



National Transportation Safety Board
Office of Railroad, Pipeline and Hazardous Materials Investigations
Washington, D.C. 20594

Report Date: June 13, 2002

PIPELINE SYSTEM CONFIGURATION

A. Accident

Operator: El Paso Natural Gas Company
Facility: 30" diameter pipeline, line number 1103
Location: Eddy County, New Mexico near the crossing of the Pecos River
Product: Natural gas
Date: August 19, 2000
Time: 0526 MDT
Accident #: DCA00-MP009

B. Piping Configuration Group

Mr. Richard H. Flint II
National Transportation Safety Board
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C. Summary of Accident

El Paso Natural Gas Company's pipeline number 1103, a 30-inch OD natural gas transmission pipeline, ruptured near the point where the pipeline crosses the Pecos River in Eddy County, New Mexico. Immediately after the rupture, a natural gas fire started and burned for approximately 51 minutes. Twelve persons camping under a concrete bridge that supported the gas pipeline were fatally injured, and three vehicles parked near the river were destroyed.

D. Pipeline system near the accident site on August 19, 2000

Line 1000 – Pipeline number 1000, referred to as the Jal-El Paso "A" line, is a 16-inch OD natural gas transmission pipeline that was out of service and filled with nitrogen at the time of the accident. The pipeline crosses the Pecos River on a pipeline suspension bridge, which is adjacent to the concrete bridge.

Line 1001 – Pipeline number 1001, referred to as the Jal-El Paso "B" line, was a 16-inch OD natural gas transmission pipeline that was not operated by El Paso at the time of the accident. The pipeline crossed the Pecos River on the west side of the concrete bridge.

Line 1100 – Pipeline number 1100, referred to as the California "A" line, is a 26-inch OD natural gas transmission pipeline that begins at the Eunice Plant located in Lea County in the SE corner of New Mexico. The pipeline transports gas west to the California-Arizona border near Ehrenberg, Arizona. The segment of pipeline near the accident site transports gas from Eunice Plant to Pecos River Compressor Station through approximately 53 miles of pipe. The pipeline crosses the Pecos River on a suspension bridge located between the suspension bridge that supports line 1000 and the concrete bridge. Approximately 1300 feet upstream of the river crossing there was a 16-inch OD crossover (branch line with valves) to line 1103; this crossover was removed after the accident. Approximately 1700 feet upstream of the river, there was a pig receiver at block valve number 5; this receiver was removed after the accident. There is no drip in the pipeline between the pig receiver and the Pecos River Compressor Station.

Line 1101 – Pipeline number 1101, referred to as the Jal-Pecos River line, is a 16-inch OD natural gas pipeline that had been sold to another operator and was not operated by El Paso at the time of the accident.

Line 1103 -- Pipeline number 1103, referred to as the California "B" line, is a 26, 30 and 31-inch OD natural gas transmission pipeline that begins at Keystone Compressor Station in Winkler County, Texas near the SE corner of New Mexico. The pipeline transports gas west to the California-Arizona border near Ehrenberg, Arizona. The segment of pipeline in which the failure occurred is 30-inch OD and transports gas from Keystone Compressor Station to Pecos River Compressor Station through approximately 57 miles of pipe. The 26 and 31-inch OD pipe is all downstream of the Pecos River Compressor Station. The pipeline crosses the Pecos River supported on the east side of the concrete bridge, which is adjacent to the pipeline suspension bridges. The accident site is approximately one mile upstream of the Pecos River Compressor Station on the south side of the Pecos River. There was a drip in the pipeline between the pig receiver and the Pecos River. Between the pig receiver and the drip, a 16-inch OD crossover (branch line with valves) connected line 1103 to line 1100. The drip and the crossover were removed after the accident.

Line 1110 – Pipeline number 1110, referred to as the California "C" line, is a 26 and 30-inch OD natural gas transmission pipeline that begins at a connection with line 1103 approximately 9-1/2 miles downstream of Keystone Compressor Station. The pipeline transports gas west to Hueco Compressor Station in Hudspeth County, Texas and runs intermittently to the California border. The 26-inch OD pipe is all downstream of the Pecos River Compressor Station. The segment of pipeline near the accident site transports gas from Keystone Compressor Station to Pecos River Compressor Station through approximately 48 miles of pipe. The pipeline crosses the Pecos River supported on the west side of the concrete bridge (same bridge as line 1103), which is adjacent to the pipeline suspension bridge. There was a drip in the pipeline between the pig receiver and the Pecos River; this drip was removed after the accident.

Line 3191 — Pipeline number 3191 is a 16-inch OD natural gas pipeline that begins at the South Carlsbad Compressor Station in Eddy County, NM. The pipeline transports gas south through approximately 25 miles of pipe and connects to lines 1103 and 1110 upstream of the Pecos River Compressor Station. The pipeline does not cross the Pecos River near the accident site.

E. Pipeline system valve operators and spacing on August 19, 2000

Line 1100 (California "A" Line)

There are 8 block valves between Eunice Plant and Pecos River Compressor Station.

Valve ID	Automatic or Remote control	Milepost number	Spacing from upstream valve (miles)
0 (at Eunice Plant)	no	0+516	n/a
1 (pig launcher)	no	0+1165	0.1
2	no	11+404	10.9
3	no	26+45	14.9
4	no	39+5163	14.0
5 (pig receiver upstream of the accident site)	no	51+5130	12.0
6 (upstream of Pecos River Compressor Station)	no	53+797	1.4
6 ½ (inside yard of Pecos River Compressor Station)	automatic (opened by ESD system)	53+1332	0.1
6 ¾ (downstream of Pecos River Compressor Station)	no	53+1779.3	0.1

Figure 1
Line 1100 Valves

Note: mileposts for valve locations are different from drawing to drawing. These were taken from drawings 1100-0+000-1 rev. 4 and 1100.0-10.00 rev. T

Line 1103 (California "B" Line)

There are 7 block valves between Keystone Compressor station and Pecos River Compressor Station.

Valve ID	Automatic or Remote control	Milepost number	Spacing from upstream valve (miles)
0 (at Keystone Compressor Station)	no	0+661	n/a
1	no	9+2225	9.4
2 (pig launcher)	no	10+2350	1.0
3	no	29+3464	19.2
5	no	47+1363	17.6
6 (pig receiver upstream of the accident site)	no	56+2819	9.3
6 ½ (inside yard of Pecos River Compressor Station)	automatic, opened by ESD system	57+3159	1.1
6 ¾ (downstream of Pecos River Compressor Station)	no	57+3607	0.1

Figure 2
Line 1103 Valves

Note: mileposts for valve locations are different from drawing to drawing. These were taken from 1103-0-000 rev. 4, except for valves 6 ½ and 6¾, which were calculated using data on drawing 1103.0-11.10 rev. k.

Line 1110 (California "C" Line)

There are 6 block valves between the Pecos River Compressor Station and the beginning of line 1110 (at milepost 9+2200 on line 1103).

Valve ID	Automatic or Remote control	Milepost number	Spacing from upstream valve (miles)
1 (at connection with line 1103)	no	9+2181	n/a
2 (pig launcher)	no	10+2328	1.0
3	no	29+3464	19.2
5	no	47+1363	17.6
6 (pig receiver upstream of the accident) site)	no	51+6272	9.3
6 ½ (inside yard of Pecos River Compressor Station)	automatic, opened by ESD system	53+1332	1.3
6 ¾ (downstream of Pecos River Compressor Station)	no	53+1779	0.1

Figure 3
Line 1110 Valves

Note: mileposts for valve locations are different from drawing to drawing. These were taken from 1103-0-000 rev. 7 and 1110.0-11.10 rev F.

Line 3191

Near the east fence of the Pecos River Compressor Station, there were two 16-inch block valves in this pipeline that were used to isolate the pipeline from lines 1103 and 1110. These valves were not equipped with remote or automatic control.

E. Line 1103 at the accident site on August 19, 2000

On line 1103, the following pipeline features are at the accident site, starting with block valve number 6 and proceeding west (downstream) towards Pecos River Compressor Station:

- *Block valve number 6* -- located approximately 56 miles downstream of Keystone Compressor Station, this is a manually operated 30 x 24 x 30 inch 400# Walworth plug valve with one 10-inch blowoff (downstream) and one 6-inch blowoff (upstream). Inside the pipeline adjacent to the downstream face of the valve is an eight-foot long, 24-inch diameter x 30-inch diameter pressure recovery tube.

Also at this location is a receiver for the cleaning pigs launched from block valve number 2, which is located approximately 10 miles downstream of Keystone Compressor Station. (Drawings 1103-56+2818-1 rev. A, 1103-56+2818-2 rev. A, and 1103-0+000 rev. 4).

- *Crossover to Line 1100* – approximately 720 feet downstream of block valve number 6, a 16-inch OD crossover (branch line with valves) connected line 1103 to line 1100 (Drawing 1103.0-11.10 rev. K)
- *Drip assembly* – located approximately 990 feet downstream of block valve number 6, this is a liquid collection leg buried beneath the pipeline that consists of approximately 40 feet of 30-inch pipe. The leg is buried approximately 7 feet directly below the gas pipeline and slopes downward toward the dead end of the leg; a siphon drain is installed at the dead end of the leg. Gas does not flow through the storage leg. (Drawing 1103-52+1980 rev. 1).

In addition, there was a liquid storage tank at this location, consisting of a 110-barrel aboveground, steel tank installed within a concrete dike. The siphon drain in the liquid collection leg of the drip assembly emptied into this tank. The tank was fitted with piping and valves for loading the collected liquids into a truck for disposal. (Drawing 1103-52+1980 rev. 1).

- *Pecos River crossing* -- located approximately 2025 feet downstream of block valve number 6, a steel bridge with a single lane concrete-paved road spans approximately 430 feet across the Pecos River. The pipeline rests on horizontal steel support beams that cantilever off the side of the bridge girders.

G. Maximum Allowable Operating Pressure (MAOP) of line 1103 at the accident site

Line 1103 was 30-inch OD pipe manufactured by Republic Steel in 1950 in accordance with the first edition (1948) of API Standard 5LX. The specified minimum yield strength (SMYS) was 52,000 psi, and the nominal wall thickness was 0.335-inch, with sections of heavier wall pipe at locations such as crossings and block valve assemblies. The longitudinal seam weld in the pipe was a double submerged arc weld (DSAW).

At the time of the accident, the maximum allowable operating pressure (MAOP) from Keystone Compressor Station to Pecos River Compressor Station was 837 psig, which is equivalent to a stress level of 72% SMYS in the 0.335-inch wall thickness pipe.

- Milepost 0 (Keystone Compressor Station) to milepost 1.18 -- the MAOP was established at 837 psig to match the remainder of the downstream pipeline to Pecos River Compressor Station. It could have been set as high as 918 psig, based on an actual high operating pressure of 918 psig on the 97th day of 1967.

- Milepost 1.18 to Pecos River Compressor Station – the MAOP of this section was established at 837 psig based on an uprating conducted on May 2, 1970 (some records state this date as May 2, 1979). A 0.9-mile long segment of pipeline between block valves 1 and 2 was hydrostatically tested for 8 hours to 1064 psig on May 2, 1979. (Drawing 1103-0-000 rev. 4, (on which block valve 2 at milepost 10+2349.5 appears to be mislabeled as block valve 1))

H. Elevations of line 1103 line at the site of the accident

Pipeline Feature	Engineering Station number	Elevation (Top of pipe, plus 2800 feet)	Reference drawing
Block Valve #6	2481+76	97	1103.1-6 rev. 2 1103.0-11.10 rev. K
pipeline	2487+00	87.41	1103.5-15 rev. 3
pipeline	2487+80	86.84	1103.5-15 rev. 3
pipeline	2488+00	85.65	1103.5-15 rev. 3
pipeline	2488+95	82.30	1103.5-15 rev. 3
pipeline (at 16-inch crossover to line 1100)	approx. 2488+96	82.30	1103.5-15 rev. 3
pipeline	2490+00	80.30	1103.5-15 rev. 3
pipeline	2491+00	77.84	1103.5-15 rev. 3
pipeline (above the drip barrel)	2491+66	73	1103.5-15 rev. 3
pipeline	2492+75	72.43	1103.5-15 rev. 3
pipeline	2493+82	71.91	1103.1-4
south edge of crater	2494+06	70.41	1103.1-4
south edge of rupture cut out	2494+33	67.79	1103.1-4
north edge of rupture cut out	2495+13	69.26	1103.1-4
north edge of crater	2495+33	69.36	1103.1-4
pipeline	2495+56	70.45	1103.1-4
pipeline	2495+82	69.51	1103.1-4
pipeline	2496+00	67.53	1103.5-15 rev. 3
pipeline	2496+14	68.71	1103.1-4
pipeline	2496+40	68.50	1103.1-4
pipeline	2496+63	67.83	1103.1-4
pipeline	2496+90	67.21	1103.1-4
pipeline	2498+70	69.65	1103.5-15 rev. 3
pipeline	2499+50	65.94	1103.5-15 rev. 3
pipeline on bridge at Pecos River crossing	2500+10	81.16	1103.5-15 rev. 3
pipeline at centerline of concrete bridge over the Pecos River	2502+00	82.74	1103.5-15 rev. 3

Figure 4
Elevation Data for the Line 1103
from
Block Valve 6 to the Pecos River Bridge

I. Pigability of line 1103 at the time of the accident

At the time of the accident, the line could be pigged with a cleaning pig from approximately 10.5 miles west of Keystone Compressor Station to block valve number 6 at the Pecos River. (Drawing 1103-0+000 rev. 4).

Between block valve number 6 and Pecos River Compressor Station, the following features caused the pipeline to be unable to accommodate a cleaning pig or internal inspection pig:

- *block valve number 6* – this is a 30-inch plug valve with a 24-inch opening in the plug. (Drawing 1103-56+2818-2 rev. A).
- *drip* – the drip was not designed to accommodate a pig. The drip assembly consists of two sections of 30-inch OD pipe at different elevations, connected by a vertical segment of pipe (which includes a 30-inch OD x 24 inch OD x 30-inch OD tee) at one end, all in the same vertical plane. The lower section of the drip collects and stores the liquids and the upper section transports the gas downstream. (Drawing 1103-52+1980 rev. 1).

J. Liquid collection at block valve 6 on line 1103

At the time of the accident, the pipeline was designed so that liquids, including pig liquids, arriving near block valve number 6 would continue downstream through the block valve assembly. The liquids would then collect in the drip, which is approximately 990 feet downstream of the block valve. Liquids were then blown into the adjacent steel storage tank for later removal by truck. This tank was also used in conjunction with the drip on line 1110.

Before approximately 1975, liquids that remained in the pig receiver barrel were blown into a dirt pit through a 6-inch pipe (identified on drawings as a 6-5/8" bypass) off the bottom of the pig receiver near the closure. This 6-inch pipe also connected to an identical 6-inch pipe, which was used to blow down the adjacent line 1100 pig receiver into the same disposal pit. (Drawing 1103-56+2818-1 rev. A).

After 1975, the 6-inch blowdown piping to the disposal pit had been taken out of service. A concrete basin was installed below the closure at the end of the pig receiver; pigging residue was removed from the pig receiver via the closure and transferred to portable fiberglass containers for disposal. During pigging operations, the 10-inch pipe off the top of the pig receiver permitted gas to pass from the receiver back to the pipeline, and to trap sediment and liquids displaced by the pig and not removed via the closure. There are no drain lines connected to the pig receiver, as the downstream drip served to collect the pig liquids.

K. Pipeline system pigging

1. Cleaning pigs

Line 1103 was pigged to remove solids and liquids that get into the pipeline. When possible, cleaning pigs were run a minimum of twice per year. El Paso's line cleaning operation

included launching up to eight bi-directional, rubber disk-type pigs at 20-minute intervals. (Cupped type pigs were used until 1998). The pigs were received one at a time unless they come in empty (i.e. if the pigs are not moving any fluids such that more than one pig arrives at the receiver simultaneously). Based on the length of the receiver barrel, only two pigs could be caught together.

In the 3 years before the accident, line 1103 in the Jal Operating Complex was pigged on the following dates (since line 1103 begins at Keystone Compressor Station and the western limit of the Jal Operating Complex is block valve number 6 on line 1103, these records are for the segment of line 1103 from the pig launcher near block valve number 2 to the pig receiver at block valve number 6):

1997: February 13, March 13, December 3, December 4

1998: January 4, April 21, April 22

1999: January 27

2000: May 22

Except for the 1/27/99 cleaning, for which "2100 lbs solid/2 barrels oil" was reported, records for each pig run noted, "no solids/liquids reported". All results are noted as "estimated." In April and May 2001, El Paso notified both the Office of Pipeline Safety and the NTSB that the "2100 lbs" was more likely "20 lbs."

2. In-Line Inspection (ILI)

In response to a request from NTSB, El Paso provided records of previous in line inspections. One internal corrosion anomaly was discovered and repaired in line 1300.

July 1997: 70 miles of line 1300 from Corona Station to Roswell Station in New Mexico.

June 1998: 33 miles of line 1103 from Guadalupe Station to Cornudas Station in Texas

June 1998: 33 miles of line 1100 from Guadalupe Station to Cornudas Station in Texas

February 2000: 33 miles of lines 3133 and 3137 from Goldsmith Plant to Sweetie Peck in Texas.

Reference Materials

Attachments – drawings

Line 1100

1100-0+000-1 rev. 4
1100.0-10.00 rev. T

Line 1103

1103.0-11.10 rev. K
1103.1-4
1103.1-6 rev. 2
1103.5-15 rev. 3
1103-0+000 rev. 4 and rev. 7
1103-52+1980 rev. 1
1103-56+2818-1 rev. A
1103-56+2818-2 rev. A

Line 1110

1110.0-11.10 rev. F

Attachments – other

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|--------------|---|
| Attachment 1 | "Backup Data, Engineering Department, Codes and Standards, Maximum Allowable Operating Pressure Determination," Sheet 8 rev. B, dated 5/24/77 and Sheet 9 rev. B, dated 5/24/77, revised 5/2/79 |
| Attachment 2 | Original Survey notes for line 1103, page 2, dated 2/18/50 and the Bill of Material for line 1103, page 1, dated 10/25/48 |
| Attachment 3 | Thomas P. Morgan Interview, page 17, dated 4/5/01 |
| Attachment 4 | Thomas P. Morgan Interview, page 12, dated 4/5/01. |
| Attachment 5 | Letter (no date) from El Paso to Richard Lopez (item 5), and the August 24, 2000 email from D. L. McFarden to D. R. Payne |
| Attachment 6 | Chart included in the Response to Request No. 11, from El Paso to NTSB, dated October 12, 2000 |
| Attachment 7 | Letter dated May 25, 2001 from Thomas Morgan to Cliff Zimmerman. |