USDOT U.S. Department of Transportation
PHMSA Pipeline and Hazardous Materials Safety Administration
OPS Office of Pipeline Safety
Southwest Region

Investigators	Charles Onwuachi David York
Region Director	R.M. Seeley
Date of Report	12/27/2016
Subject	Failure Investigation Report – Enterprise Crude Pipeline, LLC, Cushing West Tank Farm Release

Operator, Location, & Consequences

Date of Failure	12/1/2015
Commodity Released	Crude Oil
City/County & State	Cushing, Payne County, OK
OpID & Operator Name	30829 Enterprise Crude Pipeline
Unit # & Unit Name	14464 Oklahoma 30-Inch
SMART Activity #	151766
Milepost/Location	Cushing
Type of Failure	Tank line failure due to internal corrosion
Fatalities	0
Injuries	0
Description of area impacted	On-site impact to soil and containment pond
Total Costs	$291,898

Executive Summary

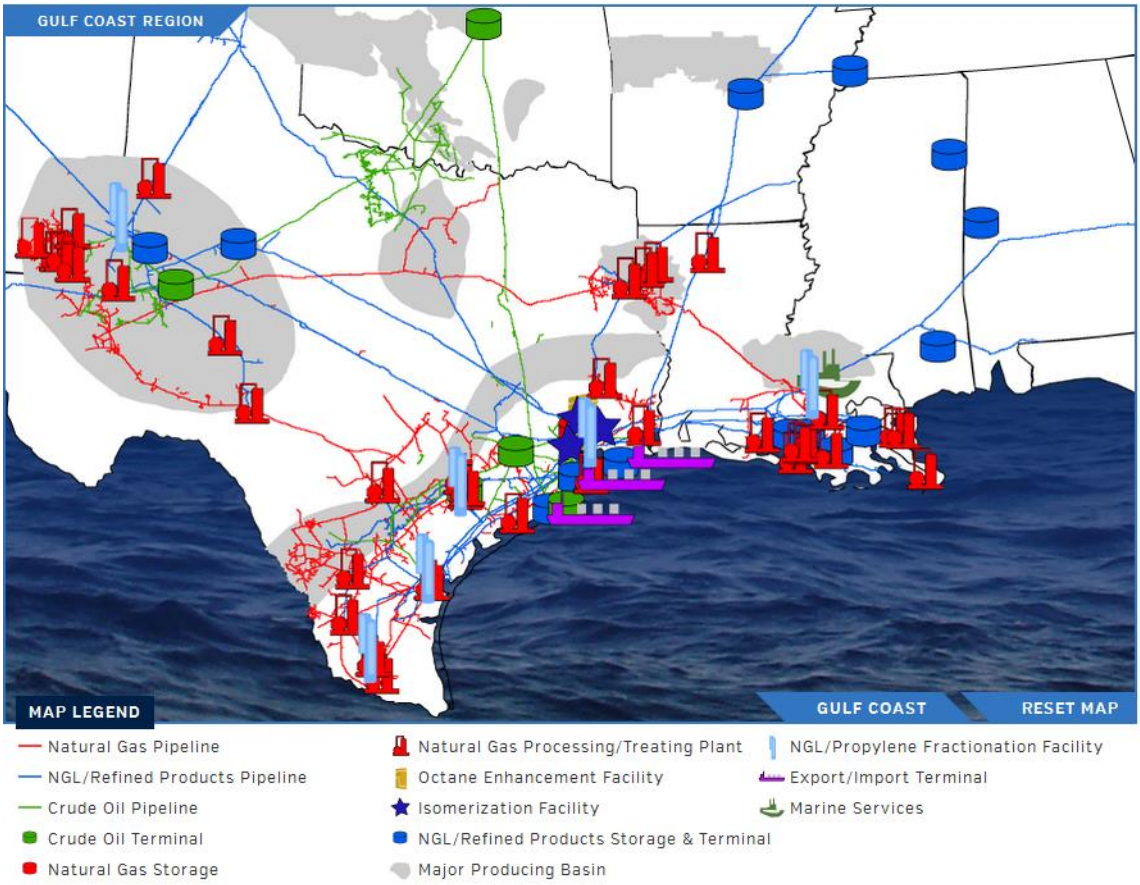
On December 1, 2015, at approximately 10:10 p.m. Central Standard Time (CST), personnel from Enterprise Crude Pipeline, LLC (Enterprise), discovered a spill at their West Cushing Tank Farm in Cushing, Oklahoma. Approximately 1,000 barrels of crude oil were released within the terminal, briefly interrupting operations as Enterprise investigated the source of the leak. Enterprise reported the release to the National Response Center at 11:30 p.m. CST.

The spill was contained within the tank farm after travelling along the surface of the ground to a retention pond on the west side of the terminal. The source of the release was determined to be a buried steel tank transfer pipeline within the station that had an outer diameter of 16 inches. Stress Engineering Services of Houston, Texas, performed a failure analysis on the damaged portion of pipe, stating in their final report that the cause of the spill was internal corrosion. The remaining portion of the line was evacuated of product and abandoned in place.

No fire or injuries occurred as a result of the failure; however, the spill resulted in approximately $291,898 in total damages.

System Details

Enterprise operates two storage tank terminals in Cushing, Oklahoma, designated as their East & West Tank Farms. The combined storage capacity of the terminals is approximately 3.3 million barrels (MMbbls),[1] inclusive of five larger external floating roof tanks that are leased to Paragon but operated by Enterprise. Currently there are fifteen storage tanks within the terminal that serve as breakout tanks to several crude oil pipelines operated by Enterprise and other entities. Product is transported into the West Terminal through pipeline systems operated by Enterprise, including the Red River Gathering System and the Basin Pipeline. Product can also be delivered to the Seaway Crude Pipeline system that connects the West Cushing Terminal to refineries on the Gulf Coast.



Source: http://www.enterpriseproducts.com/about-us/system-map

The leak was identified on an 1,160-foot section of steel pipeline with a 16-inch outer diameter that served as a fill line within the facility for Tank 41123. The pipe wall measured 0.25 inches, and was manufactured with a fusion bond external coating; however, the pipeline did not have an internal coating. The maximum operating pressure of the line was designated as 275 pounds per square inch gauge (psig), limited by the American National Standards Institute (ANSI) 150 components installed on the system. The manufacturer and specified minimum yield strength of the line segment was reportedly unknown.

The West Terminal is in the Pipeline and Hazardous Materials Safety Administration's (PHMSA) Inspection System 1970 under the name Enterprise_Crude.

[1] *Crude Oil Pipelines & Services*. Enterprise Products Partners, L.P. Retrieved August 2016. http://www.enterpriseproducts.com/operations/onshore-crude-oil-pipelines-services

Events Leading up to the Failure

On December 1, 2015, at approximately 1:00 p.m. CST, Enterprise started to move product out of Tank 41123. The three pipelines connected to Tank 41123 have outer diameters of 16, 18, and 24 inches. The transfer was scheduled for the 18-inch delivery line, progressing throughout the day and ending by midnight. During the course of this delivery process, Enterprise began a flush into Tank 41123 through the 16-inch fill line at approximately 8:28 p.m. CST. The flush lasted for roughly 30 minutes.

At 9:56 p.m. CST, a terminal operator—who was scheduled to take samples from the Manifold A area—detected the scent of crude oil and discovered oil on the ground just north of Manifold A.

Emergency Response

Upon notification from the terminal operator, operations personnel immediately initiated shutdown of all equipment within the terminal. Notification of the incident was made by telephone, first to operations and maintenance supervisors and then to response contractors and additional operations personnel. Two local spill response teams were mobilized and began arriving at the terminal at 11:30 p.m. with heavy machinery, frac tanks, and vacuum trucks. Crews continued work to identify and sequester the source of the release, isolating Tank 41123 at 11:45 p.m. through the use of manual valves.

The oil travelled approximately 1,200 feet from the leak source to an onsite containment area and retention pond. The contaminated soil was removed to an area on the northwest side of the terminal while personnel installed a hard boom across the retention area, removing the oil with surface skimmers.

The Cushing West Terminal is not located in an area determined to possibly affect a High Consequence Area as a result of an unintended release. The Terminal is included in the Facility Response Plan written to comply with Title 49 CFR 194; however, the plan was not activated in response to this spill.

PHMSA's Southwest Region responded to the site on Thursday, December 3, 2015, to initiate an investigation.

Summary of Return-to-Service

The 16-inch pipeline was not immediately returned to service following the release. Following visual examination, Enterprise installed a mechanical clamp over the damaged portion of the pipeline on December 3, 2015. The line was drained down and remained inactive, and the damaged portion of the pipe was later removed and sent to Houston, Texas, for failure analysis.

With the damaged 16-inch fill line isolated, the West Terminal restarted operations on Wednesday, December 2, 2015.

Investigation Details

PHMSA's investigation included a review of the events, the response of Enterprise personnel, Supervisory Control and Data Acquisition (SCADA) operations, and internal corrosion management within the terminal.

(b) (7)(F) [redacted]

The release was discovered following the flush performed on Tank 41123 through a third-party line. The flush operation required an attendant be onsite at the Manifold A area. As the flush was completed the manual valve to the 16-inch line at Manifold A area was closed, at which time Enterprise personnel had not detected an abnormal condition at the terminal.

At approximately 10:00 a.m. on December 2, hydro-excavation revealed the source of the spill to be the 16-inch fill line. A visual examination revealed a small hole at the 6 o'clock position on the piping, buried under approximately 3.5 feet of soil and gravel. No mechanical damage was visible, and the external coating around the defect appeared to be in good condition. Enterprise ordered a 16 x 18 PLDICO Clamp + Sleeve to facilitate the repair, which was completed on December 3, before PHMSA inspectors arrived onsite.

At the time of the accident, the pressure within the 16-inch line was estimated to be less than 10 psig. Enterprise provided records indicating the 16-inch line was hydrostatically tested in 1997 to a minimum pressure of 346 psig for 8 hours.

Product is transported to the West Terminal through pipelines owned and operated by Enterprise and Enbridge, as well as through a truck terminal located within the facility. Internal corrosion monitoring at the West Terminal is conducted primarily through weight loss coupons installed on incoming pipelines at the East Terminal: there are no monitoring points located within the West Terminal. Records show that the average corrosion rate in miles per year (MPY) over the course of three years leading up to the accident was well below what would be considered significant. Additionally, biocide treatment was started in 2012.

Metallurgical Analysis

Enterprise sent approximately 6 feet of the failed 16-inch pipe to Stress Engineering Services in Houston, Texas, for analysis. The findings are summarized here; a copy of the final report can be found in Appendix D.

In a final report dated July 12, 2016, Stress Engineering concluded that the hole, measuring 1 1/16 inches in diameter and found in the bottom of the 16-inch pipe, was the result of a carbon dioxide-driven attack. Several pits of varying size were found along the bottom of the pipe sample, around which tests registered the presence of hydrogen sulfide, although the report concluded that this did not influence the creation of the pitting. Chemical analysis on deposits within the pit adjacent to the through-wall defect revealed the presence of sand and chlorine, products likely to be entrained in the product stream.

While the year and manufacturer of the pipe were unknown, tensile and hardness tests show the pipe met the current requirements for the American Petroleum Institute (API) Grades X42, X46, and B. The analysis did not discover any manufacturing or metallurgical defects that could have contributed to the failure, and apart from the external coating missing at the defect, the fusion-bonded epoxy (FBE) coating was determined to be in good condition.

Conclusion

PHSMA concurs with the findings of the metallurgical analysis. The pit immediately adjacent to the through-wall defect exhibited signs of deposit corrosion, common in station piping where flow rates are generally lower than transmission piping and pigging is largely impracticable.

PHMSA determined the accident likely went undetected for approximately one hour, and Enterprise's response was appropriate following discovery of the spill.

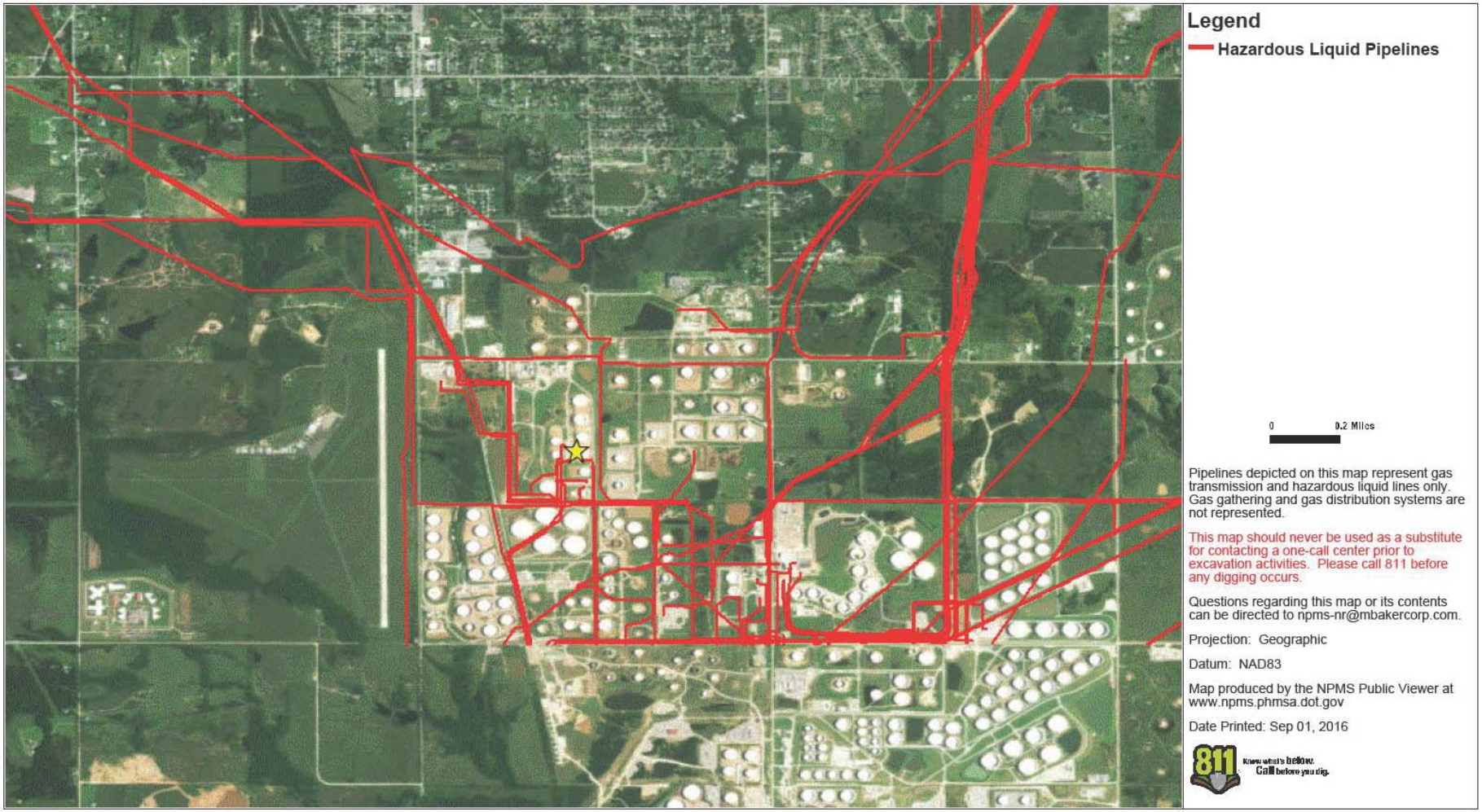
Appendices

A Map and Photographs
B NRC Report #1134731
C Operator Accident Report to PHMSA (#20150464)
D Laboratory Analysis

Appendix A – Map

Pipeline and Hazardous Materials Safety Administration

NATIONAL PIPELINE MAPPING SYSTEM



[Return to Search]

NRC Number: 1134731

Call Date: 12/02/2015 **Call Time:** 00:30:00

Caller Information

First Name:	DAVID	Last Name:	GIBBENS
Company Name:	ENTERPRISE CRUDE PIPELINE		
Address:	9420 WEST SAM HOUSTON PKWY NORTH		
City:	HOUSTON	State:	TX
Country:	USA	Zip:	77064
Phone 1:	2818872640	Phone 2:	
Organization Type:	PRIVATE	Is caller the spiller?	(•) Yes ( ) No ( ) No Response
Confidential:	( ) Yes (•) No ( ) No Response		

Discharger Information

First Name:	DAVID	Last Name:	GIBBENS
Company Name:	ENTERPRISE CRUDE PIPELINE		
Address:	9420 WEST SAM HOUSTON PKWY NORTH		
City:	HOUSTON	State:	TX
Country:	USA	Zip:	77064
Phone 1:	2818872640	Phone 2:	
Organization Type:	PRIVATE		

Spill Information

State:	OK	County:	PAYNE
Nearest City:	CUSHING	Zip Code:	

Location

740120 SOUTH 3510 ROAD

Spill Date:	12/01/2015 (mm/dd/yyyy)	Spill Time:	22:15:00 (24hh:mm:ss)
DTG Type:	<- Select DTG Type ->		
Incident Type	Storage Tanks	Reported Incident Type	STORAGE TANKS

Description

CALLER IS REPORTING A DISCHARGE OF LIGHT SOUR CRUDE FROM A CRUDE TANK DUE TO A CRACKED MANIFOLD.

Materials Involved

Material / Chris Name	Chris Code	Total Qty.	Water Qty.
OIL: CRUDE	OIL	800 BARREL(S)	

Medium Type: <- Select Medium Type ->

Additional Medium Information:

/ ONSITE FIRE RESERVOIR (SECONDARY CONTAINMENT)

Injuries:		Fatalites:	
Evacuations:	( ) Yes (•) No ( ) Unknown	No. of Evacuations:	
Damages:	( ) Yes (•) No ( ) Unknown	Damage Amount:	
Federal Agency Notified:	( ) Yes ( ) No (•) Unknown	State Agency Notified:	(•) Yes ( ) No ( ) Unknown
Other Agency Notified:	(•) Yes ( ) No (•) Unknown		

Remedial Actions

IN THE PROCESS GETTING A PLANNED TOGETHER FOR CLEAN UP.

Additional Info

CALLER STATED THAT THE MATERIAL DISCHARGED INTO AN ONSITE PIT WITH WATER IN IT THAT IS USED TO PUT OUT FIRES.

Latitude

Degrees: Minutes: Seconds: Quadrant:

Longitude

Degrees: Minutes: Seconds: Quadrant:

Distance from City: Direction:

Section: Township:

Range: Milepost:

Rescinded **Comments** (max 250 characters)

NOTICE: This report is required by 49 CFR Part 195. Failure to report can result in a civil penalty not to exceed $100,000 for each violation for each day that such violation persists except that the maximum civil penalty shall not exceed $1,000,000 as provided in 49 USC 60122.	OMB NO: 2137-0047 EXPIRATION DATE: 12/31/2016
U.S Department of Transportation Pipeline and Hazardous Materials Safety Administration	**Original Report Date:** 12/16/2015 **No.** 20150464 - 21420 (DOT Use Only)

ACCIDENT REPORT - HAZARDOUS LIQUID PIPELINE SYSTEMS

A federal agency may not conduct or sponsor, and a person is not required to respond to, nor shall a person be subject to a penalty for failure to comply with a collection of information subject to the requirements of the Paperwork Reduction Act unless that collection of information displays a current valid OMB Control Number. The OMB Control Number for this information collection is 2137-0047. All responses to the collection of information are mandatory. Send comments regarding this burden or any other aspect of this collection of information, including suggestions for reducing the burden to: Information Collection Clearance Officer, PHMSA, Office of Pipeline Safety (PHP-30) 1200 New Jersey Avenue, SE, Washington, D.C. 20590.

INSTRUCTIONS

Important: *Please read the separate instructions for completing this form before you begin. They clarify the information requested and provide specific examples. If you do not have a copy of the instructions, you can obtain one from the PHMSA Pipeline Safety Community Web Page at http://www.phmsa.dot.gov/pipeline/library/forms.*

PART A - KEY REPORT INFORMATION

Report Type: *(select all that apply)*	**Original:**	**Supplemental:**	**Final:**
		Yes	**Yes**

Last Revision Date:	06/06/2016
1. Operator's OPS-issued Operator Identification Number (OPID):	30829
2. Name of Operator	ENTERPRISE CRUDE PIPELINE LLC
3. Address of Operator:	
3a. Street Address	1100 Louisiana Street
3b. City	Houston
3c. State	Texas
3d. Zip Code	77002
4. Local time *(24-hr clock)* and date of the Accident:	12/01/2015 22:10
5. Location of Accident:	
Latitude:	35.95201
Longitude:	-96.759592
6. National Response Center Report Number (if applicable):	1134731
7. Local time *(24-hr clock)* and date of initial telephonic report to the National Response Center (if applicable):	12/01/2015 22:35
8. Commodity released: *(select only one, based on predominant volume released)*	Crude Oil
- Specify Commodity Subtype:	
- If "Other" Subtype, Describe:	
- If Biofuel/Alternative Fuel and Commodity Subtype is Ethanol Blend, then % Ethanol Blend:	
- If Biofuel/Alternative Fuel and Commodity Subtype is Biodiesel, then Biodiesel Blend e.g. B2, B20, B100	
9. Estimated volume of commodity released unintentionally (Barrels):	1,000.00
10. Estimated volume of intentional and/or controlled release/blowdown (Barrels):	
11. Estimated volume of commodity recovered (Barrels):	1,000.00
12. Were there fatalities?	No
- If Yes, specify the number in each category:	
12a. Operator employees	
12b. Contractor employees working for the Operator	
12c. Non-Operator emergency responders	
12d. Workers working on the right-of-way, but NOT associated with this Operator	
12e. General public	
12f. Total fatalities (sum of above)	
13. Were there injuries requiring inpatient hospitalization?	No
- If Yes, specify the number in each category:	
13a. Operator employees	
13b. Contractor employees working for the Operator	
13c. Non-Operator emergency responders	
13d. Workers working on the right-of-way, but NOT associated with this Operator	
13e. General public	

13f. Total injuries (sum of above)	
14. Was the pipeline/facility shut down due to the Accident?	Yes
- If No, Explain:	
- If Yes, complete Questions 14a and 14b: *(use local time, 24-hr clock)*	
14a. Local time and date of shutdown:	12/01/2015 22:10
14b. Local time pipeline/facility restarted:	12/02/2015 13:00
- Still shut down? (* Supplemental Report Required)	
15. Did the commodity ignite?	No
16. Did the commodity explode?	No
17. Number of general public evacuated:	0
18. Time sequence *(use local time, 24-hour clock)*:	
18a. Local time Operator identified Accident - effective 7- 2014 changed to "Local time Operator identified failure":	12/01/2015 22:10
18b. Local time Operator resources arrived on site:	12/01/2015 22:10
PART B - ADDITIONAL LOCATION INFORMATION	
1. Was the origin of the Accident onshore?	Yes
If Yes, Complete Questions (2-12)	
If No, Complete Questions (13-15)	
- If Onshore:	
2. State:	Oklahoma
3. Zip Code:	74023
4. City	Cushing
5. County or Parish	Payne
6. Operator-designated location:	Milepost/Valve Station
Specify:	West Terminal
7. Pipeline/Facility name:	Cushing West Terminal
8. Segment name/ID:	Tank 23 flush line
9. Was Accident on Federal land, other than the Outer Continental Shelf (OCS)?	No
10. Location of Accident:	Totally contained on Operator-controlled property
11. Area of Accident (as found):	Underground
Specify:	Under soil
- If Other, Describe:	
Depth-of-Cover (in):	36
12. Did Accident occur in a crossing?	No
- If Yes, specify type below:	
- If Bridge crossing –	
Cased/ Uncased:	
- If Railroad crossing –	
Cased/ Uncased/ Bored/drilled	
- If Road crossing –	
Cased/ Uncased/ Bored/drilled	
- If Water crossing –	
Cased/ Uncased	
- Name of body of water, if commonly known:	
- Approx. water depth (ft) at the point of the Accident:	
- Select:	
- If Offshore:	
13. Approximate water depth (ft) at the point of the Accident:	
14. Origin of Accident:	
- In State waters - Specify:	
- State:	
- Area:	
- Block/Tract #:	
- Nearest County/Parish:	
- On the Outer Continental Shelf (OCS) - Specify:	
- Area:	
- Block #:	
15. Area of Accident:	
PART C - ADDITIONAL FACILITY INFORMATION	
1. Is the pipeline or facility:	Interstate
2. Part of system involved in Accident:	Onshore Terminal/Tank Farm Equipment and Piping
- If Onshore Breakout Tank or Storage Vessel, Including Attached Appurtenances, specify:	
3. Item involved in Accident:	Pipe
- If Pipe, specify:	Pipe Body
3a. Nominal diameter of pipe (in):	16

3b. Wall thickness (in):	.250
3c. SMYS (Specified Minimum Yield Strength) of pipe (psi):	Unknown
3d. Pipe specification:	5L
3e. Pipe Seam , specify:	Longitudinal ERW - High Frequency
- If Other, Describe:	
3f. Pipe manufacturer:	Unknown
3g. Year of manufacture:	Unknown
3h. Pipeline coating type at point of Accident, specify:	Fusion Bonded Epoxy
- If Other, Describe:	
- If Weld, including heat-affected zone, specify. If Pipe Girth Weld, 3a through 3h above are required:	
- If Other, Describe:	
- If Valve, specify:	
- If Mainline, specify:	
- If Other, Describe:	
3i. Manufactured by:	
3j. Year of manufacture:	
- If Tank/Vessel, specify:	
- If Other - Describe:	
- If Other, describe:	
4. Year item involved in Accident was installed:	1993
5. Material involved in Accident:	Carbon Steel
- If Material other than Carbon Steel, specify:	
6. Type of Accident Involved:	Leak
- If Mechanical Puncture – Specify Approx. size:	
in. (axial) by	
in. (circumferential)	
- If Leak - Select Type:	Pinhole
- If Other, Describe:	
- If Rupture - Select Orientation:	
- If Other, Describe:	
Approx. size: in. (widest opening) by	
in. (length circumferentially or axially)	
- If Other – Describe:	

PART D - ADDITIONAL CONSEQUENCE INFORMATION

1. Wildlife impact:	No
1a. If Yes, specify all that apply:	
- Fish/aquatic	
- Birds	
- Terrestrial	
2. Soil contamination:	Yes
3. Long term impact assessment performed or planned:	No
4. Anticipated remediation:	Yes
4a. If Yes, specify all that apply:	
- Surface water	
- Groundwater	
- Soil	Yes
- Vegetation	
- Wildlife	
5. Water contamination:	No
5a. If Yes, specify all that apply:	
- Ocean/Seawater	
- Surface	
- Groundwater	
- Drinking water: *(Select one or both)*	
- Private Well	
- Public Water Intake	
5b. Estimated amount released in or reaching water (Barrels):	
5c. Name of body of water, if commonly known:	
6. At the location of this Accident, had the pipeline segment or facility been identified as one that "could affect" a High Consequence Area (HCA) as determined in the Operator's Integrity Management Program?	No
7. Did the released commodity reach or occur in one or more High Consequence Area (HCA)?	No
7a. If Yes, specify HCA type(s): *(Select all that apply)*	
- Commercially Navigable Waterway:	
Was this HCA identified in the "could affect" determination for this Accident site in the Operator's	

Integrity Management Program?	
- High Population Area:	
Was this HCA identified in the "could affect" determination for this Accident site in the Operator's Integrity Management Program?	
- Other Populated Area	
Was this HCA identified in the "could affect" determination for this Accident site in the Operator's Integrity Management Program?	
- Unusually Sensitive Area (USA) - Drinking Water	
Was this HCA identified in the "could affect" determination for this Accident site in the Operator's Integrity Management Program?	
- Unusually Sensitive Area (USA) - Ecological	
Was this HCA identified in the "could affect" determination for this Accident site in the Operator's Integrity Management Program?	
8. Estimated cost to Operator – effective 12-2012, changed to "Estimated Property Damage":	
8a. Estimated cost of public and non-Operator private property damage paid/reimbursed by the Operator – effective 12-2012, "paid/reimbursed by the Operator" removed	$ 0
8b. Estimated cost of commodity lost	$ 3,800
8c. Estimated cost of Operator's property damage & repairs	$ 288,098
8d. Estimated cost of Operator's emergency response	$ 0
8e. Estimated cost of Operator's environmental remediation	$ 0
8f. Estimated other costs	$ 0
Describe:	
8g. Estimated total costs (sum of above) – effective 12-2012, changed to "Total estimated property damage (sum of above)"	$ 291,898

PART E - ADDITIONAL OPERATING INFORMATION

1. Estimated pressure at the point and time of the Accident (psig):	10.00
2. Maximum Operating Pressure (MOP) at the point and time of the Accident (psig):	275.00
3. Describe the pressure on the system or facility relating to the Accident (psig):	Pressure did not exceed MOP
4. Not including pressure reductions required by PHMSA regulations (such as for repairs and pipe movement), was the system or facility relating to the Accident operating under an established pressure restriction with pressure limits below those normally allowed by the MOP?	No
- If Yes, Complete 4.a and 4.b below:	
4a. Did the pressure exceed this established pressure restriction?	
4b. Was this pressure restriction mandated by PHMSA or the State?	
5. Was "Onshore Pipeline, Including Valve Sites" OR "Offshore Pipeline, Including Riser and Riser Bend" selected in PART C, Question 2?	No
- If Yes - *(Complete 5a. – 5f below)* effective 12-2012, changed to *"(Complete 5.a – 5.e below)"*	
5a. Type of upstream valve used to initially isolate release source:	
5b. Type of downstream valve used to initially isolate release source:	
5c. Length of segment isolated between valves (ft):	
5d. Is the pipeline configured to accommodate internal inspection tools?	
- If No, Which physical features limit tool accommodation? *(select all that apply)*	
- Changes in line pipe diameter	
- Presence of unsuitable mainline valves	
- Tight or mitered pipe bends	
- Other passage restrictions (i.e. unbarred tee's, projecting instrumentation, etc.)	
- Extra thick pipe wall (applicable only for magnetic flux leakage internal inspection tools)	
- Other -	
- If Other, Describe:	
5e. For this pipeline, are there operational factors which significantly complicate the execution of an internal inspection tool run?	
- If Yes, Which operational factors complicate execution? *(select all that apply)*	

- Excessive debris or scale, wax, or other wall buildup	
- Low operating pressure(s)	
- Low flow or absence of flow	
- Incompatible commodity	
- Other -	
- If Other, Describe:	
5f. Function of pipeline system:	> 20% SMYS Regulated Trunkline/Transmission
6. Was a Supervisory Control and Data Acquisition (SCADA)-based system in place on the pipeline or facility involved in the Accident?	Yes
If Yes -	
6a. Was it operating at the time of the Accident?	Yes
6b. Was it fully functional at the time of the Accident?	Yes
6c. Did SCADA-based information (such as alarm(s), alert(s), event(s), and/or volume calculations) assist with the detection of the Accident?	No
6d. Did SCADA-based information (such as alarm(s), alert(s), event(s), and/or volume calculations) assist with the confirmation of the Accident?	No
7. Was a CPM leak detection system in place on the pipeline or facility involved in the Accident?	No
- If Yes:	
7a. Was it operating at the time of the Accident?	
7b. Was it fully functional at the time of the Accident?	
7c. Did CPM leak detection system information (such as alarm(s), alert(s), event(s), and/or volume calculations) assist with the detection of the Accident?	
7d. Did CPM leak detection system information (such as alarm(s), alert(s), event(s), and/or volume calculations) assist with the confirmation of the Accident?	
8. How was the Accident initially identified for the Operator?	Local Operating Personnel, including contractors
- If Other, Specify:	
8a. If "Controller", "Local Operating Personnel", including contractors", "Air Patrol", or "Ground Patrol by Operator or its contractor" is selected in Question 8, specify:	Operator employee
9. Was an investigation initiated into whether or not the controller(s) or control room issues were the cause of or a contributing factor to the Accident?	No, the Operator did not find that an investigation of the controller(s) actions or control room issues was necessary due to: (provide an explanation for why the Operator did not investigate)
- If No, the Operator did not find that an investigation of the controller(s) actions or control room issues was necessary due to: *(provide an explanation for why the operator did not investigate)*	Controller nor control room were a contributing factor
- If Yes, specify investigation result(s): *(select all that apply)*	
- Investigation reviewed work schedule rotations, continuous hours of service (while working for the Operator), and other factors associated with fatigue	
- Investigation did NOT review work schedule rotations, continuous hours of service (while working for the Operator), and other factors associated with fatigue	
Provide an explanation for why not:	
- Investigation identified no control room issues	
- Investigation identified no controller issues	
- Investigation identified incorrect controller action or controller error	
- Investigation identified that fatigue may have affected the controller(s) involved or impacted the involved controller(s) response	
- Investigation identified incorrect procedures	
- Investigation identified incorrect control room equipment operation	
- Investigation identified maintenance activities that affected control room operations, procedures, and/or controller response	
- Investigation identified areas other than those above:	
Describe:	

PART F - DRUG & ALCOHOL TESTING INFORMATION

1. As a result of this Accident, were any Operator employees tested under the post-accident drug and alcohol testing requirements of DOT's Drug & Alcohol Testing regulations?	No
- If Yes:	
1a. Specify how many were tested:	

1b. Specify how many failed:	
2. As a result of this Accident, were any Operator contractor employees tested under the post-accident drug and alcohol testing requirements of DOT's Drug & Alcohol Testing regulations?	No
- If Yes:	
2a. Specify how many were tested:	
2b. Specify how many failed:	

PART G – APPARENT CAUSE

Select only one box from PART G in shaded column on left representing the APPARENT Cause of the Accident, and answer the questions on the right. Describe secondary, contributing or root causes of the Accident in the narrative (PART H).

Apparent Cause:	G1 - Corrosion Failure

G1 - Corrosion Failure - only one **sub-cause** can be picked from shaded left-hand column

Corrosion Failure – Sub-Cause:	Internal Corrosion
- If External Corrosion:	
1. Results of visual examination:	
- If Other, Describe:	
2. Type of corrosion: *(select all that apply)*	
- Galvanic	
- Atmospheric	
- Stray Current	
- Microbiological	
- Selective Seam	
- Other:	
- If Other, Describe:	
3. The type(s) of corrosion selected in Question 2 is based on the following: *(select all that apply)*	
- Field examination	
- Determined by metallurgical analysis	
- Other:	
- If Other, Describe:	
4. Was the failed item buried under the ground?	
- If Yes :	
□4a. Was failed item considered to be under cathodic protection at the time of the Accident?	
If Yes - Year protection started:	
4b. Was shielding, tenting, or disbonding of coating evident at the point of the Accident?	
4c. Has one or more Cathodic Protection Survey been conducted at the point of the Accident?	
If "Yes, CP Annual Survey" – Most recent year conducted:	
If "Yes, Close Interval Survey" – Most recent year conducted:	
If "Yes, Other CP Survey" – Most recent year conducted:	
- If No:	
4d. Was the failed item externally coated or painted?	
5. Was there observable damage to the coating or paint in the vicinity of the corrosion?	
- If Internal Corrosion:	
6. Results of visual examination:	General Corrosion
- Other:	
7. Type of corrosion *(select all that apply)*: -	
- Corrosive Commodity	
- Water drop-out/Acid	
- Microbiological	
- Erosion	
- Other:	Yes
- If Other, Describe:	carbon dioxide
8. The cause(s) of corrosion selected in Question 7 is based on the following *(select all that apply)*: -	
- Field examination	
- Determined by metallurgical analysis	Yes
- Other:	
- If Other, Describe:	
9. Location of corrosion *(select all that apply)*: -	
- Low point in pipe	Yes
- Elbow	
- Other:	

- If Other, Describe:	
10. Was the commodity treated with corrosion inhibitors or biocides?	Yes
11. Was the interior coated or lined with protective coating?	No
12. Were cleaning/dewatering pigs (or other operations) routinely utilized?	Not applicable - Not mainline pipe
13. Were corrosion coupons routinely utilized?	Not applicable - Not mainline pipe
Complete the following if any Corrosion Failure sub-cause is selected AND the "Item Involved in Accident" (from PART C, Question 3) is Tank/Vessel.	
14. List the year of the most recent inspections:	
14a. API Std 653 Out-of-Service Inspection	
- No Out-of-Service Inspection completed	
14b. API Std 653 In-Service Inspection	
- No In-Service Inspection completed	
Complete the following if any Corrosion Failure sub-cause is selected AND the "Item Involved in Accident" (from PART C, Question 3) is Pipe or Weld.	
15. Has one or more internal inspection tool collected data at the point of the Accident?	No
15a. If Yes, for each tool used, select type of internal inspection tool and indicate most recent year run: -	
- Magnetic Flux Leakage Tool	
Most recent year:	
- Ultrasonic	
Most recent year:	
- Geometry	
Most recent year:	
- Caliper	
Most recent year:	
- Crack	
Most recent year:	
- Hard Spot	
Most recent year:	
- Combination Tool	
Most recent year:	
- Transverse Field/Triaxial	
Most recent year:	
- Other	
Most recent year:	
Describe:	
16. Has one or more hydrotest or other pressure test been conducted since original construction at the point of the Accident?	No
If Yes -	
Most recent year tested:	
Test pressure:	
17. Has one or more Direct Assessment been conducted on this segment?	No
- If Yes, and an investigative dig was conducted at the point of the Accident::	
Most recent year conducted:	
- If Yes, but the point of the Accident was not identified as a dig site:	
Most recent year conducted:	
18. Has one or more non-destructive examination been conducted at the point of the Accident since January 1, 2002?	No
18a. If Yes, for each examination conducted since January 1, 2002, select type of non-destructive examination and indicate most recent year the examination was conducted:	
- Radiography	
Most recent year conducted:	
- Guided Wave Ultrasonic	
Most recent year conducted:	
- Handheld Ultrasonic Tool	
Most recent year conducted:	
- Wet Magnetic Particle Test	
Most recent year conducted:	
- Dry Magnetic Particle Test	
Most recent year conducted:	
- Other	
Most recent year conducted:	
Describe:	
G2 - Natural Force Damage - only one **sub-cause** can be picked from shaded left-handed column	
Natural Force Damage – Sub-Cause:	
- If Earth Movement, NOT due to Heavy Rains/Floods:	
1. Specify:	

- If Other, Describe:	
- If Heavy Rains/Floods:	
2. Specify:	
- If Other, Describe:	
- If Lightning:	
3. Specify:	
- If Temperature:	
4. Specify:	
- If Other, Describe:	
- If Other Natural Force Damage:	
5. Describe:	
Complete the following if any Natural Force Damage sub-cause is selected.	
6. Were the natural forces causing the Accident generated in conjunction with an extreme weather event?	
6a. If Yes, specify: *(select all that apply)*	
- Hurricane	
- Tropical Storm	
- Tornado	
- Other	
- If Other, Describe:	
G3 - Excavation Damage - only one **sub-cause** can be picked from shaded left-hand column	
Excavation Damage – Sub-Cause:	
- If Previous Damage due to Excavation Activity: Complete Questions 1-5 ONLY IF the "Item Involved in Accident" (from PART C, Question 3) is Pipe or Weld.	
1. Has one or more internal inspection tool collected data at the point of the Accident?	
1a. If Yes, for each tool used, select type of internal inspection tool and indicate most recent year run: -	
- Magnetic Flux Leakage	
Most recent year conducted:	
- Ultrasonic	
Most recent year conducted:	
- Geometry	
Most recent year conducted:	
- Caliper	
Most recent year conducted:	
- Crack	
Most recent year conducted:	
- Hard Spot	
Most recent year conducted:	
- Combination Tool	
Most recent year conducted:	
- Transverse Field/Triaxial	
Most recent year conducted:	
- Other	
Most recent year conducted:	
Describe:	
2. Do you have reason to believe that the internal inspection was completed BEFORE the damage was sustained?	
3. Has one or more hydrotest or other pressure test been conducted since original construction at the point of the Accident?	
- If Yes:	
Most recent year tested:	
Test pressure (psig):	
4. Has one or more Direct Assessment been conducted on the pipeline segment?	
- If Yes, and an investigative dig was conducted at the point of the Accident:	
Most recent year conducted:	
- If Yes, but the point of the Accident was not identified as a dig site:	
Most recent year conducted:	
5. Has one or more non-destructive examination been conducted at the point of the Accident since January 1, 2002?	
5a. If Yes, for each examination, conducted since January 1, 2002, select type of non-destructive examination and indicate most recent year the examination was conducted:	
- Radiography	
Most recent year conducted:	
- Guided Wave Ultrasonic	
Most recent year conducted:	

- Handheld Ultrasonic Tool	
Most recent year conducted:	
- Wet Magnetic Particle Test	
Most recent year conducted:	
- Dry Magnetic Particle Test	
Most recent year conducted:	
- Other	
Most recent year conducted:	
Describe:	
Complete the following if Excavation Damage by Third Party is selected as the sub-cause.	
6. Did the operator get prior notification of the excavation activity?	
6a. If Yes, Notification received from: *(select all that apply)* -	
- One-Call System	
- Excavator	
- Contractor	
- Landowner	
Complete the following mandatory CGA-DIRT Program questions if any Excavation Damage sub-cause is selected.	
7. Do you want PHMSA to upload the following information to CGA-DIRT (www.cga-dirt.com)?	
8. Right-of-Way where event occurred: *(select all that apply)* -	
- Public	
- If "Public", Specify:	
- Private	
- If "Private", Specify:	
- Pipeline Property/Easement	
- Power/Transmission Line	
- Railroad	
- Dedicated Public Utility Easement	
- Federal Land	
- Data not collected	
- Unknown/Other	
9. Type of excavator:	
10. Type of excavation equipment:	
11. Type of work performed:	
12. Was the One-Call Center notified?	
12a. If Yes, specify ticket number:	
12b. If this is a State where more than a single One-Call Center exists, list the name of the One-Call Center notified:	
13. Type of Locator:	
14. Were facility locate marks visible in the area of excavation?	
15. Were facilities marked correctly?	
16. Did the damage cause an interruption in service?	
16a. If Yes, specify duration of the interruption (hours)	
17. Description of the CGA-DIRT Root Cause *(select only the one predominant first level CGA-DIRT Root Cause and then, where available as a choice, the one predominant second level CGA-DIRT Root Cause as well):*	
Root Cause:	
- If One-Call Notification Practices Not Sufficient, specify:	
- If Locating Practices Not Sufficient, specify:	
- If Excavation Practices Not Sufficient, specify:	
- If Other/None of the Above, explain:	
G4 - Other Outside Force Damage - *only one **sub-cause** can be selected from the shaded left-hand column*	
Other Outside Force Damage – Sub-Cause:	
- If Damage by Car, Truck, or Other Motorized Vehicle/Equipment NOT Engaged in Excavation:	
1. Vehicle/Equipment operated by:	
- If Damage by Boats, Barges, Drilling Rigs, or Other Maritime Equipment or Vessels Set Adrift or Which Have Otherwise Lost Their Mooring:	
2. Select one or more of the following IF an extreme weather event was a factor:	
- Hurricane	
- Tropical Storm	
- Tornado	
- Heavy Rains/Flood	
- Other	
- If Other, Describe:	
- If Previous Mechanical Damage NOT Related to Excavation: Complete Questions 3-7 ONLY IF the "Item Involved in Accident" (from PART C, Question 3) is Pipe or Weld.	
3. Has one or more internal inspection tool collected data at the point of	

the Accident?	
3a. If Yes, for each tool used, select type of internal inspection tool and indicate most recent year run:	
- Magnetic Flux Leakage	
Most recent year conducted:	
- Ultrasonic	
Most recent year conducted:	
- Geometry	
Most recent year conducted:	
- Caliper	
Most recent year conducted:	
- Crack	
Most recent year conducted:	
- Hard Spot	
Most recent year conducted:	
- Combination Tool	
Most recent year conducted:	
- Transverse Field/Triaxial	
Most recent year conducted:	
- Other	
Most recent year conducted:	
Describe:	
4. Do you have reason to believe that the internal inspection was completed BEFORE the damage was sustained?	
5. Has one or more hydrotest or other pressure test been conducted since original construction at the point of the Accident?	
- If Yes:	
Most recent year tested:	
Test pressure (psig):	
6. Has one or more Direct Assessment been conducted on the pipeline segment?	
- If Yes, and an investigative dig was conducted at the point of the Accident:	
Most recent year conducted:	
- If Yes, but the point of the Accident was not identified as a dig site:	
Most recent year conducted:	
7. Has one or more non-destructive examination been conducted at the point of the Accident since January 1, 2002?	
7a. If Yes, for each examination conducted since January 1, 2002, select type of non-destructive examination and indicate most recent year the examination was conducted:	
- Radiography	
Most recent year conducted:	
- Guided Wave Ultrasonic	
Most recent year conducted:	
- Handheld Ultrasonic Tool	
Most recent year conducted:	
- Wet Magnetic Particle Test	
Most recent year conducted:	
- Dry Magnetic Particle Test	
Most recent year conducted:	
- Other	
Most recent year conducted:	
Describe:	
- If Intentional Damage:	
8. Specify:	
- If Other, Describe:	
- If Other Outside Force Damage:	
9. Describe:	
G5 - Material Failure of Pipe or Weld - only one **sub-cause** can be selected from the shaded left-hand column	
Use this section to report material failures ONLY IF the "Item Involved in Accident" (from PART C, Question 3) is "Pipe" or "Weld."	
Material Failure of Pipe or Weld – Sub-Cause:	
1. The sub-cause shown above is based on the following: *(select all that apply)*	
- Field Examination	
- Determined by Metallurgical Analysis	
- Other Analysis	
- If "Other Analysis", Describe:	
- Sub-cause is Tentative or Suspected; Still Under Investigation (Supplemental Report required)	

- If Construction, Installation, or Fabrication-related Or If Original Manufacturing-related:	
2. List contributing factors: *(select all that apply)*	
- Fatigue or Vibration-related	
Specify:	
- If Other, Describe:	
- Mechanical Stress:	
- Other	
- If Other, Describe:	
- If Environmental Cracking-related:	
3. Specify:	
- If Other - Describe:	
Complete the following if any Material Failure of Pipe or Weld sub-cause is selected.	
4. Additional factors: (*select all that apply*):	
- Dent	
- Gouge	
- Pipe Bend	
- Arc Burn	
- Crack	
- Lack of Fusion	
- Lamination	
- Buckle	
- Wrinkle	
- Misalignment	
- Burnt Steel	
- Other:	
- If Other, Describe:	
5. Has one or more internal inspection tool collected data at the point of the Accident?	
5a. If Yes, for each tool used, select type of internal inspection tool and indicate most recent year run:	
- Magnetic Flux Leakage	
Most recent year run:	
- Ultrasonic	
Most recent year run:	
- Geometry	
Most recent year run:	
- Caliper	
Most recent year run:	
- Crack	
Most recent year run:	
- Hard Spot	
Most recent year run:	
- Combination Tool	
Most recent year run:	
- Transverse Field/Triaxial	
Most recent year run:	
- Other	
Most recent year run:	
Describe:	
6. Has one or more hydrotest or other pressure test been conducted since original construction at the point of the Accident?	
- If Yes:	
Most recent year tested:	
Test pressure (psig):	
7. Has one or more Direct Assessment been conducted on the pipeline segment?	
- If Yes, and an investigative dig was conducted at the point of the Accident -	
Most recent year conducted:	
- If Yes, but the point of the Accident was not identified as a dig site -	
Most recent year conducted:	
8. Has one or more non-destructive examination(s) been conducted at the point of the Accident since January 1, 2002?	
8a. If Yes, for each examination conducted since January 1, 2002, select type of non-destructive examination and indicate most recent year the examination was conducted: -	
- Radiography	
Most recent year conducted:	
- Guided Wave Ultrasonic	
Most recent year conducted:	
- Handheld Ultrasonic Tool	
Most recent year conducted:	

- Wet Magnetic Particle Test	
Most recent year conducted:	
- Dry Magnetic Particle Test	
Most recent year conducted:	
- Other	
Most recent year conducted:	
Describe:	
G6 – Equipment Failure - only one **sub-cause** can be selected from the shaded left-hand column	
Equipment Failure – Sub-Cause:	
- If Malfunction of Control/Relief Equipment:	
1. Specify: *(select all that apply)* -	
- Control Valve	
- Instrumentation	
- SCADA	
- Communications	
- Block Valve	
- Check Valve	
- Relief Valve	
- Power Failure	
- Stopple/Control Fitting	
- ESD System Failure	
- Other	
- If Other – Describe:	
- If Pump or Pump-related Equipment:	
2. Specify:	
- If Other – Describe:	
- If Threaded Connection/Coupling Failure:	
3. Specify:	
- If Other – Describe:	
- If Non-threaded Connection Failure:	
4. Specify:	
- If Other – Describe:	
- If Other Equipment Failure:	
5. Describe:	
Complete the following if any Equipment Failure sub-cause is selected.	
6. Additional factors that contributed to the equipment failure: *(select all that apply)*	
- Excessive vibration	
- Overpressurization	
- No support or loss of support	
- Manufacturing defect	
- Loss of electricity	
- Improper installation	
- Mismatched items (different manufacturer for tubing and tubing fittings)	
- Dissimilar metals	
- Breakdown of soft goods due to compatibility issues with transported commodity	
- Valve vault or valve can contributed to the release	
- Alarm/status failure	
- Misalignment	
- Thermal stress	
- Other	
- If Other, Describe:	
G7 - Incorrect Operation - only one **sub-cause** can be selected from the shaded left-hand column	
Incorrect Operation – Sub-Cause:	
- If Tank, Vessel, or Sump/Separator Allowed or Caused to Overfill or Overflow	
1. Specify:	
- If Other, Describe:	
- If Other Incorrect Operation	

2. Describe:	
Complete the following if any Incorrect Operation sub-cause is selected.	
3. Was this Accident related to *(select all that apply)*: -	
- Inadequate procedure	
- No procedure established	
- Failure to follow procedure	
- Other:	
- If Other, Describe:	
4. What category type was the activity that caused the Accident?	
5. Was the task(s) that led to the Accident identified as a covered task in your Operator Qualification Program?	
5a. If Yes, were the individuals performing the task(s) qualified for the task(s)?	

G8 - Other Accident Cause - only one **sub-cause** can be selected from the shaded left-hand column

Other Accident Cause – Sub-Cause:	
- If Miscellaneous:	
1. Describe:	
- If Unknown:	
2. Specify:	

PART H - NARRATIVE DESCRIPTION OF THE ACCIDENT

On 12/1/2015 at approximately 22:10 local operating personnel discovered crude oil coming from the ground near the tank 23 flush line. All incoming and outgoing movements were shutdown until the source could be identified. Hydro-excavation was completed and verified the source to be tank 23 flush line. A clamp was installed and all movements restarted.

After metallurgical analysis was completed it was determined that the pinhole was caused by carbon dioxide attack of the pipe.

Tank 23 flush line has been abandoned. This is the final repair to close the report.

PART I - PREPARER AND AUTHORIZED SIGNATURE

Preparer's Name	Chase Andress
Preparer's Title	Pipeline Compliance Specialist
Preparer's Telephone Number	713-381-6426
Preparer's E-mail Address	candress@eprod.com
Preparer's Facsimile Number	
Authorized Signer Name	Chase Andress
Authorized Signer Title	Pipeline Compliance Specialist
Authorized Signer Telephone Number	713-381-6426
Authorized Signer Email	candress@eprod.com
Date	06/06/2016

Appendix D

Laboratory Analysis

This document is on file at PHMSA