

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

Principal Investigator Jeremy Kemak - NYSDPS
Senior Accident Investigator Michael Yazemboski - PHMSA ER
Region Director Byron E. Coy
Date of Report 10/29/2012
Subject Failure Investigation Report – Columbia Gas Transmission Millennium Pipeline Leak Owego, NY

Operator, Location, & Consequences

Date of Failure 01/11/2011
Commodity Released Natural Gas
City/County & State Owego/ Tioga County New York
OpID & Operator Name 2616 Columbia Gas Transmission Corp.
Unit # & Unit Name 1661 Millennium West - NY
SMART Activity # 132869
Milepost / Location Latitude 42.15309 ; Longitude -76.13328
Type of Failure Weld Leak
Fatalities 0
Injuries 0
Description of area impacted Class 1 Area. Non-HCA
Property Damage 0

Failure Investigation Report - Columbia Gas Transmission, Millennium Pipeline Weld Anomaly
Failure Date 01/11/2011

Executive Summary

On January 11, 2011, Columbia Gas Transmission (CGT) field operations personnel discovered bubbles emerging from a small creek at milepost (MP) 47.5 on the Millennium Pipeline right-of-way. This area is located in a rural area near Owego, New York, in Tioga County. CGT confirmed that the bubbles were being emitted from a leak on the Millennium 30-inch natural gas pipeline that had been installed in 2008. The leak was reported to the NiSource Gas Transmission & Storage Monitoring Center, and the pipeline pressure was reduced from 1070 pounds per square inch gage (psig) to 900 psig.

Repair efforts started on January 12, 2011, with fabrication and installation of a 2-inch alternate supply line to New York State Electric and Gas (NYSEG) in order to maintain gas supply feeding the town of Owego, New York. This bypass allowed for uninterrupted service while the pipeline was temporarily out of service for repair.

The cause of this event was a pinhole leak in a circumferential weld located on a double joint section of pipe. The investigation concluded that the weld defect originated from the original construction of the pipeline in 2008. Remediation of the leak was completed on January 16, 2011, and the line was returned to normal operating pressure.

There were no fatalities, injuries, or fire resulting from this event.

Following the restart of the pipeline, a further review of the records for the entire section of line from the Corning Compressor Station to Hancock, New York, resulted in the discovery of three additional locations where discrepancies were found in the NDT records. As a result, on July 6, 2011, PHMSA Eastern Region issued Columbia Gas Transmission (CGT), operator of the Millennium Pipeline, a Consent Order (CO) (CPF#1-2011-1013S), requiring CGT to undertake an assessment of the affected sections to ensure the overall integrity of girth welds. The CO also required a 20 percent reduction in operating pressure based on the operating pressure at the time of the incident. The pressure reduction was to remain in place until the required in-line assessments and remediation activities were completed. Additional details related to the CO are provided in the "Return to Service" section below.

System Details

The Millennium Pipeline consists of approximately 180 miles of 24- and 30-inch pipe that was placed in service on December 2008 (Appendix A). It is jointly owned by affiliates of NiSource Inc., National Grid, and DTE Energy. The pipeline system is currently operated and maintained by Columbia Gas Transmission.

The pipeline system starts at Millennium's Compressor Station in Corning, NY, and ends at the Ramapo Interconnect in Ramapo, NY, which ties into the Algonquin pipeline system (Appendix A). The pipeline is supplied by various interconnects and storage fields (including: Empire, Columbia, Central New York Oil and Gas, National Fuel). In addition to delivering gas to the Algonquin pipeline system, Millennium also delivers gas to various local distribution companies (including: NYSEG, Orange and Rockland, National Fuel, and Central Hudson).

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The Millennium Pipeline system has a Maximum Allowable Operating Pressure (MAOP) of 1200 psig. The pipe at the leak location consists of 30-inch diameter, 0.405-inch wall thickness, X-70 SMYS pipe. There was no history of leaks, repairs, exposed pipe, or other conditions relevant to this event on this section of the Millennium system.

Events Leading up to the Failure

On January 11, 2011, at 14:00, Columbia Gas Transmission field operations personnel were performing AC decoupler testing. While working in the immediate area, they discovered bubbles emerging from a small creek traversing the Millennium Pipeline right-of-way. Upon further investigation, it was confirmed that the bubbles were being emitted from a leak on the Millennium 30-inch natural gas pipeline.

Emergency Response

Below is a summary of the action taken by CGT and emergency response personnel during the duration of this event. Additional details are provided in the event log (Appendix D).

A gas leak was discovered off of Schneider Road by CGT employees while performing pipeline operations. The employees notified the CGT monitoring center. CGT's incident management plan was implemented. Notification was made to the Millennium Commercial Department of Leaks, and CGT personnel were assigned to man the valves upstream and downstream of the leak. NYSEG Gas Control / Electric Dispatch was notified of the leak, and a contractor was contacted to begin developing a repair plan. The leak was reported to New York State Spill Response and to the NRC. Plans were developed to blow down the line, isolate the leak, and make repairs. The Tioga County Emergency Coordinator and Broome County Emergency Coordinator were notified of the blow down plan. NYSDPS was notified and began their investigation on January 15, 2012.

Preparations were made to:

1. Close and re-route traffic on East Maine Road during the blow down;
2. Make reverse 911 calls to residents within 1 mile of the blow down site;
3. Have Choconut Center Fire Department on site during the blow down;
4. Have Broome County Airport re-route air traffic around the blow down site; and
5. Have NYSEG de-energize their 345-kilovolt (KV) lines at the leak site and at E. Maine Road.

The line was successfully blown down, and plans were made to perform a repair.

Summary of Return-to-Service

Repair efforts started on January 12, 2011, with fabrication and installation of a 2-inch alternate supply line to New York State Electric and Gas (NYSEG) for the tap feeding the town of Owego. This bypass allowed for uninterrupted service while the Millennium Pipeline was temporarily out of service for repair.

On January 15, 2011, the pipeline pressure was reduced to 200 psig, and excavation of the leak site began. At 17:30, an anomaly was exposed on a circumferential double joint weld. Following the blow down of the pipeline section, the mechanical weld that leaked was radiographed. It was concluded that

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the leak was confined to the anomaly area. The weld anomaly measured approximately 0.125 inches in length and was located near the bottom of the pipe at the 5:30 o'clock position.

In order to permanently repair the leak, excess material was removed from anomaly area, the weld was manually re-welded, and a 3/8 inch thick Dresser Style 115 welded repair sleeve was installed (Appendix B). The repair sleeve was non-destructively evaluated through magnetic particle inspection, and the repair of the leak was completed at 11:30 on January 16, 2011. Once coating was complete, proper backfill was reestablished, and the pipeline was returned to its normal operating pressure at 17:15 on January 16, 2011.

As a result of the investigation, three additional suspect welds were identified based on a review of welding and NDT records from the 2008 construction. On July 6, 2011, PHMSA Eastern Region issued Columbia Gas Transmission (CGT), operator of the Millennium Pipeline, a Consent Order (CO) (CPF#1-2011-1013S), requiring CGT to undertake an assessment of the affected sections to ensure the overall integrity of girth welds by using in-line inspection methods and pipe examination as detailed in the CO. The affected sections of the Millennium System included the 24- and 30-inch diameter pipeline sections that transport natural gas from Corning to Ramapo, NY. The CO also required that the operating pressure in the affected sections be reduced by 20 percent until in-line inspection assessments and remedial action had been completed.

Investigation Details

The details of the investigation are provided below.

1. Leak Investigation Details
 - a. The leak was located at MP 47.5 in a rural (Class 1), non-HCA area near Owego, NY, in Tioga County. The nearest structure was a single family dwelling 1200 feet northeast from the leak site. (Appendix A)
 - b. The pressure upstream of the leak site at the Corning Compressor Station was 1098 psig. The pressure downstream of the leak site at the Port Dickinson M&R Station was 1054 psig.
 - c. Prior to the leak, the pipeline pressure at the leak location was 1070 psig, which is below the MAOP of 1200 psig for the system.
 - d. The pipeline was excavated at the leak location. Visual inspection indicated that the pipe burial depth was 72 inches, the pipe external coating was in good condition, and there were no signs of external corrosion.
2. CGT personnel coordinated Emergency Response activities with local fire and police departments to ensure public safety and security of the leak site. No issues were identified with the coordination activities or the implementation of CGT's emergency plans.
3. Records, ILI results, and procedures reviewed:
 - a. NYSDPS personnel conducting the investigation reviewed welding and NDT records associated with the leak site and the section of the Millennium Pipeline from Corning Compressor Station to Hancock, NY. Records indicated that this weld defect originated

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from the 2008 construction of the pipeline. Records show that this weld did not pass visual inspection.

- b. The Millennium Pipeline was successfully hydrostatically tested on November 11, 2008, at a pressure of 2118 psig, for 8 hours. This testing was done in accordance with code requirements.
 - c. A geometry in-line inspection tool (dent tool) was run on November 17, 2008, after the construction of the pipeline. Inspection data was analyzed and remedial action was taken by CGT to address the indications identified. There were no indications noted at the leak location.
 - d. An automatic welding process (procedure SMAW 33) was used offsite by CGT to create the double joints used in the 2008 construction of the pipeline. The double joint sections of pipe were then transported to the pipeline right-of-way for installation in the ditch.
 - e. A leak survey was performed on November 2, 2010. There were no leaks found as a result of this survey.
 - f. There was no history of leaks, repairs, or exposed pipe on this section of pipe since it was constructed in 2008.
 - g. A review of construction records from 2008 was performed, including welding records and NDT records for the section of the Millennium Pipeline from the Corning Compressor Station to Hancock, NY. This review also included the double joint rack where the rejected weld was made. A review of these records resulted in the identification of two additional double joint butt welds and one tie-in weld that were not adequately evaluated (Appendix F – X-RAYS 7957 and 8974). The daily radiographic report indicated that the two double joint butt welds needed re-evaluation “REX100 %”. According to Millennium personnel, this was due to issues with the film quality. However, these two additional welds were installed in the pipeline without any repair or further nondestructive testing. A tie-in weld with the NDT status identified as “Unknown” was listed on the alignment sheet as being installed in the pipeline (Appendix G). Millennium personnel were unable to provide records proving that nondestructive testing had been performed.
4. The cause of the leak was determined through visual inspection of the weld, and thus a laboratory analysis was not performed.
 5. Although Columbia Gas Transmission notified the NRC on January 12, 2011, at 12:20 (NRC# 964362), CGT determined that this event did not qualify as a reportable incident in accordance with Part 191.15 Code of Federal Regulations, and thus an incident report was not submitted or required for this event.

Findings and Contributing Factors

As a result of the investigation, it was determined that the leak was due to a circumferential weld defect on a double joint section of pipe. The weld defect, measuring approximately 0.125 inches in length, was located near the bottom of the pipe at the 5:30 o'clock position (Appendix B). A review of the

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construction records for this location showed that the weld defect originated from the initial construction of the line in 2008 (Appendix F – X-RAY number 7733).

Nondestructive test (NDT) records reviewed for this segment of pipe indicated that this weld did not pass a visual inspection and was rejected. As a result, there were no NDT radiographic inspections performed on this weld. During the construction process, this section of pipe containing the rejected weld was taken to the field and installed into the pipeline without being repaired.

Based on this information, investigators conducted a review of all welding and NDT records for the section of the Millennium Pipeline from Corning Compressor Station to Hancock, New York. This review identified discrepancies in the records at two additional double joint butt welds and one tie-in weld. The records showed that these welds were marked for reevaluation, but no records were found indicating that the reevaluation was performed (Appendix F, Appendix G).

As a result of these findings, on July 6, 2011, PHMSA Eastern Region issued Columbia Gas Transmission (CGT), operator of the Millennium Pipeline, a Consent Order (CO) (CPF#1-2011-1013S), requiring CGT to undertake an assessment of the affected sections to ensure the overall integrity of girth welds using in-line inspection methods.

Appendices

- A 132869_Appendix A-Maps - Leak Location
- B 132869_Appendix B-Report Photos
- C 132869_Appendix C-NRC Report 964362
- D 132869_Appendix D-Event Log
- E 132869_Appendix E-Pressure Records
- G 132869_Appendix G-Alignment Sheet for Tie-In Weld “Unknown”

Appendix A

Maps

This document is on file at PHMSA

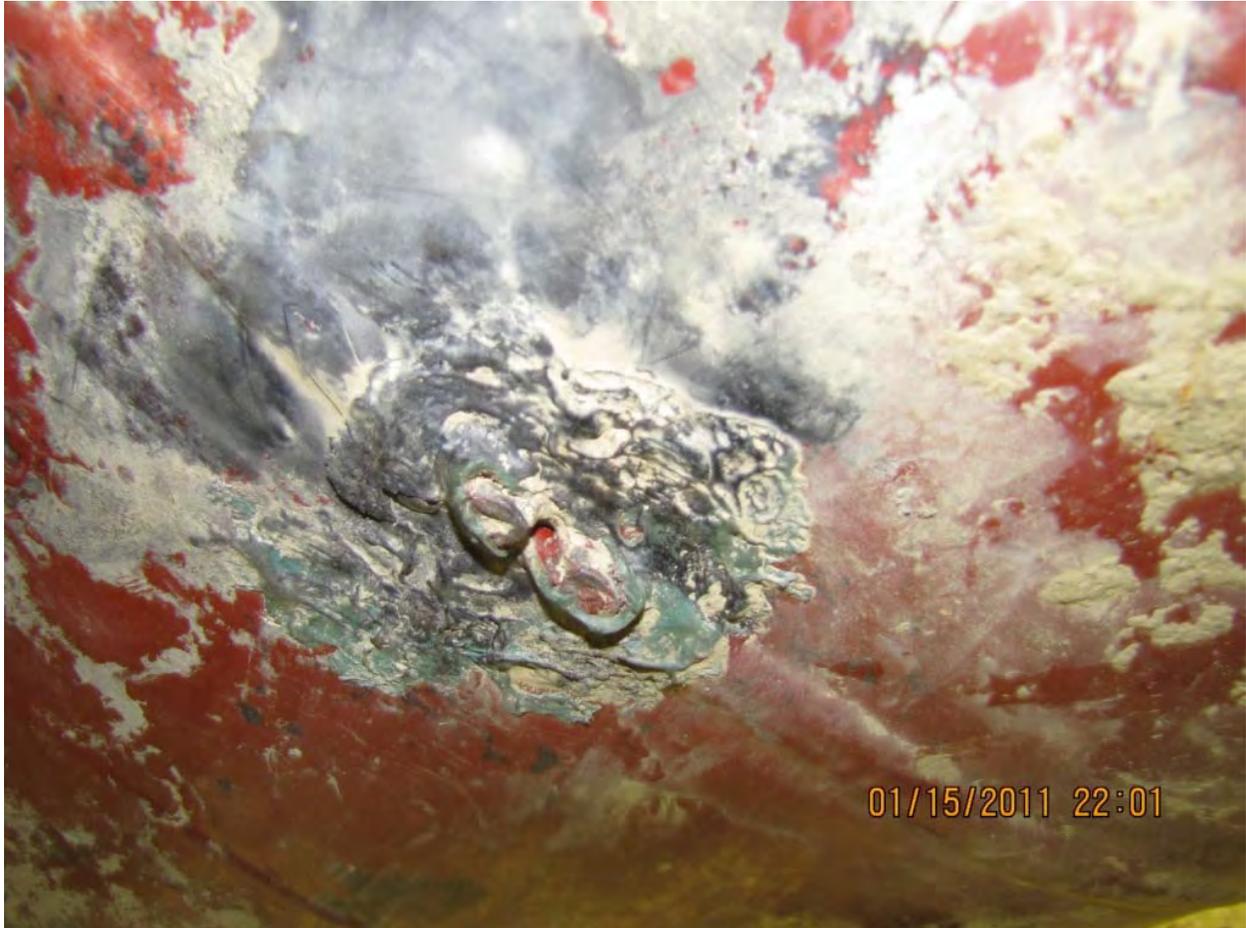
Excavation of leak site



Exposed section containing double joint anomaly



Anomaly as found



Anomaly after being sandblasted



Repair sleeve being installed



Tape wrap of repair sleeve



132869_Appendix C-NRC Report 964362

NATIONAL RESPONSE CENTER 1-800-424-8802

*** For Public Use ***

Information released to a third party shall comply with any applicable federal and/or state Freedom of Information and Privacy Laws

Incident Report # 964362

INCIDENT DESCRIPTION

*Report taken at 12:12 on 12-JAN-11

Incident Type: PIPELINE

Incident Cause: UNKNOWN

Affected Area: WETLANDS

The incident was discovered on 11-JAN-11 at 14:26 local time.

Affected Medium: WATER WETLANDS

SUSPECTED RESPONSIBLE PARTY

Organization: COLUMBIA GAS TRANSMISSION
CHARLESTON, WV 25314

Type of Organization: PRIVATE ENTERPRISE

INCIDENT LOCATION

SCHNEIDER RD County: TIOGA

SEE LAT/LONG

City: OWEGO State: NY

Latitude: 42° 09' 11" N

Longitude: 076° 07' 59" W

RELEASED MATERIAL(S)

CHRIS Code: ONG Official Material Name: NATURAL GAS

Also Known As:

Qty Released: 0 UNKNOWN AMOUNT Qty in Water: 0 UNKNOWN AMOUNT

DESCRIPTION OF INCIDENT

CALLER STATES THAT A RELEASE OF NATURAL GAS WAS DISCOVERED ON A PIPELINE IN A WETLANDS AREA.

INCIDENT DETAILS

Pipeline Type: TRANSMISSION

DOT Regulated: YES

Pipeline Above/Below Ground: ABOVE

Exposed or Under Water: YES

Pipeline Covered: YES

---WATER INFORMATION---

Body of Water: WETLANDS

Tributary of:

Nearest River Mile Marker:

Water Supply Contaminated: UNKNOWN

DAMAGES

Fire Involved: NO Fire Extinguished: UNKNOWN

INJURIES: NO Hospitalized: Empl/Crew: Passenger:

FATALITIES: NO Empl/Crew: Passenger: Occupant:

EVACUATIONS: NO Who Evacuated: Radius/Area:

Damages: NO

<u>Closure Type</u>	<u>Description of Closure</u>	<u>Length of Closure</u>	<u>Direction of Closure</u>
Air:	N		
Road:	N		

Major Artery: N

Waterway: N

132869_Appendix C-NRC Report 964362

Track: N

Passengers Transferred: NO
Environmental Impact: UNKNOWN
Media Interest: NONE Community Impact due to Material:

REMEDIAL ACTIONS

A REPAIR CREW IS ON SITE FOR THE LEAK.

Release Secured: NO
Release Rate:
Estimated Release Duration:

WEATHER

Weather: OVERCAST, 27°F

ADDITIONAL AGENCIES NOTIFIED

Federal: PHMSA EAST
State/Local: NY DEC, NY PUBLIC SERVICE COMMISSION
State/Local On Scene: NONE
State Agency Number: 1010563

NOTIFICATIONS BY NRC

ATLANTIC STRIKE TEAM (MAIN OFFICE)
12-JAN-11 12:25
DHS NOC (NOC)
12-JAN-11 12:25
USCG ICC (ICC ONI)
12-JAN-11 12:25
CT DEPT OF EMERGENCY MGMT (COMMISSIONER)
12-JAN-11 12:25
DOT CRISIS MANAGEMENT CENTER (MAIN OFFICE)
12-JAN-11 12:25
U.S. EPA II (MAIN OFFICE)
12-JAN-11 12:26
NATIONAL INFRASTRUCTURE COORD CTR (MAIN OFFICE)
12-JAN-11 12:25
NJ OFC HMLND SECURITY & PREPAREDNES (COMMAND CENTER)
12-JAN-11 12:25
NJ STATE POLICE (MARINE SERVICES BUREAU)
12-JAN-11 12:25
NOAA RPTS FOR NY (MAIN OFFICE)
12-JAN-11 12:25
BUREAU TOXIC SUBSTANCE R. WILBURN (MAIN OFFICE)
12-JAN-11 12:25
NY STATE DEC SPILL HOTLINE (MAIN OFFICE)
12-JAN-11 12:25
PA STATE POLICE (BUREAU OF CRIMINAL INVESTIGATION)
12-JAN-11 12:25
PA EMERG MGMT AGCY (MAIN OFFICE)
12-JAN-11 12:25
USCG DISTRICT 1 (COMMAND CENTER)
12-JAN-11 12:25

ADDITIONAL INFORMATION

NO ADDITIONAL INFORMATION.

*** END INCIDENT REPORT # 964362 ***

132869_Appendix D-Event Log

<i>Event Log</i>	
Sequence of events prior, during, and after the incident by time. (Consider the events of all parties involved in the incident, Fire Department and Police reports, Operator Logs and other government agencies.)	
Time / Date	Event
2:00 pm / 1-11-11	Gas leak discovered off of Schneider Road by Columbia employees while performing pipeline operations.
2:30 pm / 1-11-11	Andy Lake notified Columbia Gas monitoring center of the leak.
4:00 pm / 1-11-11	Notification made to Millennium Commercial Department of Leak.
4:00 pm / 1-11-11	Columbia Gas personnel assigned to man valves 1013 and 1014 (valves upstream and downstream of leak) on 24/7 schedule; set up task to check leak every day to determine if any changes were occurring.
6:00 pm / 1-11-11	Incident Management Plan Call #1 held to discuss leak repair strategy.
7:00 pm / 1-11-11	NYSEG Gas Control / Electric Dispatch notified of the leak.
Morning / 1-12-11	Otis Eastern (Contractor) contacted to mobilize; arranged for 30 inch pretested pipe, 30 inch weld over sleeve, and 30 inch leak clamp to be trucked to the site; reviewed leak repair options (bypass around leak, isolate pipe section and blow down etc.); identified market impacts; identified government agencies, emergency responders, customer, suppliers who needed to be contacted.
11:00 am / 1-12-11	Gas leak is reported to New York State Spill Response; Incident Report 1010563
12:20 pm / 1-12-11	Gas leak is reported to NRC; Incident Report 964362
Afternoon / 1-12-11	Gathering material and personnel to construct a 2 inch supply connection from Stagecoach / Millennium connection to lateral feeding NYSEG's Owego market; contacts made with NYSEG's gas department and electrical department in regards to coordination of two companies; started preparing blow down plan to isolate leak.
6:00 pm / 1-12-11	Incident management plan call #2 is held; determined that commercial arrangements could be made to isolate leak and make repair; blow down scheduled for Saturday morning at mainline valve off of East Maine Road, Broome County, NY.
7:55 am / 1-13-11	NYSEG and NYSDPS notified of plan to blow down pipeline on Saturday 1/15/11.
9:30 am / 1-13-11	Tioga County Emergency Coordinator is notified of blow down plan and need for a meeting to discuss action plan.
9:30 am / 1-13-11	Broome County Emergency Coordinator is notified of blow down plan and need for a meeting to discuss action plan.
11:00 am / 1-13-11	Meeting set up with Broome and Tioga County Emergency Control Coordinator for 2:00 pm.
2:00 pm / 1-13-11	Meeting with Broome County and Tioga County Emergency Coordinators to discuss blow down plan. Preparations were made to close and re-route traffic on East Maine Road during blow down; reverse 911 call would be made to residents within 1 mile of blow down site; Choconut Center Fire dept would be on site during blow down; Broome County Airport would re-route air traffic 1 mile around blow down site for 4 hours; explained that we were working with NYSEG to have them de-energize their 345 KV lines at the leak site and at E. Maine Road.
6:00 pm / 1-13-11	Held Incident Management Plan call #3 to discuss progress / issues related to leak repair.
1-14-11	Contractor and equipment mobilization; repair materials being delivered to site; Owego alternate supply connector being constructed; blow down silencer being shipped from Virginia; contacts being made with local residents and government officials; NYSEG preparing alternative feeds at Westover and Endicott to support markets; NYSEG scheduling power lines to be de-energized.; Security (Tioga Sheriff's dept) being arranged for leak site.
6:00 pm / 1-14-11	Incident Management Plan call #4 held to discuss progress / issues related to leak repair.

132869_Appendix D-Event Log

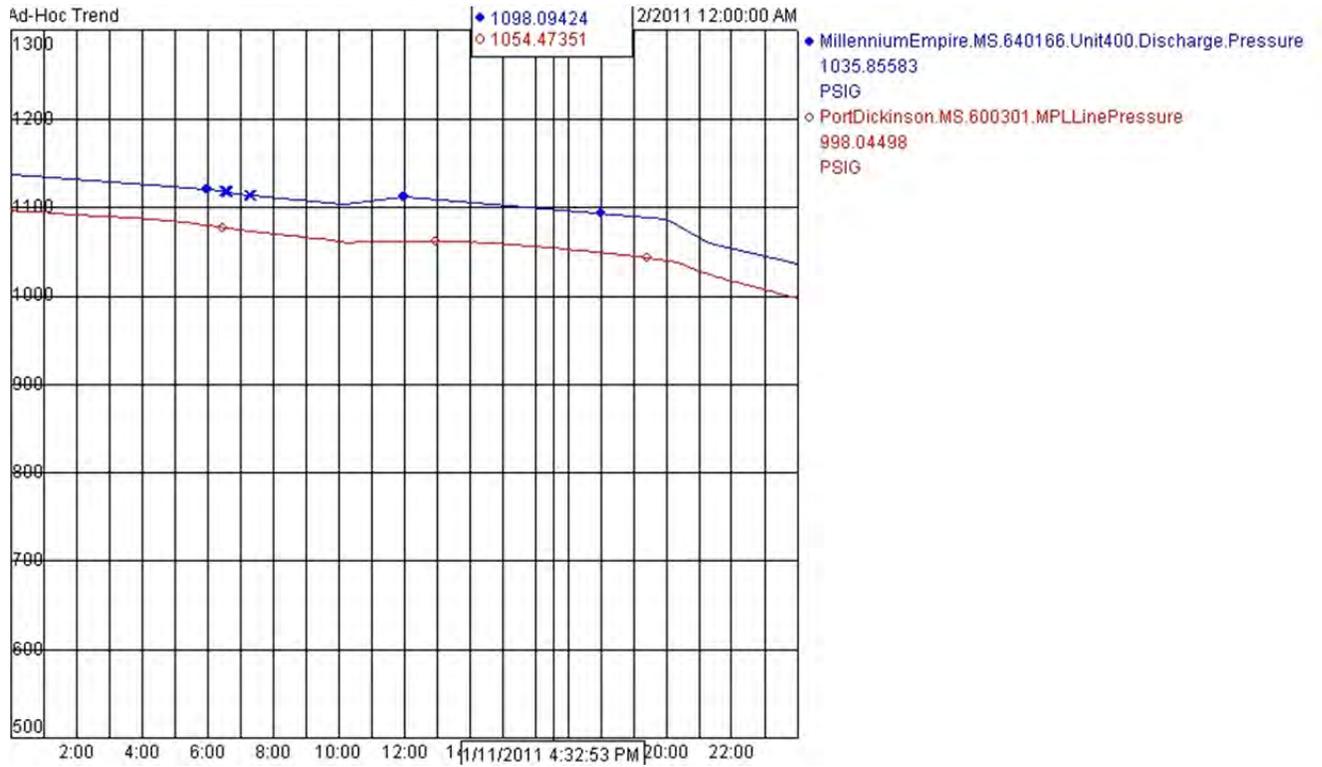
<i>Event Log</i>	
Sequence of events prior, during, and after the incident by time. (Consider the events of all parties involved in the incident, Fire Department and Police reports, Operator Logs and other government agencies.)	
6:45 am / 1-15-11	NYSEG states that they are primary feed at Westover and Endicott stations.
7:15 am / 1-15-11	NYSEG calls and states they are de-energizing power line at leak site and then at blow down site.
7:30 am / 1-15-11	Owego markets are being fed off of 2-inch alternate supply line.
8:00 am / 1-15-11	Supply being shut off on Millennium; Corning compressor station being shut down.
8:00 am / 1-15-11	Broome and Tioga EOC updated that mainline valves are being closed to isolate leak.
8:30 am / 1-15-11	Sheriff and Choconut fire dept are in place on E. Maine Road, East Main Road is temporarily closed.
8:40 am / 1-15-11	Upstream valve #1013 west of leak is closed.
9:00 am / 1-15-11	NYSDPS updated regarding the current action plan.
9:10 am / 1-15-11	NYSEG calls to state power line is de-energized at East Maine Road.
9:20 am / 1-15-11	Downstream valve #1014 east of leak is closed; 820 psig locked in on pipe section.
9:50 am / 1-15-11	Notifications are made to Columbia Gas Control and Broome EOC that blow down is ready to start. Broome EOC notifies Airport to start 4 hour restricted fly zone over blow off valve.
10:00 am / 1-15-11	Blow down started.
12:20 pm / 1-15-11	Tioga County Fire Director and fire chiefs from Tioga County visit leak site and have emergency plan in place.
1:50 pm / 1-15-11	NYSEG and Choconut Center fire chief notified that pressure on isolated section is 200 psig and that it is safe to energize power line at E. Maine Road. Notified Broome EOC that they could contact Airport to lift restricted fly zone.
2:30 pm / 1-15-11	Consultation with Choconut Center fire chief; determination made that E. Maine Road can be opened back up for traffic and emergency responders can leave site.
3:00 - 5:30 pm / 1-15-11	Contractor excavating at leak site.
6:00 pm / 1-15-11	Incident Management Plan call #5 held to discuss progress / issues related to leak repair.
7:00 pm / 1-15-11	Blow down complete; Notification to Tioga County EOC.
7:00 pm 1-15-11 – 12:00 am / 1-16-11	Air movers installed to purge gas out of pipeline; Weld leak investigated by consultant Det Norske Veritas (DNV Columbus, Inc); Discussions with NYDPS to determine proper repair method; Determination is made to repair the pinhole leak in the weld and then install a weld over sleeve as the permanent repair. NYDPS informed PHMSA of the proposed repair method. PHMSA did not express any concerns.
2:30 am / 1-16-11	Weld repair made and x-rayed.
3:00 am / 1-16-11	Weld over sleeve installation begins.
9:30 am / 1-16-11	NYSEG re-energizes power lines at leak site.
11:30 am / 1-16-11	Weld over sleeve installation completed and NDE verified good.
12:30 am / 1-16-11	Coating of pipe and weld over sleeve commences.
1:30 pm / 1-16-11	Coating completed and everyone is out of excavation.
1:30 pm / 1-16-11	Notify Broome EOC, Gas Control, NYSEG that purge of pipeline will start at 2:00 pm at E. Maine Rd; backfilling started at leak site.
2:00 pm / 1-16-11	Purge begins.
3:40 pm / 1-16-11	Purge completed; 100% gas in air at valve at E. Maine Rd.

132869_Appendix D-Event Log

<i>Event Log</i>	
Sequence of events prior, during, and after the incident by time. (Consider the events of all parties involved in the incident, Fire Department and Police reports, Operator Logs and other government agencies.)	
4:00 pm / 1-16-11	Start loading isolated section from east and west.
5:15 pm / 1-16-11	Pipeline loaded and back in-service; mainline valves opened.
6:00 pm / 1-16-11	Incident Management Plan call #6 held to discuss progress / issues related to leak repair.
6:30 pm / 1-16-11	Corning compressor station starts compressor unit.
6:30 pm / 1-16-11	Owego temporary feed disconnected; Owego being fed from the Millennium Pipeline.
7:30 pm / 1-16-11	NYSEG, Tioga EOC, and Broome County EOC notified that pipeline is back in normal operations.

132869_Appendix E-Records
Columbia Gas Transmission Millennium Pipeline Leak Owego, NY
Failure Date 01/11/2011

Pressure at time of failure



132869_Appendix E-Records
Columbia Gas Transmission Millennium Pipeline Leak Owego, NY
Failure Date 01/11/2011

Daily Radiographic Report (Defective Double Joint Weld 7733)



SHAW PIPELINE SERVICES

A SHAWCOR COMPANY
 5435 South 101st East Ave., Tulsa, OK 74146
 (918) 627-8288 Fax (918) 627-0020

DAILY RADIOGRAPHIC REPORT

CUSTOMER: U.S. Pipeline PROJECT: Millennium

X-RAY	WELD BY	LOCATION	With in Code		Exposure		Number of Exposures	Pipe Size	X-Ray	Gamma Ray	DEFECT LOCATION AND REMARKS
			Yes	No	In Side	Out Side					
1005 7703	1-3,5	405 x 405	/	/	X		11	30"	X		
2	04		/	/							
3	05		/	/							
4	06		/	/							
5	07		/	/							
6	08		/	/							
7	09		/	/							
8	10		/	/							
9	11		/	/							
10	12		/	/							
11	13		/	/							04-13-16 IP
12	14		/	/							
13	15		/	/							
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26	28		/	/							
27	29		/	/							
28	30		/	/							
29	31		/	/							
30	32		/	/							
31	33		/	/							Didn't shoot
32	34		/	/							
33	35	405 x 405	/	/							
34	36		/	/							
35	37		/	/							
36	38		/	/							
37	39	425 x 425	/	/							
38	40		/	/							
39	41	405 x 405	/	/							30" - 73
40	42	405 x 405	/	/	X		11	30"	X		

Date: 8-1-08 Customer Job No: 0805 SPS Job No: 981 Job Location: Owego NY Report No: 160 Unit No: 0 No. Men on Job: 5 No Welds Radiographed: 1

Travel # _____ Hours _____ Miles _____ Hours Worked: _____ FROM _____ A.M. TO _____ PM _____ TOTAL HOURS: 10

TERMS AND ABBREVIATIONS:

IP - Inadequate Penetration	ICP - Inadequate Cross Penetration	ESI - Elongated Slag Inclusion	IS - Isolated Slag Inclusion	HB - Hollow Bead	AI - Accum. of Imperfections
IPD - Inadequate Penetration due to high/low	IC - Internal Concavity	P - Porosity	CP - Cluster Porosity	C - Crack	LC - Low Cap
IF - Incomplete Fusion	BT - Burn Through			EU - External Undercut	RS - Right of Way Side
				IU - Internal Undercut	DS - Ditch Side

Signature of Customers Rep. [Signature] Certifies Time and Materials Correct

Signature of Radiographer Tech. Thomas Willis

Assistant Tech. J. McElroy

Assistant Tech. J.O. Bryant

Assistant Tech. M. R. Ridgeway

Assistant Tech. W. Boek

Additional Tech. Or Assistant _____

Shaw Pipeline Services assumes no responsibility for losses of any kind due to interpretation. All work meets current API Standards.

Daily Radiographic Report (Double Joint Weld 7957)



SHAW PIPELINE SERVICES

A SHAWCOR COMPANY
5435 South 101st East Ave., Tulsa, OK 74146
(918) 627-8288 Fax (918) 627-0020

DAILY RADIOGRAPHIC REPORT

CUSTOMER: U.S Pipeline

PROJECT: Millennium

X-RAY	WELD BY	LOCATION	With in Code		Exposure		Number of Exposures	Pipe Size	X-Ray	Gamma Ray	DEFECT LOCATION AND REMARKS
			Yes	No	In Side	Out Side					
1-7950	1-3,5	405 x 405			X		1	30"	X		Rex 100%
2 51			/	/							
3 52			/	/							
4 53			/	/							
5 54			/	/							Rex 100%
6 55			/	/							
7 56			/	/							
8 57			/	/							Rex 100%
9 58			/	/							86-91, 95-2 IF
10 59			/	/							
11 60			/	/							
12 61			/	/							2-14 IF
13 62			/	/							
14 63			/	/							0-2, 8-10 IF
15 64			/	/							
16 65			/	/							61-66, 69-71 IF
17 66			/	/							
18 67			/	/							
19 68			/	/							
20 69			/	/							94-08 IF
21 70			/	/							4-15 IF
22 71			/	/							
23 72			/	/							
24 73			/	/							
25 74			/	/							95-5, 10-21 IF
26 75			/	/							
27 76			/	/							
28 77			/	/							65-67, 69-71 IF
29 78			/	/							
30 79			/	/							
31 80			/	/							
32 81			/	/							
33 82			/	/							
34 83			/	/							
35 84			/	/							
36 85			/	/							
37 86			/	/							
38 87			/	/							
39 88			/	/							
40 89	1-3,5	405 x 405			X		1	30"	X		

Date: 8-6-09 Customer Job No. 0809 SPS Job No. 581 Job Location Owego, NY Report No. 169 Unit No. 0 No. Men on Job 5 No. Welds Radiographed 158

Travel If Applicable: Hours _____ Miles _____ Hours Worked: _____ FROM _____ AM TO _____ PM TOTAL HOURS 12

TERMS AND ABBREVIATIONS:
 IF - Inadequate Fusion due to Cold Lap
 IP - Inadequate Penetration
 IPO - Inadequate Penetration due to high-low
 I - Incomplete Fusion
 IFD - Incomplete Fusion due to Cold Lap
 ICP - Inadequate Crown Penetration
 IC - Incomplete Circumference
 BT - Blow Through
 ESI - Elongated Slag Inclusion
 ISI - Isolated Slag Inclusion
 P - Porosity
 CP - Cluster Porosity
 HB - Hollow Bead
 C - Crack
 EU - External Undercut
 IU - Internal Undercut
 AI - Accum. of Imperfections
 LC - Low Cap.
 RS - Right of Way Side
 DS - Ditch Side

Signature of Customers Rep. Certifies Time and Materials Correct: _____
 Signature of Radiographer Tech: Thomas Willis
 Assistant Tech: J. McElroy
 Assistant Tech: J.P. Bryant
 Assistant Tech: C. Barber
 Assistant Tech: W. Roark

Shaw Pipeline Services assumes no responsibility for losses of any kind due to interpretation. All work meets current API Standards.

132869_Appendix E-Records
Columbia Gas Transmission Millennium Pipeline Leak Owego, NY
Failure Date 01/11/2011

Daily Radiographic Report (Double Joint Weld 8974)

X-RAY		WELD BY:	LOCATION	With In Code		Exposure		Number of	Pipe	X-	Gamma	DEFECT LOCATION AND REMARKS
100T				Yes	No	In Side	Out Side	Exposures	Size	Ray	Ray	
1	8961	1-3.5	429 x 429	/		X		1	30"	X		
2	62			/								
3	63			/								
4	64			/								
5	65			/								
6	66			/								
7	67			/								
8	68			/								
9	69			/								
10	70			/								
11	71			/								
12	72			/								
13	73			/								
14	74			/								Rex 100% ✓
15	75			/								
16	76			/								
17	77			/								
18	78			/								
19	79			/								
20	80			/								
21	81			/								
22	82			/								
23	83			/								
24	84			/								
25	85			/								
26	86			/								
27	87			/								
28	88			/								Rex 100% ✓
29	89			/								
30	90			/								
31	91			/								
32	92			/								
33	93			/								
34	94			/								
35	95			/								
36	96			/								Contractor repair ✓
37	97			/								
38	98			/								
39	99			/								
40	9000	1-3.5	429 x 429	/		X		1	30"	X		

Date: 8-18-05	Customer Job No: 0805	SPS Job No: 981	Job Location: Owego NY	Report No: 200	Unit No: 0	No. Men on Job: 5	No Welds Radiographed: 139
Travel #	Hours	Miles	Hours Worked	FROM	A.M. TO	PM	TOTAL HOURS
							12

TERMS AND ABBREVIATIONS:

IP - Inadequate Penetration	IFD - Incomplete Fusion due to Cold Lap	ESI - Elongated Slag Inclusion	HB - Hollow Bead	AI - Accum. of Imperfections
IPD - Inadequate Penetration due to high-low	ISP - Inadequate Cross Penetration	ISI - Isolated Slag Inclusion	C - Crack	LC - Low Cap
IF - Incomplete Fusion	IC - Internal Concavity	P - Porosity	EU - External Undercut	RS - Right of Way Side
	BT - Burr Through	CP - Cluster Porosity	IU - Internal Undercut	DS - Ditch Side

Signature of Customers Rep. Certifies Time and Materials Correct: *[Signature]*
 Signature of Radiographer Tech: Thomas L. Williams
 Assistant Tech: J. O'Elroy
 Assistant Tech: J. D. Bryant
 Assistant Tech: W. R. Dink
 Assistant Tech: D. Chamberlain

Shaw Pipeline Services assumes no responsibility for losses of any kind due to interpretation. All work meets current API Standards.

132869_Appendix E-Records
Columbia Gas Transmission Millennium Pipeline Leak Owego, NY
Failure Date 01/11/2011

Alignment Sheet For Tie In Weld "Unknown"

POINT NUMBER	STATION	OFFSET	NORTHING	EASTING	ELEVATION	DESCRIPTION	VERT. STA.
260245	3379+42	-0.636604	778553.372	1022801.48	1350.152	WLD 2BTI-253 870521 28001	3410+32
267908	3379+49	-0.372731	778551.741	1022809.11	1349.34	WLD 2B-TI-35 773814 21584	3410+40
260246	3379+50	-0.490547	778551.75	1022809.73	1349.644	WLD 2BTI-254 773814 21594	3410+40
267911	3379+89	-0.545648	778545.031	1022847.68	1342.942	WLD 3A-DJ-2016 870075 20529	3410+79
267913	3380+28	-0.365069	778537.923	1022886.47	1352.985	WLD 2B-XR-102 870076 20580	3411+20
267917	3380+66	-0.37058	778531.212	1022924.1	1326.939	WLD 3A-DJ-2037 773817 22479	3411+59
267922	3381+07	0.101764	778523.635	1022963.85	1323.483	WLD 2BTI-36 800079 20723	3411+89
267927	3381+47	0.154596	778516.482	1023003.82	1320.515	WLD 3ADJ-2085 870327 26367	3412+40
267933	3381+84	0.089712	778509.847	1023040.14	1319.635	WLD 2B-XR-109 890081 20468	3412+77
267938	3382+22	0.134973	778502.951	1023076.78	1320.04	WLD 3A-DJ-2091 773881 22903	3413+14
267941	3382+61	0.447433	778495.428	1023116.33	1320.76	WLD 2B-XR-111 890192 23775	3413+54
267946	3383+02	0.41071	778487.958	1023155.45	1320.481	WLD 3A-DJ-2078 890192 24619	3413+84
267951	3383+34	0.091441	778482.357	1023187.19	1318.65	* WLD UNKNOWN 870076 20469 *	3414+27
267957	3383+74	0.299223	778475.319	1023226.57	1318.023	WLD 3ADJ2086 870337 26573	3414+87
267960	3384+13	0.148472	778468.898	1023265.15	1317.948	WLD UNKNOWN 794200 20415	3415+06
267964	3384+54	0.408776	778461.815	1023305.19	1317.873	WLD 3A-DJ-785 890081 20338	3415+47
267968	3384+93	0.073977	778455.479	1023344.36	1317.738	WLD UNKNOWN 783952 21072	3416+86
267972	3385+32	-0.043374	778449.034	1023382.88	1317.482	WLD 3A-DJ-2090 870263 23758	3416+25
267977	3385+73	0.258144	778441.795	1023422.73	1317.982	WLD 2B-XR-120 773832 21139	3416+66
267982	3386+12	0.444109	778434.614	1023461.08	1319.823	WLD 3ADJ2083 870323 26926	3417+05
267988	3386+51	0.499359	778427.48	1023499.87	1319.482	WLD 2B-XR-121 890066 21781	3417+44
267993	3386+91	0.331494	778420.61	1023538.47	1320.714	WLD 3ADJ2092 870246 23750	3417+64
267998	3387+31	0.157865	778413.523	1023578.3	1322.875	WLD 2B-XR-123 870074 22224	3418+24
268002	3387+71	-0.036772	778406.517	1023618.01	1326.356	WLD 3ADJ-793 794211 22260	3418+65
268003	3388+03	0.011833	778401.025	1023648.85	1329.357	WLD 2B-TI-38 773838 20453	3418+86



SHAW PIPELINE SERVICES

A SHAWCOR COMPANY

5435 South 101st East Ave., Tulsa, OK 74146
 (918) 627-8288 Fax (918) 627-0020

DAILY RADIOGRAPHIC REPORT

CUSTOMER: U.S. Pipeline

PROJECT: Millenium

X-RAY	WELD BY	LOCATION	Weld In Code		Exposure		Number of Exposures	Pipe Size	X-Ray	Gamma Ray	DEFECT LOCATION AND REMARKS
			Yes	No	In Side	Out Side					
1005 1-203	1-3,5	405 x 405	/	/	X		11	30"	X		
2 04			/	/							
3 05			/	/							
4 06			/	/							
5 07			/	/							
6 08			/	/							
7 09			/	/							
8 10			/	/							
9 11			/	/							
10 12			/	/							
11 13			/	/							
12 14			/	/							04-13-16 IP
13 15			/	/							
14 16			/	/							
16 17			/	/							
18 18			/	/							
17 19			/	/							
18 20			/	/							
19 21			/	/							
20 22			/	/							
21 23			/	/							
22 24			/	/							
23 25			/	/							
24 26			/	/							
25 27			/	/							
26 28			/	/							
27 29			/	/							
28 30			/	/							
29 31			/	/							
30 32			/	/							
31 33			/	/							Didn't shoot
32 34			/	/							
33 35		405 x 405	/	/							
34 36			/	/							
35 37			/	/							
36 38			/	/							
37 39		429 x 429	/	/							
38 40			/	/							
39 41		405 x 405	/	/							30" = 73
40 42	1-3,5		/	/	X		11	30"	X		

Date: 8-1-08 Customer Job No: 0805 SPG Job No: 981 Job Location: Downing on NY Report No: 160 Unit No: 0 No. Man on Job: 5 No Welds Radiographed: 7/23

Travel If Applicable: Hours _____ Miles _____ Hours Worked: _____ FROM _____ A.M. TO _____ P.M. TOTAL HOURS: 10

TERMS AND ABBREVIATIONS:
 IP - Inadequate Penetration
 IPD - Inadequate Penetration due to high joint
 IF - Incomplete Fusion
 IFD - Incomplete Fusion due to Cold Lap
 ICP - Inadequate Cross Penetration
 IC - Internal Concavity
 BT - Burn Through
 ESI - Elongated Slag Inclusion
 ISI - Isolated Slag Inclusion
 P - Porosity
 CP - Cluster Porosity
 HB - Hollow Bead
 C - Crack
 EU - External Undercut
 IU - Internal Undercut
 AI - Accum. of Imperfections
 LC - Low Cap
 RS - Right of Way Side
 DS - Ditch Side

Signature of Customers Rep. [Signature] Certifies Time and Materials Correct
 Signature of Engineer/Inspector [Signature]
 Signature of Assistant Tech. J. McElroy
 Signature of Assistant Tech. J. O'Brien
 Signature of Assistant Tech. M. Ridgeway
 Signature of Assistant Tech. W. Boak

Shaw Pipeline Services assumes no responsibility for losses of any kind due to interpretation. All work meets current API Standards.

Additional Tech. Or Assistant



SHAW PIPELINE SERVICES

A SHAWCOR COMPANY

5435 South 101st East Ave., Tulsa, OK 74146

(918) 627-8288 Fax (918) 627-0020

DAILY RADIOGRAPHIC REPORT

CUSTOMER: U.S. Pipeline

PROJECT: Millcreek

X-RAY 1-00T	WELD BY	LOCATION	With In Code		Exposure		Number of Exposures	Pipe Size	X-Ray	Gamma Ray	DEFECT LOCATION AND REMARKS
			Yes	No	In Side	Out Side					
1-79.50	1-3.5	405 x 405			X		1	30"	X		Rex 100%
2 51			/	/							
3 52			/	/							
4 53			/	/							
5 54			/	/							Rex 100%
6 55			/	/							
7 56			/	/							
8 57			/	/							Rex 100%
9 58			/	/							86-91, 95-2 IF
10 59			/	/							
11 60			/	/							2-14 IF
12 61			/	/							0-7, 8-10 IF
13 62			/	/							
14 63			/	/							
15 64			/	/							
16 65			/	/							61-66, 69-71 IF
17 66			/	/							
18 67			/	/							
19 68			/	/							
20 69			/	/							94-08 IF
21 70			/	/							4-15 IF
22 71			/	/							
23 72			/	/							
24 73			/	/							
25 74			/	/							95-5, 10-21 IF
26 75			/	/							
27 76			/	/							
28 77			/	/							65-67, 69-71 IF
29 78			/	/							
30 79			/	/							
31 80			/	/							
32 81			/	/							
33 82			/	/							
34 83			/	/							
35 84			/	/							
36 85			/	/							
37 86			/	/							
38 87			/	/							
39 88			/	/							
40 89	1-3.5	405 x 405			X		1	30"	X		

Date: 8-6-08 Customer Job No. 0809 SPS Job No. 581 Job Location Osage, NY Report No. 169 Unit No. 0 No. Men on Job 5 No. Welds Radiographed 158

Travel If Applicable: Hours _____ Miles _____ Hours Worked: _____ FROM _____ A.M. TO _____ P.M. TOTAL HOURS 13

TERMS AND ABBREVIATIONS:
 IP - Inadequate Penetration
 IPD - Inadequate Penetration due to high-low
 IF - Incomplete Fusion
 IPD - Incomplete Fusion due to Cold Lap
 ICP - Inadequate Fusion Penetration
 IC - Internal Cracks
 IT - Worm Through
 ESI - Elongated Slag Inclusion
 ISI - Isolated Slag Inclusion
 P - Porosity
 CP - Cluster Porosity
 HB - Hollow Head
 C - Crack
 EU - External Undercut
 IU - Internal Undercut
 AI - Accn. of Inspections
 LC - Low Cap.
 RS - Right of Way Side
 DS - Ditch Side

Signature of Customers Rep. Certified Time and Materials Correct: [Signature]
 Signature of Radiographer Tech: Thomas Willis
 Assistant Tech: J. McElroy
 Assistant Tech: T.D. Bryant
 Assistant Tech: C. Racher
 Assistant Tech: W. Roak



SHAW PIPELINE SERVICES

A SHAWCOR COMPANY

5435 South 101st East Ave., Tulsa, OK 74146
(918) 627-8288 Fax (918) 627-0020

DAILY RADIOGRAPHIC REPORT

CUSTOMER: U.S. Pipeline

PROJECT: Millennium

X-RAY	WELD BY	LOCATION	With In Code		Exposure		Number of Exposures	Pipe Size	X-Ray	Gamma Ray	DEFECT LOCATION AND REMARKS
			Yes	No	In Side	Out Side					
100T											
89.61	1-3.5	429 x 429	/	/	X		1	30"	X		
62			/	/							
63			/	/							
64			/	/							
65			/	/							
66			/	/							
67			/	/							
68			/	/							
69			/	/							
70			/	/							
71			/	/							
72			/	/							
73			/	/							
74			/	/							Rex 100% ✓
75			/	/							
76			/	/							
77			/	/							
78			/	/							
79			/	/							
80			/	/							
81			/	/							
82			/	/							
83			/	/							
84			/	/							
85			/	/							
86			/	/							
87			/	/							
88			/	/							Rex 100% ✓
89			/	/							
90			/	/							
91			/	/							
92			/	/							
93			/	/							
94			/	/							
95			/	/							
96			/	/							Contractor repair ✓
97			/	/							
98			/	/							
99			/	/							
9000	1-3.5	429 x 429	/	/	X		1	30"	X		

Date: 8-18-05 Customer Job No: 0805 SPS Job No: 981 Job Location: Onaga NY Report No: 200 Unit No: 0 No. Men on Job: 5 No Welds Radiographed: 139

Travel # Applicable: Hours Miles Hours Worked FROM A.M. TO P.M. TOTAL HOURS 12

TERMS AND ABBREVIATIONS:
 IP - Inadequate Penetration
 IPD - Inadequate Penetration due to high-low
 IF - Incomplete Fusion
 IFD - Incomplete Fusion due to Cold Lap
 ICP - Inadequate Cross Penetration
 IC - Internal Cavities
 BT - Burn Through
 ESI - Elongated Slag Inclusion
 ISI - Isolated Slag Inclusion
 P - Porosity
 CP - Cluster Porosity
 HB - Hollow Bead
 C - Crack
 EU - External Undercut
 IU - Internal Undercut
 AI - Accum. of Imperfections
 LC - Low Cap
 RS - Right of Way Side
 DS - Ditch Side

Signature of Customers Rep. Certifies Time and Materials Correct: [Signature]
 Signature of Radiographer Tech: Thomas D. Williams
 Assistant Tech: J. D. Elroy
 Assistant Tech: D. B. Bryant
 Assistant Tech: W. B. Bork
 Assistant Tech: D. Chamberlain

Shaw Pipeline Services assumes no responsibility for losses of any kind due to interpretation. All work meets current API Standards.

132869_Appendix G-Alignment Sheet

POINT NUMBER	STATION	OFFSET	NORTHING	EASTING	ELEVATION	DESCRIPTION	VERT. STA.
267045	3379+42	-0.636604	778553.933	1022901.40	1350.153	WLD 2BTI-253 870521 26001	3410+32
267008	3379+49	-0.372731	778551.741	1022905.14	1349.54	WLD 2B-TI-35 773814 21594	3410+40
267046	3379+50	-0.490547	778551.75	1022809.73	1349.644	WLD 2BTI-254 773814 21594	3410+40
267011	3370+69	-0.545542	778545.031	1022847.68	1342.912	WLD 3A-DJ-2016 870075 20528	3410+79
267913	3380+28	-0.365009	778537.923	1022860.47	1332.965	WLD 2B-XR-102 870076 20500	3411+20
267017	3380+66	+0.37058	778531.212	1022924.1	1326.939	WLD 3A-DJ-2037 773817 23479	3411+69
267022	3381+07	0.101764	778523.635	1022963.85	1323.483	WLD 2BTI-36 800079 20723	3411+96
267027	3381+47	0.154596	778516.482	1023003.62	1320.516	WLD 3ADJ-2085 870327 26307	3412+40
267333	3381+64	0.039712	778509.847	1023040.14	1319.635	WLD 2B-XR-109 890081 20468	3412+77
267338	3382+22	0.134973	778502.951	1023076.73	1320.04	WLD 3A-DJ-2091 773881 22903	3413+14
267041	3382+61	0.447433	778495.428	1023116.33	1320.76	WLD 2B-XR-111 800102 23775	3413+54
267046	3383+02	0.41071	778487.833	1023155.45	1320.481	WLD 3A-DJ-2078 890192 24619	3413+94
267951	3383+34	0.091441	778482.357	1023167.19	1318.66	★ WLD UNKNOWN 870076 20459	3414+27
267057	3383+74	0.299223	778475.319	1023226.57	1318.023	WLD 3ADJ2086 870337 26573	3414+67
267060	3384+13	0.148472	778468.808	1023265.15	1317.949	WLD UNKNOWN 794200 20415	3415+06
267964	3384+54	0.403775	778461.815	1023305.19	1317.873	WLD 3A-DJ-755 890081 20338	3415+47
267965	3384+93	0.073977	778455.479	1023344.36	1317.736	WLD UNKNOWN 783952 21072	3415+86
267072	3385+32	-0.043974	778449.034	1023382.83	1317.482	WLD 3A-DJ-2000 870263 23756	3416+25
267077	3385+73	0.258144	778441.795	1023422.73	1317.962	WLD 2B-XR-120 773832 21129	3410+60
267902	3386+12	0.444103	778434.814	1023461.08	1316.823	WLD 3ADJ2083 870323 26926	3417+05
267989	3386+51	0.499359	778427.40	1023499.87	1319.482	WLD 2B-XR-121 890088 21781	3417+44
267903	3386+91	0.931494	778420.61	1023538.47	1320.14	WLD 3ADJ2092 870246 23750	3417+64
267090	3387+31	0.157850	778413.523	1023576.3	1322.875	WLD 2B-XR-123 870074 22224	3418+24
268002	3387+71	-0.098772	778406.517	1023618.01	1326.356	WLD 3ADJ-793 704211 22250	3418+65
268003	3388+03	0.011633	778401.025	1023648.85	1329.357	WLD 2B-TI-38 773838 20453	3418+96