

UNITED STATES DEPARTMENT OF THE INTERIOR  
BUREAU OF SAFETY AND ENVIRONMENTAL ENFORCEMENT  
GULF OF MEXICO REGION

ACCIDENT INVESTIGATION REPORT

1. OCCURRED

DATE: 30-APR-2018 TIME: 2230 HOURS

2. OPERATOR: Murphy Exploration & Production

REPRESENTATIVE:  
TELEPHONE:

CONTRACTOR:  
REPRESENTATIVE:  
TELEPHONE:

- STRUCTURAL DAMAGE
- CRANE
- OTHER LIFTING
- DAMAGED/DISABLED SAFETY SYS.
- INCIDENT >\$25K
- H2S/15MIN./20PPM
- REQUIRED MUSTER
- SHUTDOWN FROM GAS RELEASE
- OTHER **Chemical leak in flying lead**

3. OPERATOR/CONTRACTOR REPRESENTATIVE/SUPERVISOR ON SITE AT TIME OF INCIDENT: 8. OPERATION:

4. LEASE: G10437

AREA: DC LATITUDE:  
BLOCK: 4 LONGITUDE:

5. PLATFORM:  
RIG NAME:

- PRODUCTION
- DRILLING
- WORKOVER
- COMPLETION
- HELICOPTER
- MOTOR VESSEL
- PIPELINE SEGMENT NO.
- OTHER

6. ACTIVITY:  EXPLORATION(POE)  
 DEVELOPMENT/PRODUCTION  
(DOCD/POD)

7. TYPE:

- HISTORIC INJURY
  - REQUIRED EVACUATION
  - LTA (1-3 days)
  - LTA (>3 days)
  - RW/JT (1-3 days)
  - RW/JT (>3 days)
  - Other Injury

- FATALITY
- POLLUTION
- FIRE
- EXPLOSION

- LWC  HISTORIC BLOWOUT
- UNDERGROUND
  - SURFACE
  - DEVERTER
  - SURFACE EQUIPMENT FAILURE OR PROCEDURES

COLLISION  HISTORIC  >\$25K  <=\$25K

9. CAUSE:

- EQUIPMENT FAILURE
- HUMAN ERROR
- EXTERNAL DAMAGE
- SLIP/TRIP/FALL
- WEATHER RELATED
- LEAK
- UPSET H2O TREATING
- OVERBOARD DRILLING FLUID
- OTHER \_\_\_\_\_

10. WATER DEPTH: 5822 FT.
11. DISTANCE FROM SHORE: 75 MI.
12. WIND DIRECTION:  
SPEED: M.P.H.
13. CURRENT DIRECTION:  
SPEED: M.P.H.
14. SEA STATE: FT.
15. PICTURES TAKEN:
16. STATEMENT TAKEN:

17. INVESTIGATION FINDINGS:

On April 30, 2018, Murphy reported a subsea umbilical leak coming from a chemical injection line, a Hydraulic Flying Lead (HFL), for the De Soto Canyon (DC) 4 subsea well. The Murphy owned DC 4 subsea well ties back to the Petronius Facility, Viosca Knoll (VK) 786, operated by Chevron. The chemical that was being discharged from the line was a paraffin inhibitor, Nalco EC 6004A, which contains the toxic chemical naphthalene. It was later discovered there were two leaks in total, one on the HFL located between the manifold and the Subsea Umbilical Termination Assembly (SUTA) and the second on the pressure cap of the Pipeline End Termination (PLET) where it connects to the pipeline manifold.

The leaks were undetectable both visibly at the water's surface and by detection instruments on the facility due to the water depth making it unable to determine when they began. The maximum estimated volume discharged is 900 bbls.

SEQUENCE OF EVENTS:

On April 30, 2018, Murphy was using a Remote Operated Vehicle (ROV) to perform a subsea survey for a future installation of a new PLET. While performing the survey, the ROV operator identified a plume coming from a nearby single 1/2 inch chemical injection line, a HFL.

The immediate action taken was to decrease the injection rate of paraffin inhibitor from 200 to 72 gallons per day. This was done to keep chemical pressure in the umbilical lines and prevent seawater ingress. Seawater ingress may cause hydrates to form inside the line. A different chemical or something less toxic was not used because this umbilical is about 27 miles long and a new chemical would not have reached the discharge point by the time the HFL was isolated.

The NRC was notified on May 1st at 1150 hours and assigned NRC# 12310836.

A teleconference was held May 2nd with Murphy, Chevron, BSEE New Orleans District (NOD) and the BSEE Pipeline Section. Murphy stated that the HFL was not isolated from the pipeline at the time of the ROV discovery because it was not the correct class of ROV.

A subsea intervention vessel, the M/V Ross Candies, was then dispatched and able to isolate and repair the leak on May 3, 2018 at 1750 hours.

BSEE INVESTIGATION:

During the BSEE investigation, BSEE reviewed Murphy's Root Cause Analysis (RCA) and information in response to questions from BSEE investigators. The RCA revealed that the hose assembly was rated for the appropriate collapse pressure. The system had been installed in 2015 and tested and demonstrated full pressure integrity. However, at an unknown time after May 1, 2017 (the date of the last ROV inspection), the outer sheath of the hose suffered damage due to chafing against the mounting bracket as a result of either pulsation in the line or current effects moving the hose. Once the outer jacket was compromised the external seawater hydrostatic head pressure was able to act directly on the inner pressure sheath of the hose. This head pressure was reacted by the internal head pressure of the chemical plus the positive pump pressure on the surface resulting in a higher internal pressure than external. Once the outer jacket was compromised the collapse resistance of the wire braiding was lost. Note: The hose itself is rated for a differential pressure in collapse of 3,262 psi but once the outer jacket is compromised the collapse resistance of the wire braiding is lost.

At some point the differential pressure across the inner sheath went negative (possibly due to debris in the check valve) resulting in a collapse condition on the internal pressure sheath. The collapse pressure on the pressure sheath pressed it up against the steel inner mandrel of the end fitting causing it to tear. When the line returned to normal operation the chemical leaked out of the tear, through the wire braiding, and out through the outer jacket wherever that jacket could not contain the pressure.

No sheen was sighted that was attributed to this incident. This could be due to several factors including the solubility of the chemical, water depth, rate of discharge, pressure, or size of the hole in the line.

Videos were received by BSEE, taken by the ROV, illustrating the locations of the two leaks.

BSEE found an issue with Murphy's NRC report stating that the worst case discharge for this incident was around 127 gallons. The last time Murphy looked at this equipment subsea was May 1, 2017. Murphy stated on May 15, 2018, they could not determine when the leak occurred exactly. Therefore, BSEE determined the worst case discharge should be calculated based on the leak starting May 2, 2017. The discharge range was calculated at 37,000 gallons to 1.6 million gallons. BSEE notified the Environmental Protection Agency (EPA) of these findings.

18. LIST THE PROBABLE CAUSE(S) OF ACCIDENT:

- The chemical injection lines, a Hydraulic Flying Lead (HFL) sustained breaches or breaks in two locations.

19. LIST THE CONTRIBUTING CAUSE(S) OF ACCIDENT:

- Damage sustained to the outer jacket of the chemical injection line. Once the outer jacket was damaged, the line's collapse resistance was compromised.
- Positive pressure was not maintained in the chemical injection line which resulted in a collapsed and then torn line.

20. LIST THE ADDITIONAL INFORMATION:

21. PROPERTY DAMAGED:

NATURE OF DAMAGE:

ESTIMATED AMOUNT (TOTAL):

22. RECOMMENDATIONS TO PREVENT RECURRANCE NARRATIVE:

The BSEE New Orleans District recommends for the Office of Incident Investigations to consider posting a safety alert which provides the following information regarding subsea umbilicals:

1. Update operating procedures to ensure that umbilical lines are positively pressured
2. Providing operator training to ensure the line does not get bled to zero for any

maintenance tasks

3. Add a check valve to the system topsides to ensure a positive pressure is maintained on the system

4. Add a low-pressure alarm on the chemical pump skid for any injection lines that are connected subsea with a hose

23. POSSIBLE OCS VIOLATIONS RELATED TO ACCIDENT: **NO**

24. SPECIFY VIOLATIONS DIRECTLY OR INDIRECTLY CONTRIBUTING. NARRATIVE:

25. DATE OF ONSITE INVESTIGATION:

28. ACCIDENT CLASSIFICATION:

29. ACCIDENT INVESTIGATION  
PANEL FORMED: **NO**

26. INVESTIGATION TEAM MEMBERS:

**Gerald Taylor /**

OCS REPORT:

30. DISTRICT SUPERVISOR:

**David Trocquet**

27. OPERATOR REPORT ON FILE:

APPROVED

DATE: **13-FEB-2019**