

DOT US Department of Transportation
PHMSA Pipeline and Hazardous Materials Safety Administration
OPS Office of Pipeline Safety
Eastern Region

Principal Investigator Edwin D. Clarkson, WV PSC
Region Director Byron Coy
Date of Report 8/2/2011
Subject Failure Investigation Report – Columbia Gas Well Line Rupture

Operator, Location, & Consequences

Date of Failure 01/04/2009
Commodity Released Natural Gas
City/County & State Charleston, Kanawha County, WV
OpID & Operator Name 2616 - Columbia Gas Transmission
Unit # & Unit Name 65921 - COCO A, B, C Storage Fields
SMART Activity # 130266
Milepost / Location Latitude: 38.44811, Longitude: -81.44553
Type of Failure Rupture of a 6" storage well line due to internal corrosion complicated by low impact toughness of the pipe material
Fatalities 0
Injuries 0
Description of area impacted Rural area. Not within an HCA.
Property Damage \$29,011

Failure Investigation Report – Columbia Gas Transmission Well Line Rupture
Failure Date: 01/04/2009

Executive Summary

On January 4, 2009, a 6.625 inch diameter storage well line in Coco C storage field near Charleston, Kanawha County, WV, ruptured due to internal corrosion pitting complicated by low impact toughness of the pipe material. The failure apparently occurred 4 hours after the line was pressurized from ambient to 1720 psig. The Maximum Allowable Operating Pressure (MAOP) was 1800 psig. The pipe was 1956-1957 vintage ERW pipe with a Specified Minimum Yield Strength (SMYS) of 35,000 psig.

There were no fatalities, injuries, or supply issues as a result of the incident.

System Details

The Coco storage fields are located in Kanawha County, West Virginia. Columbia commenced storage operations in the 1950's. The facility covers over 20,000 acres and includes approximately 60 miles of 4" through 20" pipeline. The pipeline system maximum allowable operating pressure (MAOP) is 1800 psig.

The Coco C storage field is located near the town of Blue Creek in Kanawha County, West Virginia, and approximately 20 miles northeast from Charleston, WV.

The pipeline that failed was well line X-52C-W7329 in the Coco C storage field. The line is 4" diameter coming out of the well and into the measurement station and increases to 6" diameter from the measurement station to the tie in with the field line. The pipe is 1956 - 1957 vintage, X-35, 0.280" wall thickness.

There is no history of internal corrosion related incidents occurring at Coco C field.

Events Leading up to the Failure

The well line was loaded at the time of failure but was not flowing gas. The valve at the tie in to the field line was closed; the well gate was open. The failure apparently occurred 4 hours after the line was pressurized from ambient to 1720 psig. A local resident near the incident location reported the failure to Columbia Gas Transmission (Appendix 1- NRC Report).

Emergency Response

Columbia Gas Transmission responded to the incident and shut down and isolated the section of pipeline.

Summary of Return-to-Service

The well was shut in. Line W-7329 was isolated and a replacement project is being considered for approval in 2012.

Investigation Details

The pipe at the failure location disintegrated into multiple fragments (Appendix 2). Columbia began documentation and recovery of the fragments on 1/7/2009. The pipe fragments were sent out for metallurgical examination. A review of the outside consultants metallurgical report was completed (Appendix 4). The analysis determined that the root cause of failure was internal corrosion complicated by low impact toughness of the pipe material.

Failure Investigation Report – Columbia Gas Transmission Well Line Rupture
Failure Date: 01/04/2009

As a result of this incident, an internal corrosion review was conducted on 10/16/2009. Based on a review of pipeline records, Columbia noted that four other pipelines might have possible low impact toughness properties. After a review of the metallurgical report and the internal corrosion assessment, Columbia developed a remedial plan for examination and selected replacement of Coco C storage lines. (Appendix 5 / Appendix 7).

Findings & Contributing Factors

The pipe ruptured due to internal corrosion pitting complicated by low impact toughness of the pipe material (Appendix 4). The corrosion pitting was the result of sulfur and chloride containing compounds, and third party investigator speculated that the low point in the pipeline under creek retained free liquids. Future plans are to replace the entire well line in 2012. A means for liquid removal will be considered in the replacement project.

Appendices

- 1 NRC Report #893963
- 2 Annotated Photographs
- 3 Operator Accident/Incident Report to PHMSA
- 4 Laboratory Analysis (Matco Services lab analysis for the failed section)
- 5 Preliminary Plan
- 6 Map
- 7 Update to NiSource Preliminary Plan Appendix 5



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Rescinded Comments (max 250 characters)

NRC Number: 893963
Call Date: 01/04/2009 Call Time: 16:56:40

Caller Information

First Name: Last Name:
Company Name:
Address:
City: State:
Country: Zip:
Phone 1: Phone 2:
Organization Type: Is caller the spiller? Yes No No Response
Confidential: Yes No No Response

Discharger Information

First Name: Last Name:
Company Name:
Address:
City: State:
Country: Zip:
Phone 1: Phone 2:
Organization Type:

Spill Information

State: County:
Nearest City: Zip Code:
Location

Spill Date: (mm/dd/yyyy) Spill Time: (24hh:mm:ss)

DTG Type: DISCOVERED

Incident Type: PIPELINE Reported Incident Type

Description

130266 Appendix 1 - NRC Report 893963

Materials Involved

Material / Chris Name	Chris Code	Total Qty.	Water Qty.
NATURAL GAS	ONG	0 UNKNOWN AMOUNT	

Medium Type: AIR

Additional Medium Information:

Injuries:

Evacuations: Yes No Unknown

Damages: Yes No Unknown

Federal Agency Notified: Yes No Unknown

Other Agency Notified: Yes No Unknown

Fatalities:

No. of Evacuations:

Damage Amount:

State Agency Notified: Yes No Unknown

Remedial Actions

Additional Info

Latitude

Degrees: Minutes: Seconds: Quadrant:

Longitude

Degrees: Minutes: Seconds: Quadrant:

Distance from City:

Direction:

Section:

Township:

Range:

Milepost:



Date 1/6/09

Columbia Gas Transmission Inc.

Coco Storage C field

Line number X-52C-W7329 diameter 6.625 inches, .280 inch wall thickness, X-35

Description of photo – Pipeline indicates internal corrosion.



Date 1/6/09

Columbia Gas Transmission Inc.

Coco Storage C field

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Description of photo – Pipeline indicates internal corrosion.



Date 1/6/09

Columbia Gas Transmission Inc.

Coco Storage C field

Line number X-52C-W7329 diameter 6.625 inches, .280 inch wall thickness, X-35

Description of photo – Short section of line 7329 indicating brittle fracture



Date 1/6/09

Columbia Gas Transmission Inc.

Coco Storage C field

Line number X-52C-W7329 diameter 6.625 inches, .280 inch wall thickness, X-35

Description of photo – Tie in side where the fracture stops at a weld



Date 1/6/09

Columbia Gas Transmission Inc.

Coco Storage C field

Line number X-52C-W7329 diameter 6.625 inches, .280 inch wall thickness,

Description of photo – Short section of line 7329 indicating brittle fracture



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Coco Storage C field

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Date 1/6/09

Columbia Gas Transmission Inc.

Coco Storage C field

Line number X-52C-W7329 diameter 6.625 inches, .280 inch wall thickness, X-35

Description of photo – Short section of line 7329 indicating brittle fracture



Date 1/6/09

Columbia Gas Transmission Inc.

Coco Storage C field

Line number X-52C-W7329 diameter 6.625 inches, .280 inch wall thickness, X-35

Description of photo – Overview of well side



Date 1/6/09

Columbia Gas Transmission Inc.

Coco Storage C field

Line number X-52C-W7329 diameter 6.625 inches, .280 inch wall thickness, X-35

Description of photo – Short section of line 7329 indicating brittle fracture



Date 1/6/09

Columbia Gas Transmission Inc.

Coco Storage C field

Line number X-52C-W7329 diameter 6.625 inches, .280 inch wall thickness, X-35

Description of photo – Meter house for well 7329



Date 1/6/09


Columbia Gas Transmission Inc.

Coco Storage C field

Line number X-52C-W7329 diameter 6.625 inches, .280 inch wall thickness, X-35

Description of photo – Storage well 7329

130266 Appendix 3 - 7329 30 day final report

 <p>U.S Department of Transportation Pipeline and Hazardous Materials Safety Administration</p>	<p>INCIDENT REPORT – GAS TRANSMISSION AND GATHERING SYSTEMS</p> <p>Report format corresponds to Form PHMSA F 7100.2 (01-2002)</p>	Report Date	February 2, 2009
		No.	20090010 - 8041

PART A – GENERAL INFORMATION					
N	Original Report	Y	Supplemental Report	Y	Final Report
1. Operator Name and Address					
a. Operator's 5-digit Identification Number			2616		
b. If Operator does not own the pipeline, enter Owner's 5-digit Identification Number (when known)					
c. Name of Operator			COLUMBIA GAS TRANSMISSION CORP		
d. Operator street address			1700 MACCORKLE AVENUE		
e. Operator address			City CHARLESTON		
			County or Parish KANAWHA		
			State WV		
			Zip code 25314		
2. Time and date of the incident					
			Hour 15:30		
			Date of the incident 1/4/2009		
3. Location of incident					
a. Street or nearest street or road			300 WALTHER ROAD		
b. City			ELKVIEW		
			County or Parish KANAWHA		
c. State			WV		
			Zip Code 25071		
d. Mile Post/Valve Station			LINE X52CW7329		
e. Survey Station No					
f. Latitude			38.44811		
			Longitude -81.44553		
g. Class location description					
Onshore (Class Location)			1		
Offshore			N		
Area					
Block #					
State					
Outer Continental Shelf			N		
h. Accident on Federal Land other than Outer Continental Shelf			N		
i. Is pipeline Interstate			Y		
4. Type of leak or rupture					
Leak or Rupture			RUPTURE		
Type of Leak					
- Puncture, diameter (inches)					
Type of Rupture			LONGITUDINAL-TEAR/CRACK		
- Tear/Crack, length (inches)			480		
- Propagation Length, total, both sides (feet)			40		
Other (specify)					
5. Consequences					
a. Fatality			No		
Total number of people			0		
Employees			0		
General Public			0		
Non-employee Contractors			0		
b. Injury requiring inpatient hospitalization			No		
Total number of people			0		
Employees			0		

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General Public		0
Non-employee Contractors		0
c. Property damage/loss (estimated)		Yes
Total	\$	29,011
Gas loss	\$	29,011
Operator damage	\$	0
Public/private property damage	\$	0
d. Release Occurred in a 'High Consequence Area'		N
e. Gas Ignited / Gas did not ignite		Gas did not Ignite
f. Explosion / No Explosion		NO EXPLOSION
g. Evacuation (<i>general public only</i>)		N
Number of people		0
Evacuation Reason		
6. Elapsed time until area was made safe		
	Hours	1
	Minutes	0
7. Telephone Report		
NRC Report Number		893963
Date		1/4/2009
8. Pressure		
a. Estimated pressure at point and time of incident (<i>PSIG</i>)		1700.00
b. Max. allowable operating pressure (MAOP) (<i>PSIG</i>)		1800.00
c. MAOP established by 49 CFR section		49 CFR 192.619(a)(3)
d. Did an over pressurization occur relating to the incident?		N
PART B – PREPARER AND AUTHORIZED SIGNATURE		
Preparer's Name		GEORGE HAMATY
Preparer's Title		
Area Code and Telephone Number		3043573728
Preparer's E-mail Address		GHAMATY@NISOURCE.COM
Area Code and Facsimile Number		3043573804
PART C – ORIGIN OF THE INCIDENT		
1. Incident occurred on		TRANSMISSION
2. Failure occurred on		BODY OF PIPE
Other (specify)		
3. Material involved (<i>pipe, fitting, or other component</i>)		STEEL
Plastic failure was		
a. ductile		N
b. brittle		N
c. joint failure		N
Material other than plastic or steel		
4. Part of the system involved in incident		PIPELINE
Other (specify)		
5. Year the pipe or component which failed was installed		1958
PART D – MATERIAL SPECIFICATION		
1. Nominal pipe size (NPS)	(inches)	6.63
2. Wall thickness inches		0.28
3. Specification		UNKNOWN
	SMYS	35000
4. Seam type		ERW
5. Valve type		
6. Pipe or valve manufactured by		UNKNOWN
	in year	1956
PART E - ENVIRONMENT		
1. Area of incident		UNDER GROUND
Other (specify)		
Depth of cover	(inches)	24

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PART F – APPARENT CAUSE							
F1 – CORROSION							
1. External Corrosion							
2. Internal Corrosion					Yes		
Complete items a-e where applicable							
a. Pipe Coating					COATED		
b. Visual Examination					LOCALIZED PITTING		
Other (specify)							
c. Cause of Corrosion					OTHER		
Other (specify)					SULFUR AND CHLORIDE CONTAINING COMPOUNDS		
d. Was corroded part of pipeline considered to be under cathodic protection prior to discovering incident?					Y		
Year Protection Started					1970		
e. Was pipe previously damaged in the area of corrosion?					N		
How long prior to incident?					Years		
					Months		
F2 – NATURAL FORCES							
3. Earth Movement							
Description							
Other (specify)							
4. Lightning							
5. Heavy Rains/Floods							
Description							
Other (specify)							
6. Temperature							
Description							
Other (specify)							
7. High Winds							
F3 - EXCAVATION							
8. Operator Excavation Damage (including their contractors) / Not Third Party							
9. Third Party Excavation Damage							
a. Excavator group							
b. Type							
Other (specify)							
c. Did operator get prior notification of excavation activity?							
Date received					mo.	day	yr.
Notification received from							
d. Was pipeline marked?							
Temporary markings							
Permanent markings							
Marks were							
Were marks made within required time?							
F4 – OTHER OUTSIDE FORCE DAMAGE							
10. Fire/Explosion as primary cause of failure							
Description							
11. Car, truck or other vehicle not relating to excavation activity damaging pipe							
12. Rupture of Previously Damaged Pipe							
13. Vandalism							
F5 – MATERIAL AND WELDS							
Material							
14. Body of Pipe							
Description							
Other (specify)							
15. Component							
Description							
Other (specify)							

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16. Joint	
Description	
Other (specify)	
Weld	
17. Butt	
Description	
Other (specify)	
18. Fillet	
Description	
Other (specify)	
19. Pipe Seam	
Description	
Other (specify)	
Complete a-g if you indicate any cause in part F5	
a. Type of failure	
Construction Defect	NO DATA
Description	
Material Defect	NO DATA
b. Was failure due to pipe damage sustained in transportation to the construction or fabrication site?	
c. Was part which leaked pressure tested before incident occurred?	
d. Date of test	
	Month
	Day
	Year
e. Test medium	
Other (specify)	
f. Time held at test pressure	hr
g. Estimated test pressure at point of incident	
	(PSIG)
F6 – EQUIPMENT AND OPERATIONS	
20. Malfunction of Control/Relief Equipment	
Description	
Other (specify)	
21. Threads Stripped, Broken Pipe Coupling	
Description	
Other (specify)	
22. Ruptured or Leaking Seal/Pump Packing	
23. Incorrect Operation	
a. Type	
Other (specify)	
b. Number of employees involved who failed post-incident test	
Drug test	
Alcohol test	
c. Were most senior employee(s) involved qualified?	
d. Hours on duty	
F7 – OTHER	
24. Miscellaneous	
Description	
25. Unknown	
Description	
PART G – NARRATIVE DESCRIPTION OF FACTORS CONTRIBUTING TO THE EVENT	
<p>FAILURE INVESTIAGTION SHOWED THAT THE CAUSE OF FAILURE FOR THIS PIPE WAS INTERNAL CORROSION PITTING COMPLICATED BY LOW IMPACT TOUGHNESS OF THE PIPE MATERIAL. THE CORROSION PITTING IS THE RESULT OF SULFUR AND CHLORIDE CONTAINING COMPOUNDS, AND THIRD PARTY INVESTIGATOR SPECULATED THAT THE LOW POINT IN THE PIPELINE UNDER CREEK RETAINED FREE LIQUIDS. THIS LINE REMAINS OUT-OF-SERVICE AS OF MARCH 2010. FUTURE PLANS ARE TO REPLACE THE ENTIRE WELL LINE IN 2010. A MEANS FOR LIQUID REMOVAL WILL BE INCLUDED IN THE REPLACEMENT PROJECT.</p>	

Appendix 4

Laboratory Analysis (Matco Services lab analysis for the failed section)

This document is on file at PHMSA

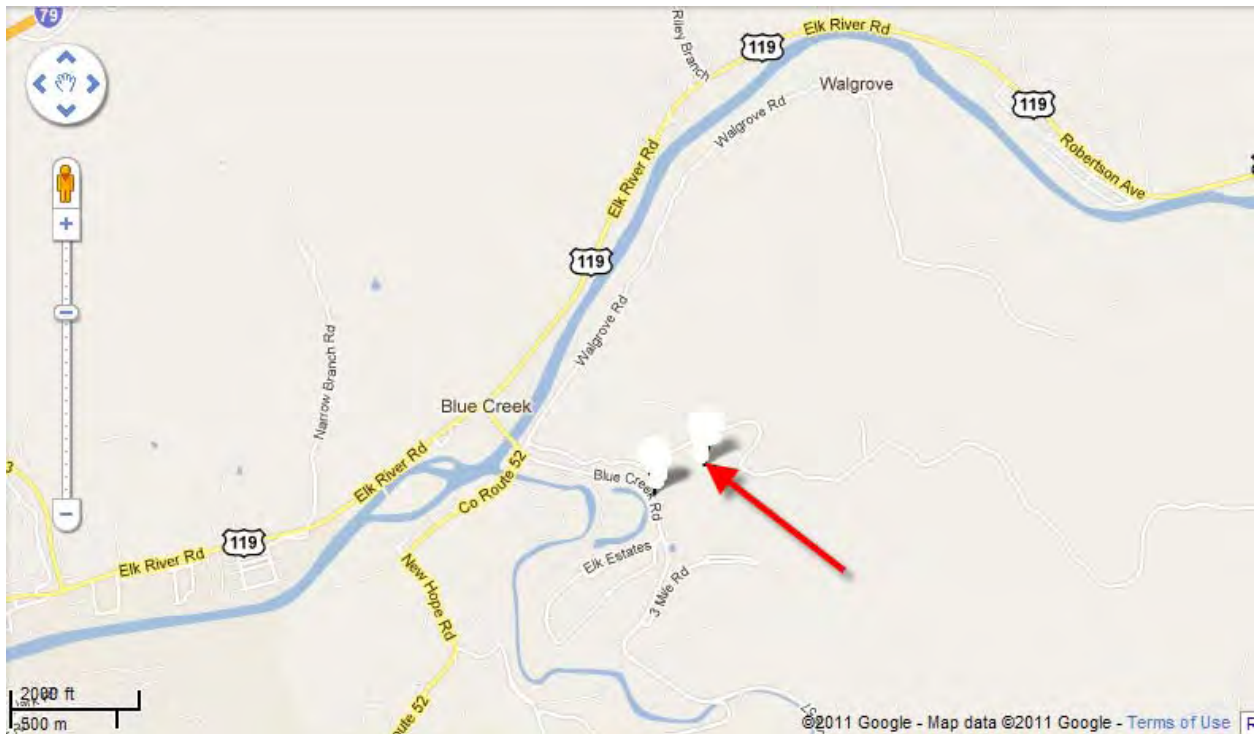
Appendix 5

Preliminary Plan

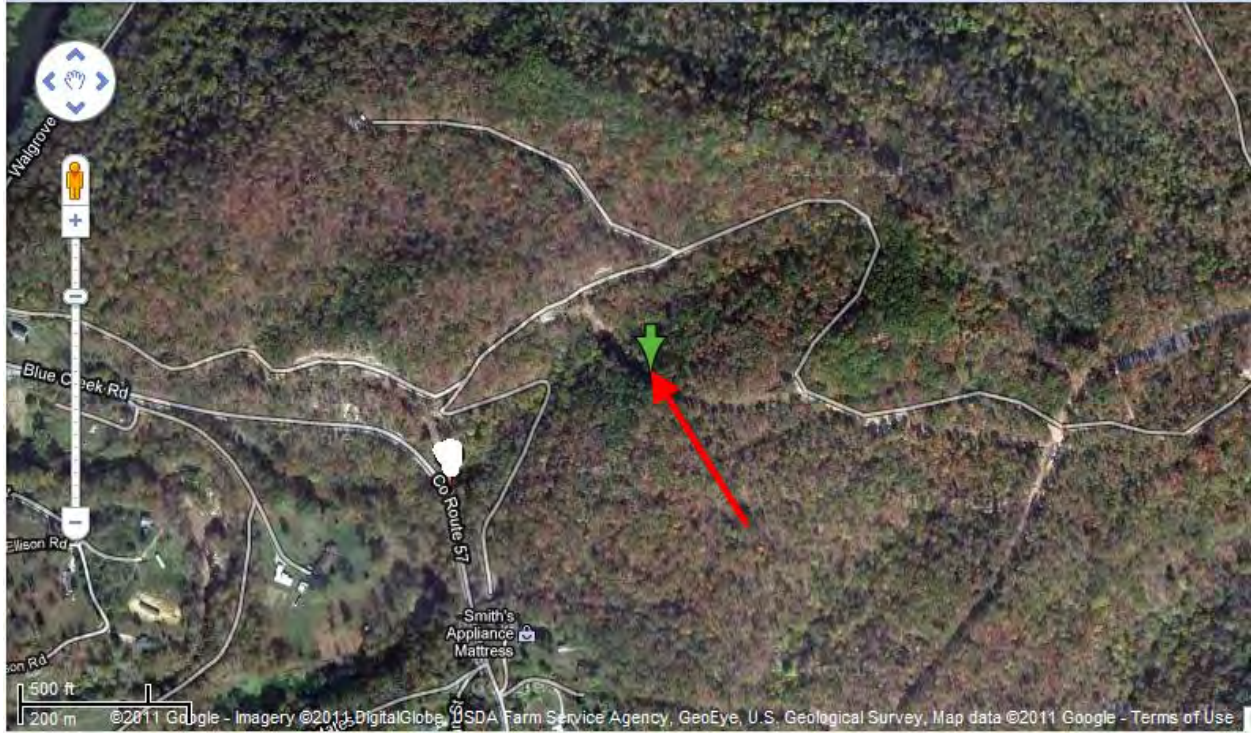
This document is on file at PHMSA

130266 Appendix 6 - Columbia Coco C I03 Incident Location

38.44811, -81.44553



130266 Appendix 6 - Columbia Coco C I03 Incident Location



Appendix 7

Update to NiSource Preliminary Plan Appendix 5

This document is on file at PHMSA