrs. Exp.	Type of Injury		

Drug/Alcohol Testing					<input checked="" type="checkbox"/> N/A
Were all employees that could have contributed to the incident, post-accident tested within the 2 hour time frame for alcohol or the 32 hour time frame for all other drugs? NA					
<input type="checkbox"/> Yes <input type="checkbox"/> No					
Job Function	Test Date & Time	Location	Results		Type of Drug
			Pos	Neg	

2 Initial volume lost or spilled
3 Including cleanup cost

Pipeline Failure Investigation Report

<i>System Description</i>
Describe the Operator's System: 1 ¼" steel service line connected to main in the alley. Service was installed in 1956. Service was joined with couplings. The riser consisted of a 1 x 1 ¼ inch reducing elbow connected to a 1" steel riser pipe.

<i>Pipe Failure Description</i>		___ <i>N/A</i>
Length of Failure (inches, feet, miles): Single break at coupling to riser pipe connection.		(1)
Position (Top, Bottom, include position on pipe, 6 O'clock): (1) Circumferential	Description of Failure (Corrosion Gouge, Seam Split): (1) Sheer break.	
Laboratory Analysis: ___ Yes ___x___ No		
Performed by:		
Preservation of Failed Section or Component: ___x___ Yes ___ No		
If Yes - Method:		
In Custody of: NorthWestern Energy		
Develop a sketch of the area including distances from roads, houses, stress inducing factors, pipe configurations, direction of flow, etc. Bar Hole Test Survey Plot, if included, should be outlined with concentrations at test points.		

<i>Component Failure Description</i>		___ <i>N/A</i>
Component Failed:	Reducing coupling	(1)
Manufacturer:	Model:	
Pressure Rating:	Size: 1 1/4" x 1"	
Other (Breakout Tank, Underground Storage):		

<i>Pipe Data</i>		___ <i>N/A</i>
Material: Steel	Wall Thickness/SDR: 0.156	
Diameter (O.D.): 1" x 1 ¼"	Installation Date: 1956	
SMYS:	Manufacturer:	
Longitudinal Seam:	Type of Coating:	
Pipe Specifications (API 5L, ASTM A53, etc.):		

<i>Joining</i>		___ <i>N/A</i>
Type: Threaded	Procedure: pre-code	
NDT Method: NA	Inspected: ___ Yes ___x___ No	

<i>Pressure @ Time of Failure @ Failure Site</i>		___x___ <i>N/A</i>
Pressure @ Failure Site: 23 psig	Elevation @ Failure Site:	

Pipeline Failure Investigation Report

<i>Internal Pipe or Component Examination</i>		__x__ N/A
Results of Gas and/or Liquid Analysis ⁽⁶⁾		
Internal Inspection Survey: __ Yes __ No	Results ⁽⁷⁾	
Did the Operator have knowledge of Corrosion before the Incident? __ Yes __ No		
How Discovered? (Instrumented Pig, Coupon Testing, ICDA, etc.):		

<i>Outside Force Damage</i>		__x__ N/A
Responsible Party:	Telephone No.:	
Address:		
Work Being Performed:		
Equipment Involved: ⁽¹⁾	Called One Call System? __ Yes __ No	
One Call Name:	One Call Report # ⁽⁸⁾	
Notice Date:	Time:	
Response Date:	Time:	
Details of Response:		
Was Location Marked According to Procedures? __ Yes __ No		
Pipeline Marking Type: ⁽¹⁾	Location: ⁽¹⁾	
State Law Damage Prevention Program Followed? __ Yes __ No __ No State Law		
Notice Required: __ Yes __ No	Response Required: __ Yes __ No	
Was Operator Member of State One Call? __ Yes __ No	Was Operator on Site? __ Yes __ No	
Did a deficiency in the Public Awareness Program contribute to the accident? __ Yes __ No		
Is OSHA Notification Required? __ Yes __ No		

<i>Natural Forces</i>	__ N/A
Description (Earthquake, Tornado, Flooding, Erosion): Movement of earth/foundation at riser.	

- 6 Attach copy of gas and/or liquid analysis report
 7 Attach copy of internal inspection survey report
 8 Attach copy of one-call report

Pipeline Failure Investigation Report

Natural Forces	__ <i>N/A</i>

Failure Isolation		__ <i>N/A</i>
Squeeze Off/Stopple Location and Method: Steel service line was squeezed off and capped. The service was then retired at the main.		(1)
Valve Closed - Upstream: Time:	I.D.: M.P.:	
Valve Closed - Downstream: Time:	I.D.: M.P.:	
Pipeline Shutdown Method: __ Manual __ Automatic __ SCADA __ Controller __ ESD		
Failed Section Bypassed or Isolated:		
Performed By:	Valve Spacing:	

Odorization		__ <i>N/A</i>
Gas Odorized: <input checked="" type="checkbox"/> Yes __ No	Concentration of Odorant (Post Incident at Failure Site): .15	
Method of Determination: __ Yes __ No	% LEL: <input checked="" type="checkbox"/> Yes __ No	% Gas In Air: <input checked="" type="checkbox"/> Yes __ No
Sniff test with Heath Odorator	Time Taken: __ Yes __ No 11:28 am	
Was Odorizer Working Prior to the Incident? <input checked="" type="checkbox"/> Yes __ No	Type of Odorizer (Wick, By-Pass): Injection	
Odorant Manufacturer: Model:	Type of Odorant: Spotleak 1009, Manufactured by Odortech	
Amount Injected:	Monitoring Interval (Weekly): monthly	
Odorization History (Leaks Complaints, Low Odorant Levels, Monitoring Locations, Distances from Failure Site): NA		

Weather Conditions		__ <i>N/A</i>
Temperature: approx.. -10 degrees F	Wind (Direction & Speed): approx. 10 mph from North	
Climate (Snow, Rain): snow on ground	Humidity:	
Was Incident preceded by a rapid weather change? __ Yes <input checked="" type="checkbox"/> No		
Weather Conditions Prior to Incident (Cloud Cover, Ceiling Heights, Snow, Rain, Fog): Typical winter weather.		

Pipeline Failure Investigation Report

<i>Gas Migration Survey</i> __ N/A	
Bar Hole Test of Area: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Equipment Used:
Method of Survey (Foundations, Curbs, Manholes, Driveways, Mains, Services) ⁽⁹⁾ (1) Bar Hole area with CGI, also used RMLD. See attached map.	

<i>Environment Sensitivity Impact</i> __x__ N/A	
Location (Nearest Rivers, Body of Water, Marshlands, Wildlife Refuge, City Water Supplies that could be or were affected by the medium loss) (1)	
OPA Contingency Plan Available? <input type="checkbox"/> Yes <input type="checkbox"/> No	Followed? <input type="checkbox"/> Yes <input type="checkbox"/> No

<i>Class Location/High Consequence Area</i> __x__ N/A	
Class Location: 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> Determination:	HCA Area? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A Determination:
Odorization Required? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	

<i>Pressure Test History</i> __ N/A <i>(Expand List as Necessary)</i>						
	Req'd ⁽¹⁰⁾ Assessment Deadline Date	Test Date	Test Medium	Pressure (psig)	Duration (hrs)	% SMYS
Installation	N/A					
Next						
Next						
Most Recent						
Describe any problems experienced during the pressure tests. Service installed pre-code. MAOP was 25 psig per operating history.						

<i>Internal Line Inspection/Other Assessment History</i> __x__ N/A <i>(Expand List as Necessary)</i>					
	Req'd ⁽¹⁰⁾ Assessment Deadline Date	Assessment Date	Type of ILI Tool ⁽¹¹⁾	Other Assessment Method ⁽¹²⁾	Indicated Anomaly If yes, describe below
Initial					<input type="checkbox"/> Yes <input type="checkbox"/> No
Next					<input type="checkbox"/> Yes <input type="checkbox"/> No
Next					<input type="checkbox"/> Yes <input type="checkbox"/> No
Most Recent					<input type="checkbox"/> Yes <input type="checkbox"/> No

9 Plot on site description page

10 As required of Pipeline Integrity Management regulations in 49CFR Parts 192 and 195

11 MFL, TFI, UT, Combination, Geometry, etc.

12 ECDA, ICDA, SCCDA, "other technology," etc.

Pipeline Failure Investigation Report

Internal Line Inspection/Other Assessment History __x__ N/A
<i>(Expand List as Necessary)</i>

Describe any previously indicated anomalies at the failed pipe, and any subsequent pipe inspections (anomaly digs) and remedial actions.

Pre-Failure Conditions and Actions __x__ N/A
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Was there a known pre-failure condition requiring ⁽¹⁰⁾ the operator to schedule evaluation and remediation?
 __ Yes (describe below or on attachment) __x__ No

If there was such a known pre-failure condition, had the operator established and adhered to a required ⁽¹⁰⁾ evaluation and remediation schedule? Describe below or on attachment. __ Yes __x__ No __ N/A

Prior to the failure, had the operator performed the required ⁽¹⁰⁾ actions to address the threats that are now known to be related to the cause of this failure? __x__ Yes __ No __ N/A

List below or on an attachment such operator-identified threats, and operator actions taken prior to the accident.

Describe any previously indicated anomalies at the failed pipe, and any subsequent pipe inspections (anomaly digs) and remedial actions.

Maps & Records N/A
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Are Maps and Records Current? ⁽¹³⁾ __x__ Yes __ No
 Comments:

Leak Survey History __x__ N/A

Leak Survey History (Trend Analysis, Leak Plots):

Pipeline Operation History __x__ N/A
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Description (Repair or Leak Reports, Exposed Pipe Reports):

Did a Safety Related Condition Exist Prior to Failure? __ Yes __ No Reported? __ Yes __ No

Unaccounted For Gas:

Over & Short/Line Balance (24 hr., Weekly, Monthly/Trend):

13 Obtain copies of maps and records

Pipeline Failure Investigation Report

Operator/Contractor Error __x_ N/A				
Name:		Job Function:		
Title:		Years of Experience:		
Training (Type of Training, Background):				
Was the person "Operator Qualified" as applicable to a precursor abnormal operating condition? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A				
Was qualified individual suspended from performing covered task <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A				
Type of Error (Inadvertent Operation of a Valve):				
Procedures that are required:				
Actions that were taken:				
Pre-Job Meeting (Construction, Maintenance, Blow Down, Purging, Isolation):				
Prevention of Accidental Ignition (Tag & Lock Out, Hot Weld Permit):				
Procedures conducted for Accidental Ignition:				
Was a Company Inspector on the Job? <input type="checkbox"/> Yes <input type="checkbox"/> No				
Was an Inspection conducted on this portion of the job? <input type="checkbox"/> Yes <input type="checkbox"/> No				
Additional Actions (Contributing factors may include number of hours at work prior to failure or time of day work being conducted):				
Training Procedures:				
Operation Procedures:				
Controller Activities:				
Name	Title	Years Experience	Hours on Duty Prior to Failure	Shift
Alarm Parameters:				
High/Low Pressure Shutdown:				
Flow Rate:				
Procedures for Clearing Alarms:				
Type of Alarm:				
Company Response Procedures for Abnormal Operations:				

Pipeline Failure Investigation Report

<i>Operator/Contractor Error</i>		<u> </u> <i>x</i> <u> </u> <i>N/A</i>
Over/Short Line Balance Procedures:		
Frequency of Over/Short Line Balance:		
Additional Actions:		

Pipeline Failure Investigation Report

Additional Actions Taken by the Operator

x N/A

Make notes regarding the emergency and Failure Investigation Procedures (Pressure reduction, Reinforced Squeeze Off, Clean Up, Use of Evacuators, Line Purging, closing Additional Valves, Double Block and Bleed, Continue Operating downstream Pumps):

Photo Documentation ⁽¹⁾

Overall Area from best possible view. Pictures from the four points of the compass. Failed Component, Operator Action, Damages in Area, Address Markings, etc.

Photo No.	Description	Photo No.	Description
1		16	
2		17	
3		18	
4		19	
5		20	
6		21	
7		22	
8		23	
9		24	
10		25	
11		26	
12		27	
13		28	
14		29	
15		30	

Camera Type:

Pipeline Failure Investigation Report

<i>Additional Information Sources</i>			
Agency	Name	Title	Phone Number
Police:			
Fire Dept.:			
State Fire Marshall:			
State Agency:			
NTSB:			
EPA:			
USCG:			
FBI:			
ATF:			
OSHA:			
Insurance Co.:			
FRA:			
MMS:			
Television:			
Newspaper:			
Other:			
<i>Persons Interviewed</i>			
Name	Title	Phone Number	

Pipeline Failure Investigation Report

<i>Investigation Contact Log</i>			
Time	Date	Name	Description

<i>Failure Investigation Documentation Log</i>				
Operator:		Unit #:	CPF #:	Date:
Appendix Number	Documentation Description	Date	FOIA	
		Received	Yes	No

Pipeline Failure Investigation Report

Site Description

Provide a sketch of the area including distances from roads, houses, stress inducing factors, pipe configurations, etc. Bar Hole Test Survey Plot should be outlined with concentrations at test points. Photos should be taken from all angles with each photo documented. Additional areas may be needed in any area of this guideline.