UNITED STATES DEPARTMENT OF THE INTERIOR
MINERALS MANAGEMENT SERVICE
GULF OF MEXICO REGION
ACCIDENT INVESTIGATION REPORT

1. OCCURRED

     DATE: **02-DEC-2007**   TIME: **1330**   HOURS

2. OPERATOR: **BHP Billiton Petroleum (GOM) Inc.**
      REPRESENTATIVE: **Campbell, Ron**
      TELEPHONE: **(713) 961-8421**
   CONTRACTOR: **Global Marine Drilling Co.**
      REPRESENTATIVE:
      TELEPHONE:

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

4. LEASE: **G21810**
      AREA: **GC**   LATITUDE:
      BLOCK: **652**   LONGITUDE:

5. PLATFORM:
      RIG NAME: **GSF C.R. LUIGS**

6. ACTIVITY: [X] 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
   [X] POLLUTION
   [ ] FIRE
   [ ] EXPLOSION
   LWC [ ] HISTORIC BLOWOUT
       [ ] UNDERGROUND
       [ ] SURFACE
       [ ] DEVERTER
       [ ] SURFACE EQUIPMENT FAILURE OR PROCEDURES
   COLLISION [ ] HISTORIC   [ ] >$25K   [ ] <=$25K

[ ] STRUCTURAL DAMAGE
[ ] CRANE
[ ] OTHER LIFTING DEVICE
[ ] DAMAGED/DISABLED SAFETY SYS.
[ ] INCIDENT >$25K
[ ] H2S/15MIN./20PPM
[ ] REQUIRED MUSTER
[ ] SHUTDOWN FROM GAS RELEASE
[X] OTHER **Riser Emergency Disconnect**

6. OPERATION:

   [ ] PRODUCTION
   [ ] DRILLING
   [ ] WORKOVER
   [X] COMPLETION
   [ ] HELICOPTER
   [ ] MOTOR VESSEL
   [ ] PIPELINE SEGMENT NO.
   [ ] OTHER

8. CAUSE:

   [X] EQUIPMENT FAILURE
   [X] HUMAN ERROR
   [ ] EXTERNAL DAMAGE
   [ ] SLIP/TRIP/FALL
   [ ] WEATHER RELATED
   [ ] LEAK
   [ ] UPSET H2O TREATING
   [ ] OVERBOARD DRILLING FLUID
   [X] OTHER **Riser Emergency Disconnect**

9. WATER DEPTH: **4331** FT.

10. DISTANCE FROM SHORE: **123** MI.

11. WIND DIRECTION: **WSW**
              SPEED: **7** M.P.H.

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

13. SEA STATE: **2** FT.

17. DESCRIBE IN SEQUENCE HOW ACCIDENT HAPPENED:

On December 2, 2007 at approximately 1300 hours with well completion operations in process, the Dynamic Positioning Operator (DPO) was performing a routine preventive maintenance procedure for the Dynamic Positioning (DP) system when the riser Emergency Disconnect Sequence (EDS) was activated. The disconnect was below the Lower Marine Riser Package (LMRP) where it connects to the BOP stack on top of the wellhead and resulted in the discharge of approximately 550 barrels of Sodium Bromide brine into GOM waters.

For this procedure, DP functional control was transferred from the primary console to the secondary console and the primary console was subsequently shut down. DP functional control using the secondary console was observed to be normal. The primary console was restarted approximately three minutes later and the data backup function was initiated by the DPO. This function transfers control data from the on-line master console, at this time the secondary console, to other DP consoles to ensure correct synchronization between all consoles. The data transfer from secondary console to primary console was completed but some of the data transferred was corrupted and the DPO did not observe this. Functional control was then transferred from the secondary console to the primary console. The DPO recognized there was a discrepancy for the rig position shown on the both the primary and secondary consoles.

In an attempt to correct the error, the DPO performed a second Initialize Backup function from the now master console, the primary console. This caused corrupt data to be transferred back to secondary console which now gave both the primary console and secondary console corrupt control data. The DPO, along with the Captain, observed the difference between the primary and secondary consoles and began trying to identify the fault. This was done by changing position references, transferring control capability between the control consoles, and enabling/disabling different position reference sensors. This resulted in another position reference sensor inadvertently becoming the master reference sensor and reset the apparent rig position such that the rig began to move further away from location when the DP system was trying to correct the rig position by moving the rig back on location. This led the DP system to chase after an erroneous position causing the rig to move outside its watch circle and exceed the riser angle limit, thus leading to the initiation of the EDS by the DP system which took approximately 58 seconds to complete. The process was initiated at the Driller Control Panel after confirmation was given by the DPO. The ROV was launched to inspect the wellhead, subsea tree, and BOP stack. The rig was moved to a safe location for the DP system to be analyzed and corrected.

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

Once it was realized that there was corrupted data, the DPO and Captain where quickly acting to try to resolve the problem when the DP system became overloaded with commands given by the DPO. The DP system is able to process a single command about every two seconds. Overloading the DP system with commands will slow down its processing capability and decrease its ability to respond to commands. The DPO was

not aware of this command processing time and possibility of overloading the system.

The DPO was familiar with operating the DP system under normal conditions, but had never before operated the DP system in an emergency situation. DP simulator training was not offered by Global Santa Fe.

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

It has been determined that the erroneous data can be transferred during routine preventive maintenance procedures. The DP system did not give an indication that the corrupted data was transferred between consoles. The program logic that gives this alarm was inadvertently omitted when the system was upgraded.

20. LIST THE ADDITIONAL INFORMATION:

The DP system is a product from the company L-3 Communications and is set up for redundancy. The system is termed the Nautical Management System (NMS) where NMS1 is the primary console system, NMS2 is the secondary console system, and NMS3 as the tertiary control system. All three consoles are on-line simultaneously in the event there is an abnormal occurrence within the system. The DP System utilizes four beacons that are installed on the sea floor, six hydrophones that are mounted externally to the bottom of the hull for the rig, four Digital Global Positioning Sensors (DGPS), and is in communication with five satellites. This version of the program has been installed for about two years on other rigs but only for about four months on the C.R. Luigs at the time of this incident. This specific problem has not been seen previously with this system. The DPO at the time had approximately three years of DP experience.

The transfer of corrupted data can be corrected by initiating a second backup function. To further prevent this from occurring again, this type of procedure should be scheduled while there is no pipe down hole or across the BOP stack, or when the formation is exposed via perforations or a open hole section. No other vessels will be allowed to remain secured to the rig during this procedure and the ROV is to be on the rig deck. Also, functional control is not transferred between consoles after a reboot of the DP system until after a careful review of the data verifies that the rebooted computer is accurate.

The previous DP system was to be rebooted every two weeks as per the manufacturer's recommendation. L-3 Communications confirmed that this new DP system was not required to be rebooted and that preventative reboots should only be performed when the LMRP is unlatched from the well. The DP system will also have the program logic put in place to give an alarm for corrupted data transfer between consoles. A one hour monitoring and system testing program prior to switching between control consoles will be put in place.

The procedure steps for performing this type of routine maintenance operation will be revised to include the time required between issuing commands so the system may stabilize. The revised procedure will also give specific parameters to monitor in order to confirm that good data transfer had in fact occurred.

A simulator program for training DPO's in drift-off and drive-off scenarios will be implemented.

The operating manual for the DP system will be revised to reflect these modifications as well as sea trials performed to ensure that the system has the expected functional

capabilities.

21. PROPERTY DAMAGED: NATURE OF DAMAGE:

   None.   **None.**

   ESTIMATED AMOUNT (TOTAL):   **$**

22. RECOMMENDATIONS TO PREVENT RECURRANCE NARRATIVE:

   The Houma District has no recommendations at this time due to the unique nature of this event.

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

24. SPECIFY VIOLATIONS DIRECTLY OR INDIRECTLY CONTRIBUTING. NARRATIVE:

25. DATE OF ONSITE INVESTIGATION:

26. ONSITE TEAM MEMBERS: 29. ACCIDENT INVESTIGATION
                                          PANEL FORMED: **NO**
   Ben Coco /
                                          OCS REPORT:

                                      30. DISTRICT SUPERVISOR:

                                          DDykes for Bryan Domangue

                                          APPROVED

                                          DATE: **06-FEB-2008**

POLLUTION ATTACHMENT

1. VOLUME: GAL   **550**   BBL

                   YARDS LONG X   YARDS WIDE

               APPEARANCE:

2. TYPE OF HYDROCARBON RELEASED:

- ☐ OIL
- ☐ DIESEL
- ☐ CONDENSATE
- ☐ HYDRAULIC
- ☐ NATURAL GAS
- ☒ OTHER   **Completion fluid**

3. SOURCE OF HYDROCARBON RELEASED: **Riser LMRP disconnect discharged 550 barrels of Sodium Bromide brine.**

4. WERE SAMPLES TAKEN? **NO**

5. WAS CLEANUP EQUIPMENT ACTIVATED? **NO**

     IF SO, TYPE:

- ☐ SKIMMER
- ☐ CONTAINMENT BOOM
- ☐ ABSORPTION EQUIPMENT
- ☐ DISPERSANTS
- ☐ OTHER _____

6. ESTIMATED RECOVERY: **0** GAL   BBL

7. RESPONSE TIME: **0** HOURS

8. IS THE POLLUTION IN THE PROXIMITY OF AN ENVIRONMENTALLY SENSITIVE AREA (CLASS I)? **NO**

9. HAS REGION OIL SPILL TASK FORCE BEEN NOTIFIED? **NO**

10. CONTACTED SHORE: **NO**   IF YES, WHERE:

11. WERE ANY LIVE ANIMALS OBSERVED NEAR: **NO**

12. WERE ANY OILED OR DEAD ANIMALS OBSERVED NEAR SPILL: **NO**