

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

ACCIDENT INVESTIGATION REPORT

For Public Release

1. OCCURRED

DATE: 07-JUN-2017 TIME: 0930 HOURS

2. OPERATOR: Shell Offshore Inc.

REPRESENTATIVE:

TELEPHONE:

CONTRACTOR: NOBLE DRILLING (U.S.) INC.

REPRESENTATIVE:

TELEPHONE:

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

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

6. OPERATION:

4. LEASE: G07493

AREA: GB LATITUDE: 27.56972222

BLOCK: 427 LONGITUDE: -92.3958333

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

5. PLATFORM:

RIG NAME: NOBLE DON TAYLOR

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

8. CAUSE:

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

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

9. WATER DEPTH: 2719 FT.

10. DISTANCE FROM SHORE: 148 MI.

11. WIND DIRECTION: NE
SPEED: 20 M.P.H.

12. CURRENT DIRECTION:
SPEED: 1 M.P.H.

13. SEA STATE: 3 FT.

14. PICTURES TAKEN:

15. STATEMENT TAKEN:

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

On 7 June 2017, the Noble Drilling Service, Inc. (Noble) Don Taylor (NDT) drill ship under contract to Shell Exploration and Production Company (Shell) reported an initial discharge of approximately 26 barrels (bbl) of 15.1 pounds per gallon (ppg) synthetic oil base mud (SOBM) during exploration operations on Well DC005 (Cardamom) at the surface location in Garden Banks (GB) Block 427. Shell notified the Bureau of Safety and Environmental Enforcement (BSEE) Lafayette District and reported the spill to the United States Coast Guard (USCG) National Response Center (NRC Report #1180500) about the initial 26-bbl spill but submitted a report revision on 8 June 2017 to the USCG NRC (NRC Report #1180527) to increase the total estimated amount of SOBM spilled to 94.2 bbl.

Chronological Order of Events:

On 6 June 2017, drilling operations ceased in order to conduct a required 14-day subsea blowout preventer (BOP) pressure test. The wellbore was circulated for 3 hours; however, Noble followed Shell's well program requirement of circulating three bottoms up prior to running casing. Shell stated in Noble's investigation report that there was no deviation in the circulating requirements, but drilling operations was not at the depth to run casing before pressure testing the subsea BOP. While tripping out of the hole in order to make up and run the test plug, a loss of 115 bbl of 15.1 ppg of SOBM was recorded. On 6 June 2017, the subsea BOP was pressure tested from 13:00 hour (hr) to 18:45 hr from the Toolpusher's panel with the yellow pod. The subsea BOP was then function tested from 18:45 hr to 19:15 hr from the Driller's Panel with the blue pod.

On 7 June 2017 at 08:25 hr, the remote operated vehicle (ROV) was deployed to inspect the marine riser and subsea BOP. At approximately 09:00 hr, ROV personnel contacted rig management and reported that SOBM had been observed leaking from an area between the upper and middle pipe rams on the subsea lower triple BOP. At approximately 14:45 hr, a 45 bbl pill was spotted at a measured depth of 2,970 feet (ft) and the ROV observed that the SOBM leak from the subsea BOP equipment had stopped. At 15:40 hr, Shell received approval from BSEE to set a 500-ft cement plug in the 11.75-inch by 11.875-inch casing.

On 8 June 2017 a 500-ft cement plug composed of 335 cubic feet of cement was set in the 11.75-inch by 11.875-inch casing; however, a SOBM loss of 249 bbl was observed indicating that the cement plug was potentially lost due to low pressure sand below the 11.75-inch liner shoe. In addition, on 8 June 2017, BSEE Lafayette District inspectors conducted a monthly rig inspection and while onsite, the BSEE inspectors gathered any available information related to the subsea BOP SOBM spill.

On 9 June 2017, BSEE issued a Preservation Order pursuant to Section 22 of the Outer Continental Shelf Lands Act (43 U.S.C. section 1348) to Shell to preserve all relevant information related to the SOBM spill that occurred on 7 June 2017. At 07:22 hr, BSEE granted Shell approval to temporarily abandon the well. At 08:30 hour on 9 June 2017, a cast iron bridge plug (CIBP) was set at a measured depth of 21,353 ft followed by a 500-ft cement plug composed of 320 cubic feet of cement that was set on top of the CIBP.

On 10 June 2017, a successful negative test was conducted on the CIBP and cement plug; therefore, the subsea BOP was unlatched at 19:35 hr for retrieval to the surface. From 10 to 12 June 2017, a BSEE incident investigation team conducted an onsite incident investigation that included witnessing the inspection of the subsea BOP when it was pulled to the surface. The BSEE investigation team gathered information that included the subsea BOP certificates of conformance, National Oilwell Varco (NOV) Product Information Bulletins (PIB) and the subsea BOP

maintenance records. NOV had released a PIB on 11 August 2015 that recommended proper hole cleaning and flushing of the subsea BOP prior to operating to avoid damage to the subsea BOP bonnet door cartridge seals.

On 11 June 2017 at 11:45 hr, the subsea BOP was retrieved to the surface and placed on a stump for inspection. The BSEE incident investigation team witnessed and documented the investigation into the cause of the subsea BOP SOBMs leak. When 250 psi of pressure was applied to the upper variable bore ram (VBR) cavity, residual SOBMs was observed leaking from the upper VBR aft door. The upper VBR aft door was opened and debris consisting of drill cuttings, cement and SOBMs had accumulated on the backside of the upper VBR ram block cavity. The BSEE investigation team visually observed a split in the aft door cartridge seal O-ring gasket and a small washed out area that intruded onto the face of the upper VBR body.

On 26 June 2017, Shell and Noble began an investigation into the SOBMs spill. They noted that the upper VBR body had washout damage, but it was repaired onboard the rig by NOV technicians. The upper VBR aft door was removed and shipped to NOV for inspection and repair.

On 25 July 2017, NOV completed their inspection of the upper VBR aft door and determined that the aft door cartridge seal failed to seal. The failure of the cartridge seal was attributed to the buildup of debris that was compressed behind the upper VBR ram block cavity. NOV designed a cartridge guard to protect the cartridge and seal from the buildup and compression of debris behind the ram block.

On 22 September 2017, Noble completed and submitted a Noble, Shell and NOV joint final investigation report to BSEE. The report stated that there was damage to the cartridge seal O-ring and washout areas on the face of the cartridge seal and on the face of the upper VBR.

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

The BSEE incident investigation team determined that the probable cause of the SOBMs spill was attributed to the failure of the upper VBR aft bonnet door cartridge seal assembly.

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

The BSEE incident investigation team identified the following factors as possible contributing causes for the SOBMs spill: 1) the buildup of debris in the upper VBR body; 2) failure to conduct proper hole cleaning and flushing of the BOP prior to operation as recommended in the NOV PIB released on 11 August 2015; and 3) inadequate communications of a known risk of loss of seal integrity as stated in the 11 August 2015 NOV PIB.

20. LIST THE ADDITIONAL INFORMATION:

21. PROPERTY DAMAGED:

The upper VBR aft bonnet door, the aft bonnet cartridge seal assembly, and the face of the upper VBR aft body was damaged during this incident.

NATURE OF DAMAGE:

The O-ring seal on the upper VBR aft bonnet door was split and there was washout damaged areas on the aft door cartridge seal face and on the face of the upper VBR.

ESTIMATED AMOUNT (TOTAL): \$36,000

22. RECOMMENDATIONS TO PREVENT RECURRENCE NARRATIVE:

The BSEE Lafayette District makes no recommendations to the Office of Incident Investigations.

23. POSSIBLE OCS VIOLATIONS RELATED TO ACCIDENT: YES

24. SPECIFY VIOLATIONS DIRECTLY OR INDIRECTLY CONTRIBUTING. NARRATIVE:

Based on the incident investigation findings; an E-100 Incident of Noncompliance (INC) was issued "After the Fact" to document that Shell Exploration and Production Company (Shell) failed to protect health, safety, property, and the environment. On 7 June 2017, the Noble Don Taylor drillship under contract to Shell had an unauthorized discharge of approximately 94.2 barrels (bbl) of 15.1 pounds per gallon (ppg) synthetic oil base mud (SOBM) into offshore waters of the Gulf of Mexico during exploration operations on Well DC005 (Cardamom) at Garden Banks Block 427. The SOBM spill was attributed a failed aft bonnet door cartridge seal on the subsea blowout preventer (BOP) upper variable bore ram (VBR).

25. DATE OF ONSITE INVESTIGATION:
11-JUN-2017
26. ONSITE TEAM MEMBERS:
Troy Naquin (Report Author) /
Ernest Carmouche (Onsite 10 to 12-
June-2017) / Jack Angelle (Onsite
10 to 12-June-2017) / Roy Kuhn
(Onsite 8-JUN-2017) / David Suire
(Onsite 8-JUN-2017) /
28. ACCIDENT INVESTIGATION
PANEL FORMED: NO
- OCS REPORT:
29. DISTRICT SUPERVISOR:
Elliott Smith

APPROVED
DATE: 25-OCT-2017