



**Investigation of Blowout and Fire
Grand Isle Block 93, Well C-4ST
OCS-G 2628
August 8, 2002**

Gulf of Mexico
Off the Louisiana Coast



U.S. Department of the Interior
Minerals Management Service
Gulf of Mexico OCS Regional Office

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Jack Williams – Chair
Lynard Carter
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Investigation and Report

Authority On 8 August 2002, the jack-up rig *Ocean King* (hereinafter referred to as the “Rig”), was engaged in drilling operations for BP Exploration & Production Inc. (hereinafter referred to as “Operator”) on Grand Isle (GI) Block 93 Well C-4ST. The Rig was in place next to the GI 93 “C” platform (hereinafter referred to as the “Platform”). Drilling was being conducted with the Rig cantilevered over the Platform by using the existing slot of the C-4 well, which had been plugged and abandoned (P&A).

Normal directional drilling operations were progressing through conductor casing set at approximately 1,200’. The well had been kicked off at 2,421’ and drilling had reached 3,590’ when it was decided to make a short trip. During the short trip, as the seventh stand of drill pipe was being pulled, the well suddenly began flowing. The uncontrolled flow and pressure rapidly built up, causing the crew to close the annular diverter element, sending the gas, mud, and sand flow into the diverter. The Rig and Platform were abandoned, and shortly thereafter the diverted flow caused the end of the portside diverter line to be blown off. The flow through this line subsequently caught fire and burned for upwards of ten minutes before bridging. The flames of the diverted flow ignited combustibles on the Rig floor that burned for several hours after the main uncontrolled well flow had ceased.

The event occurred 8 August 2002 at approximately 0830 hrs. on the Operator’s Lease OCS-G 2628 Grand Isle Block 93 in the Gulf of Mexico, offshore the State of Louisiana. Pursuant to Section 208, Subsection 22 (d), (e), and (f), of the Outer Continental Shelf (OCS) Lands Act, as amended in 1978, and the Department of the Interior Regulations 30 CFR 250, the Minerals Management Service (MMS) is required to investigate and

prepare a public report of this accident. By memorandum dated 10 August 2002, the following personnel were named to the investigative panel:

Jack Williams, Chairman – Safety Management, GOM OCS Region

Steve Lucky – New Orleans District, Field Operations, GOM OCS Region

Lynard Carter – New Orleans District, Field Operations, GOM OCS Region

Procedures On 19 August 2002, representatives of the Operator met with New Orleans District personnel to review the design of the diverter and summarize the known facts about the loss of control. On the morning of 26 August 2002, personnel from the MMS panel investigating the incident visited the site of the blowout to assess the situation and interview the supervisory personnel on the Rig during the incident. On 20 September 2002, members of the Panel and New Orleans District supervisory personnel met with personnel from the Operator to review further the Operator’s findings concerning the incident.

On 11 February 2003, members of the Panel discussed the incident by phone with drilling engineering, geosciences, and supervisory personnel from the Operator further to clarify previously acquired information concerning the development of the shallow-gas hazard study. Members of the panel also discussed the methodology of shallow-gas hazard identification with the MMS personnel charged with reviewing such data.

In addition to the interviews, other information was gathered at various times from a variety of sources. This information included the following reports and statements:

- * Interviews, notes and tapes, Rig supervisory personnel, company-man, driller, OIM;
- * Daily Drilling Reports, 26 July 2002 – 27 August 2002;
- * Operator's Drilling Plan, Well No. C-4ST;
- * Operator's GI 93 Incident Investigation Report, 22 August 2002;
- * Operator's *Ocean King* fill-up chart during loss of control;
- * Operator and MMS enhanced seismic analysis, shallow-gas evaluation, pre-incident;
- * Operator 3-D shallow-gas seismic analysis, post-incident;
- * Electric Log, Induction/Gamma Ray, Mobil Oil Corp. GI 93 Well No. C-2, 19 April 1975;
- * Pictures of equipment, layout, and orientation of Rig and Platform;
- * Pictures of blowout, evacuation of Rig and Platform;
- * Design diagram of diverter system as approved;
- * Design diagram of diverter system as built;
- * Interviews and notes, Operator's geoscience and drilling engineer personnel;
- * MMS records for all wells previously drilled from Platform including logs, plans, etc.

Introduction

Background Lease OCS-G 02628 covers approximately 5,000 acres and is located in Grand Isle Block 93, Gulf of Mexico, offshore, Louisiana (*For lease location, see Attachment 1*). The lease was issued to Mobil Oil Exploration and Producing Southeast, Inc., who became the operator effective 28 March 1974. Subsequently, Vastar Offshore, Inc. purchased the right and title and assumed the role of operator after approval by the MMS on 20 January 1999. Vastar was merged with BP Exploration and Production Inc., who became the Operator when approved on 25 April 2002. The lease is owned by the Operator 100 percent.

**Brief
Description,
Blowout and
Fire**

The C-4ST well was originally intended to bottom in Lease OCS-G 4003. After the loss of control, the well was P&A'd with the bottom hole in OCS-G 2628.

On 8 August 2002, the Rig was conducting directional drilling operations on GI 93 Well C-4ST from the well's surface location on the "C" Platform of GI 93. The well had reached 3,590' MD, 3,557' TVD. Conductor casing had been set at 1,201' and cemented to surface. The well had been kicked off at 2,421' MD and the angle had been built to approximately 27 degrees.

At 0800 hrs, a short trip was initiated with the intent of pulling up into the casing, opening the hole prior to continue drilling ahead. Bottoms-up was circulated and six stands of pipe had been pulled and racked. At approximately 0825 hrs, the seventh stand was being pulled when the well began flowing at an increasing rate. By 0830 hrs, the annular diverter element was closed and the well was put into the diverter system. The

alarm was sounded to evacuate the Rig and Platform. At approximately 0900, the end of the port diverter pipe blew off. The evacuation of the Rig and Platform was completed shortly thereafter. At approximately 0905 hrs, the uncontrolled flow of gas, water, sand, and hydrocarbons caught fire. The fire from the uncontrolled flow out of the diverter then caught combustibles on the Rig floor itself on fire.

At 0915 hrs, the well apparently bridged over and the uncontrolled flow diminished and ceased. The fire began to abate, being reduced to the combustibles on the rig floor. By mid-afternoon, the fire was apparently out, and at 1630 hrs crewmembers under the direction of Wild Well Control reboarded the Rig. After an inspection, operations to secure the well commenced. These operations continued until 27 August 2002, when the well was fully P&A'd and the Rig was removed from the well. Once the Rig was removed from the wellhead, it was jacked up at a distance and repair operations commenced on 28 August. Damage repair was completed on or about 20 October 2002, at an estimated cost of approximately two million dollars.

Findings

Preliminary Activities – Preparation of the Well Plan

The GI 93 “C” platform sits in 221’ of water. The four-legged, eight-slot Platform was set in 1975 and six wells were drilled by the operator of the time, Mobil, from the Platform in 1975 and 1976. The lease was acquired by Vastar in 1998 and two additional wells were drilled late 1998-2000. Vastar merged into BP Exploration and Production Inc. and BP became Operator in 2002.

In 2002, the Operator planned additional drilling from the “C” Platform. As all slots had been used, Operator planned to P&A certain wells, reclaim the slots, and sidetrack to new bottomhole locations. The first well planned for the drilling program was the C-4ST. On 26 July 2002, one week prior to the rig moving on location to drill the C-4ST, preparation of the “well plan” was completed. Completion of the well plan was delayed because of a change in personnel on the team preparing the plan. The well plan contemplated plugging the depleted C-4 well, and reclaiming the slot to drill the new well to be designated the C-4ST.

Preliminary Activities – Preparation of the Shallow-gas Hazard Study

The preparation of the shallow-gas hazard study followed the Operator’s standard procedure in effect at that time. As there were no sparker surveys or recent shallow-gas seismic surveys available, the study relied upon old seismic data processed to enhance the shallow formation resolution. Using the old seismic, the company geophysicists were unable to identify any shallow-gas deposits that would be likely to be penetrated by the path of the new C-4ST wellbore. However, in 1975, the only well drilled from the platform that logged the shallow formations to be penetrated by the new well had shown ±15 ft of gas sand at about 2,700’ (*see Attachment 2*). This well, the C-2, had been drilled by Mobil (the operator at that time) in 1975 and the sand (hereinafter called the

“2,700’ sand”) had been recognized to have enough gas to justify taking sidewall cores over this interval, one of which showed productivity potential.

Despite the logged (and cored) sand at 2,700’, the Mobil Well C-2 had encountered no shallow-gas problems while drilling this section. Five additional wells drilled by Mobil in 1975-76 and two drilled by Vastar in late 1999–early 2000 likewise encountered no shallow-gas drilling problems from the gas sand and, as they were all drilled with mud weights from 9.5 to 10.3, it was apparent that the sand was normally pressured. It should be noted that the permits for Wells C-2-7 specified mud weights of 9.5 to 10.0 for this portion of the hole. Later, in 1998-2000, for Wells C-8 and C-9 muds weights of 10.3 were specified. None of these wells reported any significant gas detection on the mud log while this section was being drilled, and none of the well plans for the subsequent wells after Well C-2 identified the 2,700’ sand as a potential shallow-gas hazard. The only problems routinely identified in the plans for these wells were gumbo and shale balling.

The well plan for the C-4ST called for mud weights between 9.3 and 10.0. The actual mud weight during drilling of this section was 9.2. While this mud weight apparently successfully contained the gas in the 2,700’ sand during drilling, it may have failed to allow a margin to prevent influx of gas during tripping despite the heavy loading with solids.

Though the log of the C-2 well was examined by the Operator’s geoscientists in the course of preparing the well plan for the C-4ST, they were unable to connect the possibly gas-bearing 2,700’ sand to the projected path of the new well. Apparently this seismic disconnect, the lack of shallow-gas problems in the previously drilled wells, and the failure of the well plans for the eight previously drilled wells to mention the 2,700’ gas

productive sand led the geology team to conclude that no shallow-gas hazards were expected for the C-4ST. They reported this conclusion to the drilling engineers preparing the well plan without mentioning the presence of the 2,700' gas-bearing sand identified in the C-2 well. As a result, the well plan for the new well, the C-4ST, stated only that "no shallow gas hazards are expected."

The MMS normally reviews the shallow-gas hazard potential of only the initial well drilled from a common surface location. As a result, the shallow-gas hazard portion of the well plan for the C-4ST was not formally reviewed by the regulatory agency. After the blowout, the Operator shot a new shallow-gas hazard survey over the block. Analysis of the data clearly showed the extent of the 2,700' sand.

**Drilling
Activities –
Events
Through
Loss of
Control**

18 July 2002 – Diamond Offshore Drilling Rig No. 128 *Ocean King* moved on location to begin the drilling of the C-4ST well. The well plan called for plugging the old C-4 well, reclaiming the slot, placing drive pipe, and installing new conductor casing at 1,201 ft. The plan was then to kick off the deviated hole at approximately 2,421', and drill to target, deviating a total of approximately 5,500 ft. from the vertical.

6-7 August 2002 – Completed plugging Well C-4, pulled old casing, conductor pipe, and drive pipe. Installed new drive pipe, spudded well C-4ST. Drilled and drove new conductor pipe for Well C-4ST to 1,201' MD, and cemented to surface.

8 August 2002 – Normal drilling operations, drilled to 3,592'. At 3,592' MD the deviation of the well had reached 27 degrees as planned. Increasing drag indicated the need for a wiper trip. At 0800 hrs, a short trip to pull up into the conductor began. Trip operations were preceded by circulating and conditioning 1.5 times hole volume and

getting bottoms up. During drilling, the gas detector had registered only a maximum of about 21 units, no spikes. During drilling, the returns were loading up with cuttings, so the ditch and shaker were each separately being monitored by a crewmember. A camera was employed, focused on the return line into the shaker. The camera had monitor screens in the driller's shack and company-man's office. Present in the driller's shack on the rig floor were the driller, company-man, directional driller, and tool pusher (OIM). The following chronology is based on testimony and notes by drilling operations personnel.

8 August, 0800 hrs. – Begin pulling pipe, pulled stand #1, filled the hole with 2 bbls (*for fill record and time during trip, see Attachment 3*). Pulled stand #2, filled hole, took 1 bbl. Pulled stand #3, the driller observed a slight weight bobble, worked pipe some, filled with about 1 bbl. The string was pulling wet. When the driller pulled stand #4, he observed a 20,000-lb over-pull. He worked the string up and down for gumbo. Working the pipe decreased the overpull; hole fill for stand #4 was 0.25 bbls.

0815 hrs. – According to testimony, when the driller screwed into the 5th stand, he had a plunger type flow in string. The crew filled the hole, pumping below at 33 strokes per minute with 9.3 water-based mud. After fill, the driller shut the pumps down and observed no flow on line. When stand was pulled, still no flow was observed while racking stand #5.

0817 hrs. – Screwed into stand #6, rotated to try and get assumed gumbo ball off, pumped all the way to get ready to break out. Discussion ensued between the driller and the company-man on the need for a nut plug to help break up a suspected gumbo mud balling. The driller worked 6th stand, pumped on it. Some flow began showing on shaker

after racking 6th stand, but not particularly unusual in a string pulling wet. The flow was about 2-3 fingers wide and appeared to be declining. The driller, directional driller, OIM all thought it was hydrostatic.

0830 hrs. – Broke out stand #6 and screwed into the 7th stand. Suddenly, the flow became obvious on the monitoring camera, the stream growing to about two hands-wide. The OIM and directional driller started out of the driller's shack to go look at the stream. Immediately they noticed and yelled that the mud was boiling out of the rotary. Almost immediately, before the OIM and directional driller got fully out of the driller's shack, a full flow began spewing out of the mud return line. The driller immediately chained the brake down, closed the diverter, checked all valves, and saw about 500 lbs on the diverter packer. The diverter began to leak and the OIM raised the pressure to 900 psi, which contained the leakage. The flow began to shake the rig and a stream of mud started to shoot 30' out of both diverter lines. The diverter system was set up so that initially both lines are automatically open, after which one, but only one, could be closed to direct flow into whichever diverter line was desired. At this time, the flow was apparently directed into the portside diverter partly because the starboard side line braces were beginning to deform from the pressure. Pumps were brought up to an estimated 40 strokes/min. amid increasingly violent shaking of the Rig. The derrickman saw the mud flow and boil, and rapidly abandoned his position, evacuating down the ladder with aid of an assist belt. All hands immediately abandoned the Rig floor to the sound of the alarm. The diverter was observed to be twisting and bending on the portside, which was taking most or all of the flow from the well. At some point, the starboard diverter may have been re-opened to try to relieve the pressure of the flow on the portside.

0840 hrs. – The crew collected at the abandon stations. The company-man called the Platform and informed them that the Rig was being evacuated. The production

crew decided to ESD the Platform and abandon from the Platform's plus-ten deck onto the field boat. The OIM asked the driller to switch pumps to seawater. The driller, derrickman and motorman went back below deck and swapped the pumps over to pumping seawater, an operation that took about 40 seconds. The driller then checked through the living quarters to confirm complete evacuation. The Company-man tried to phone several superintendent and supervisory personnel without success. The diverted flow from the well was now rocking the rig as the company-man gave up the effort to establish phone contact with supervisory personnel. The OIM contacted and briefed the Rig area manager on the situation until the company-man re-entered the office and suggested they quit trying to contact supervisors, at which time all went to abandon stations. At the abandon stations, the roster was checked but there was some uncertainty because of the confusion generated by crew change earlier in the morning and a discrepancy in the onboard roster, which was being updated to reflect the crew change. Consensus review and radio contact with the two capsules already launched indicated that everyone was believed accounted for (*for photographic review of the blowout progress, see Attachments 4-6*).

0900 hrs. – Two capsules had been launched when the sound dynamics of the flow from the diverter changed. This was likely caused by the end of the portside diverter blowing off. The uncontrolled flow now began to blow directly off the portside with increasing violence. Launch of the remaining capsules was completed and the four escape capsules, with the entire 47 man crew from the Rig, steered toward Diamond Drilling rig *Ocean Star*, which was stacked about 3 miles away. The production field boat completed evacuation of the eight-man production crew and proceeded to GI-94B platform.

0905 hrs. - The Rig escape capsules had progressed a short distance when the flow out of the portside of diverter ignited, followed by ignition of combustibles on the rig itself.

0915 hrs. – Flow from diverter declined and finally ceased, causing the fire to abate, apparently limited thereafter to combustibles on the Rig.

1030 hrs. – All capsules were lifted onto deck of the *Ocean Star*. Supervisors gathered everyone on the heli-deck, double-checked roster until they were satisfied all were safe. The flow from the diverter had bridged after about 10 minutes, though combustibles on the Rig itself continued to burn.

**Drilling
Activities –
Events to
Regain
Control**

1650 hrs. – Fire on the Rig burned out, though electrical arcing caused by burned cables was occurring. Under the supervision of Wild Well Control, seven people boarded the Rig and shut down all power, turned water on arcing cables, and departed after one hour.

9 – 16 August 2002 – Crew conducted sundry daily efforts to kill the well, assess damage, clear debris, isolate pipelines, production systems, and repair essential systems.

17 – 27 August 2002 - Completed installation of the freeze plug to secure the well, repaired the diverter and other essential equipment, rigged up, ran, and analyzed well with logs, etc. Discovered two thick “formation plugs” thought to be caused by bridging; no evidence of cross flow or flow to surface; therefore completed P&A operations. Rig moved east of platform for repairs.

**Summary
of Inspection
of Rig
Damage**

On 26 August 2002, three members of the MMS panel inspected the Rig and the significant damage. While the structural damage to the Rig itself was not major, significant repairs were required to the wiring, paint, lighting fixtures, beneath the floor, and on the superstructure. The diverter was heavily damaged, with end of the portside diverter pipe being blown off in the course of the uncontrolled flow. Additionally, the main diverter line teeing into the port and starboard diversion lines was heavily sand cut. Both the starboard and port diverter lines themselves exhibited some sand erosion and damage, and most of the bracing was bent and degraded by flexing (*see Attachments 7 – 9*).

It was apparent from the inspection that after the end of the portside diverter line blew off; the uncontrolled flow was directed overboard from a point directly beneath the rig floor rather than from a point outside of the vessel's structure. As a result, the uncontrolled flow apparently impacted against equipment stored on the catwalk and other infrastructure utilizing the area. This included welding equipment and electric cable bundles that were routed in close proximity to the diverter. A number of acetylene tanks were among the stored equipment that received the force of the discharge after the end of the portside diverter blew off. When the flow ignited, several of these tanks exploded and apparently added to the intensity of the fire (*see Attachment 10*).

When the uncontrolled flow ignited, the flames also apparently immediately ignited the combustibles on the portside of the Rig floor above (*see Attachments 11, 12, 13*). The paint, some stored lubrication products, electrical wiring, etc., continued to burn for some time after the blowout had bridged and the uncontrolled flow ceased.

Separate from the loss of the end of the portside diverter line, sand in the blowout stream cut out portions of the main, 16-inch diverter piping at the exit of the diverter housing next to the wellhead (*see Attachment 14*). This pipe was routed for about ten feet at an incline of about 12.5 degrees from horizontal from the housing to the tee into the port and starboard lines. The pipe was sand cut on the lower wall, where the pipe took the initial impact from the flow because of the inclination. This cut allowed the gas to migrate directly upward from this point. This gas apparently ignited on the rig floor above the rotary table almost simultaneously with the ignition of the stream exiting the portside diverter line. This fire, in turn, apparently ignited the combustibles in that portion of the Rig separately from the portside ignition. Significant damage was sustained in this area, especially to the “hawkjaw” of the iron roughneck, though the machinery was ultimately salvaged and repaired. Additionally, burn damage to components in the drill floor electrical room and various hoses and other connections was significant. Some additional damage was suffered as a result of saltwater from the fire boats.

The damage suffered as a result of the blowout and subsequent fires is estimated to have required approximately two million dollars in repair cost.

**Diverter
System
Design,
Construction,
Operation**

The diverter is supposed to allow uncontrolled shallow-gas flow to be channeled and directed overboard to minimize risk to life and damage to the Rig. When shallow-gas pockets are encountered while drilling at depths that preclude containing the gas by use of a blowout preventer stack (BOP) (because of the risk of breaching), a diverter is the primary means of reducing the material and human risk. A diverter system is required by CFR regulation 250.409 to “...divert gases, water, mud, and other materials away from the facilities and personnel.”

It is often presumed that any diverter system cannot indefinitely channel a significant uncontrolled flow because of the abrasion and power that such a flow can produce. However, the ability of a diverter to perform its role for a period of time allowing safe evacuation or well control actions is dependent upon proper design, construction, and operation of the system. Of note is the regulatory requirement of a “minimum number of turns in the vent line downstream of the spool outlet flange and the radius of curvature of turns shall be as large as practicable. All right-angle and sharp turns shall be targeted.” And “...If the diverter system utilizes only one spool outlet, branch lines shall be installed to provide downwind diversion capability (CFR 250.409).” That regulation also says, “The entire diverter system shall be firmly anchored and supported to prevent whipping and vibration.” Though the diverter for the Rig drilling the C-4ST survived long enough to allow the evacuation, it ultimately failed.

During the preliminary investigation of the blowout, MMS discovered that possibly the diverter system was not installed per the approved drawing. Therefore, MMS requested the Operator to supply an as-built drawing of the diverter system. The as-built drawing showed the diverter installed was different from the approved diverter system, and this installation failed to meet MMS regulations and policies (*see Attachment 17*).

I. Approval and Design

The diverter system schematic was approved for installation 17 July 2002, as an attachment to a Sundry Notice (request for approval) to side track the aforementioned well. The proposed drawing complied with MMS regulations and policies; the diverter system had one outlet which teed into two 12-inch lines extending beyond the edge of the drilling rig.

One diverter line was to be routed toward starboard and the other toward portside, which ensured downwind (gas) diversion capabilities. Further, the drawing indicated that the 90-degree turns in the diverter lines were targeted with sufficient metal to prevent premature cutout of the diverter lines, and the lines were to be properly braced.

II. Actual Construction

The diverter system installed had one 16-inch outlet from the diverter housing, departing the housing at a 12.5-degree angle. This outlet, which ran approximately 10-15 feet, teed (a 90-degree connection) into two 12-inch lines, these lines being routed to the starboard and portside of the Rig. However, each line subsequently made a second right-angle turn just beyond the sides of the Rig, directing the ends of both lines toward the rig's stern. Therefore, both lines terminated with the ends facing in the same direction, which would not facilitate downwind diversion, if the wind were to have come directly from the stern or westerly direction. All right-angle turns were targeted. However, the piping was apparently inadequately braced, using 2-inch angle iron welded to the rig substructure.

Subsequently, an Incident of Non-compliance (INC) dated 17 September 2002 was issued to the Operator on or about 4 November 2002. The INC was issued for failure "to obtain approval before making changes in major drilling equipment" and "to install diverter branch lines to provide downwind diversion capability," and was issued in accordance with Authority 30 CFR 250.415(a), and 250.409 (d) (1) and 409 (e)(1), respectively.

**Failure of
the Diverter
and
Consequences**

During the course of the events of the blowout, after the initial loss of control, the flow was reportedly directed into the portside, or (presumably) downwind, line. However, the entire system began to flex and bend because of the power of the flow. This flexing of the pipe apparently placed significant stress on the 2-inch braces and on the end of the portside line. The force transmitted to the portside line was increased because of back pressure generated by the aforementioned 90-degree bend at the end of the line. This back pressure, and the flexing of the inadequate 2-inch bracing, eventually resulted in the end of the portside line being blown off upstream of the 90-degree bend.

Pictures of the progress of the blowout suggest that, when the end of the portside diverter line was blown off, the resultant decrease in back pressure caused most of the uncontrolled flow to access the portside line, though it is reported that the starboard line had been opened and the starboard line braces were found to be deformed by flex. The loss of the end of the port line allowed the uncontrolled flow to exit the diverter beneath the Rig floor (rather than outboard), encountering the aforementioned acetylene tanks stored on a catwalk, and electric cable bundles that had been run in close proximity to the diverter. Examination of the damage in this area revealed that several of the tanks had exploded and the cables were cut by the flow and burned (*see photographs, Attachments 9, 10*). Some damage to the structure was observed in this area and the extent of the burn damage on the Rig was greatest on the portside immediately above the end of the diverter. The cable bundle run in proximity to the diverter was both abraded and burned. While it is not possible to identify the source of ignition of the fire definitively, similar burned cable bundles were arcing when the Rig was reboarded hours later. This raises the possibility that an arc in the abraded cables next to the portside diverter could have ignited the flow.

Abandonment Operation

The abandonment of the Rig was accomplished in a timely and orderly manner. Despite the confusion introduced by a just-completed crew change, the Rig personnel assembled in their respective proper abandonment stations and all of the equipment functioned as intended. The actions of the drilling personnel were appropriate, including raising the pump volume, chaining down the brake, and timely sounding of the alarm. The switch of the pumps from mud to saltwater is a commonly recognized practice preceding abandonment during a well control event. However, during the subject incident, this operation required three men to re-enter the abandoned motor room after the loss of control was complete.

The Rig supervisory personnel notified the adjacent production platform in a timely manner of the loss of control and the progress of the abandonment operation. This allowed the Platform personnel to take appropriate action and conduct an orderly ESD and abandonment of the Platform. However, supervisory personnel on the Rig delayed personal evacuation while attempts were made to notify absent company management of the situation.

Upon reaching the destination of the evacuation, the securing of the life capsules was accomplished in an innovative and effective manner and the subsequent assembly of the crew to ensure full evacuation was thorough and well organized. The difficulties introduced by a discrepancy in the onboard lists because of the recently completed crew change were resolved, and the immediate reaction of the company to tend to the evacuees and begin the investigation process was appropriate and well conceived.

CONCLUSIONS

The Accident The incident at the subject well included two separate events: (1) the loss of control itself and (2) the resulting fire and damage.

Cause of loss of control

The loss of control was caused by gas swabbed into the wellbore, probably from a normally pressured gas productive zone at approximately 2,660 ft., during short trip operations. There is no evidence the zone was over-pressured or had been charged up by producing or drilling during the course of operating the field.

Probable cause of loss of control

The failure of the well plan to identify the presence of a potentially gas productive zone at about 2,700' may have precipitated a default from precautionary shallow-gas hazard drilling activities to normal drilling operations, which in turn introduced the swabbing effect. The shallow-gas hazards for this well were reviewed by Operator personnel according to the methodology usually applied in producing fields. No new seismic or sparker surveys were shot to check the possibility of a shallow-gas zone. Though previous electric logs indicated the presence of probable gas in the 2,700' sand in the general proximity of the planned wellbore path, no mention of the possibility of gas in this zone was included in the well plan.

Possible cause of loss of control

It is possible that, despite the heavy loading of the mud system, the base weight of the mud used to drill the surface hole was not sufficient to allow a containment margin during tripping operations.

Cause of fire and damage

The resulting damage to the Rig was caused by the ignition of the uncontrolled hydrocarbon flow and the subsequent spread of the resulting fire to the combustibles on the Rig floor.

Possible cause of fire and damage

1. The failure of the diverter, specifically the end of the portside line, possibly led to fire on the Rig floor by allowing uncontrolled hydrocarbons to exit the diverter beneath the Rig floor rather than outboard.
2. The diverter failed in two locations, possibly because of insufficient tiedown supports, an unapproved routing plan, and a marginal design that allowed the flow to impact an inclined pipe wall immediately upon exiting the diverter housing.
3. Ignition of the uncontrolled hydrocarbon flow was possibly caused by electrical arcing in the electrical cable bundles that were subjected to the diverter flow stream. These bundles were routed in close proximity to the diverter and were subjected to direct

impact of an abrasive mixture after the failure of the portside diverter. Once the insulation of the cables was abraded, arcing may have been allowed.

4. After the end of the portside diverter was blown off, the uncontrolled flow directly impacted acetylene bottles stored on the catwalk next to the diverter system. The ignition of the flow led to the explosion of some of these bottles, possibly contributing to the intensity of the fire and damages.

Recommendations

I. It is recommended the MMS issue a Safety Alert to read as follows:

Recently, a well was being drilled from a producing platform. While making a short trip after penetrating shallow formations, the operator experienced a sudden gas influx, causing the well to be put into the diverter system. The uncontrolled flow subsequently caught fire, resulting in abandonment of the rig and platform. Though the well bridged after about ten minutes, damage to the rig and platform are estimated to be two million dollars. It is thought that the gas was swabbed into the wellbore from a shallow sand that had been logged as potentially productive in a previously drilled well. This zone was not identified as a shallow-gas hazard in the well plan. The fire damage was increased by a possible premature failure of the diverter system and subsequent exposure of stored equipment to the uncontrolled flow and fire.

The MMS recommends the following to operators preparing to drill a new well from a previously drilled surface location:

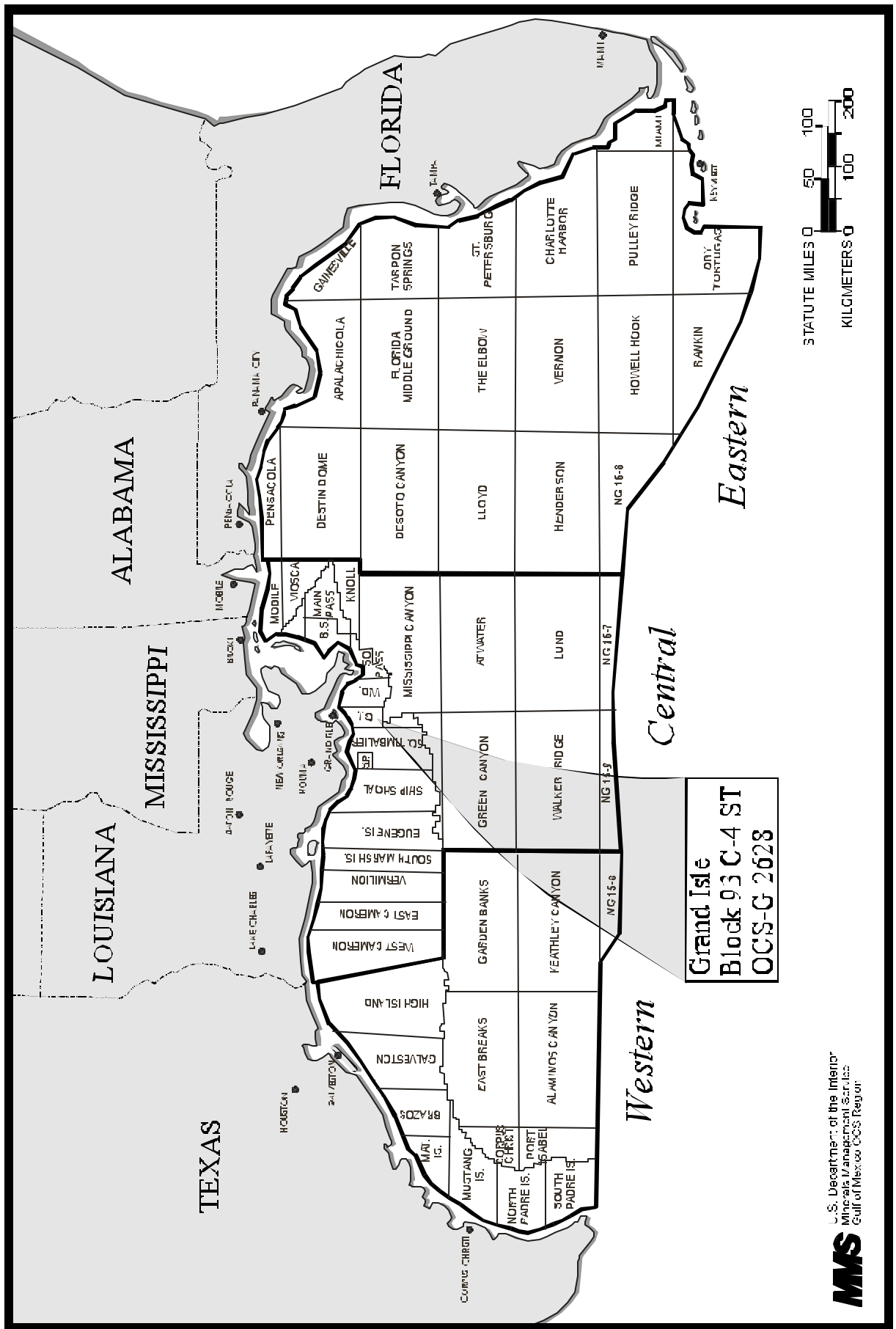
1. Shallow-gas hazard studies prepared for new wells from previously drilled surface locations should include a study of the old logs as well as seismic data. Drilling operations should be explicitly warned of shallow-gas deposits identified in previously drilled wells.
2. Care should be taken in the design, installation, and bracing of diverter systems to allow enough rigidity to resist flexing failure and to allow uncontrolled flows

to exit the system downwind and outboard of the rig. Proper design, construction, and targeting to limit the direct impact of flow upon pipe walls should be observed.



3. Where possible, electric cable bundles should be routed so as to be clear of the diverter system. Storage of flammable supplies next to the diverter system should be restricted where possible.

II. It is recommended the MMS consider initiating a study of the following issue:

The MMS should consider studying the need for a regulatory shallow-gas hazard review before approval of well permits for wells from previously drilled surface locations.



Location of Lease OCS-G 2628, Grand Isle Block 93

COMPANY MOBIL OIL CORP.

WELL OCS-G-2628 WELL I

FIELD GRAND ISLE BLOCK

COUNTY OFFSHORE STA

LOCATION: NA INT'L: BELG

SEC NA TWP NA RGE

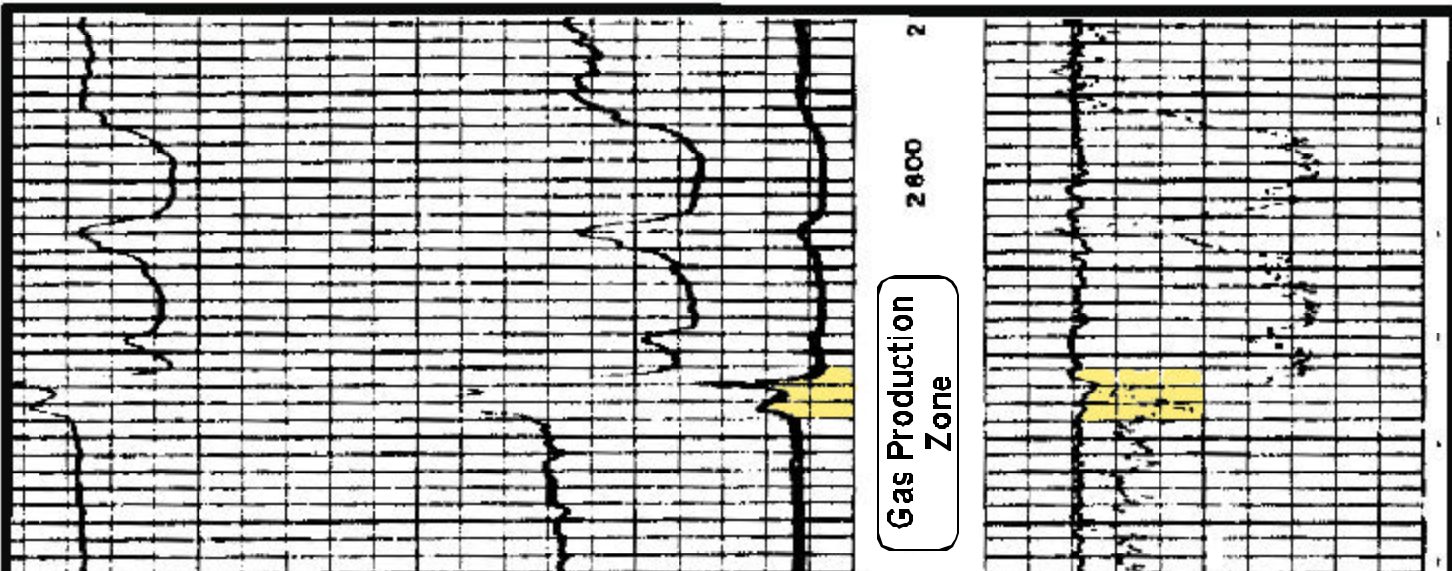
Permanent Datum BHF Elev. 51

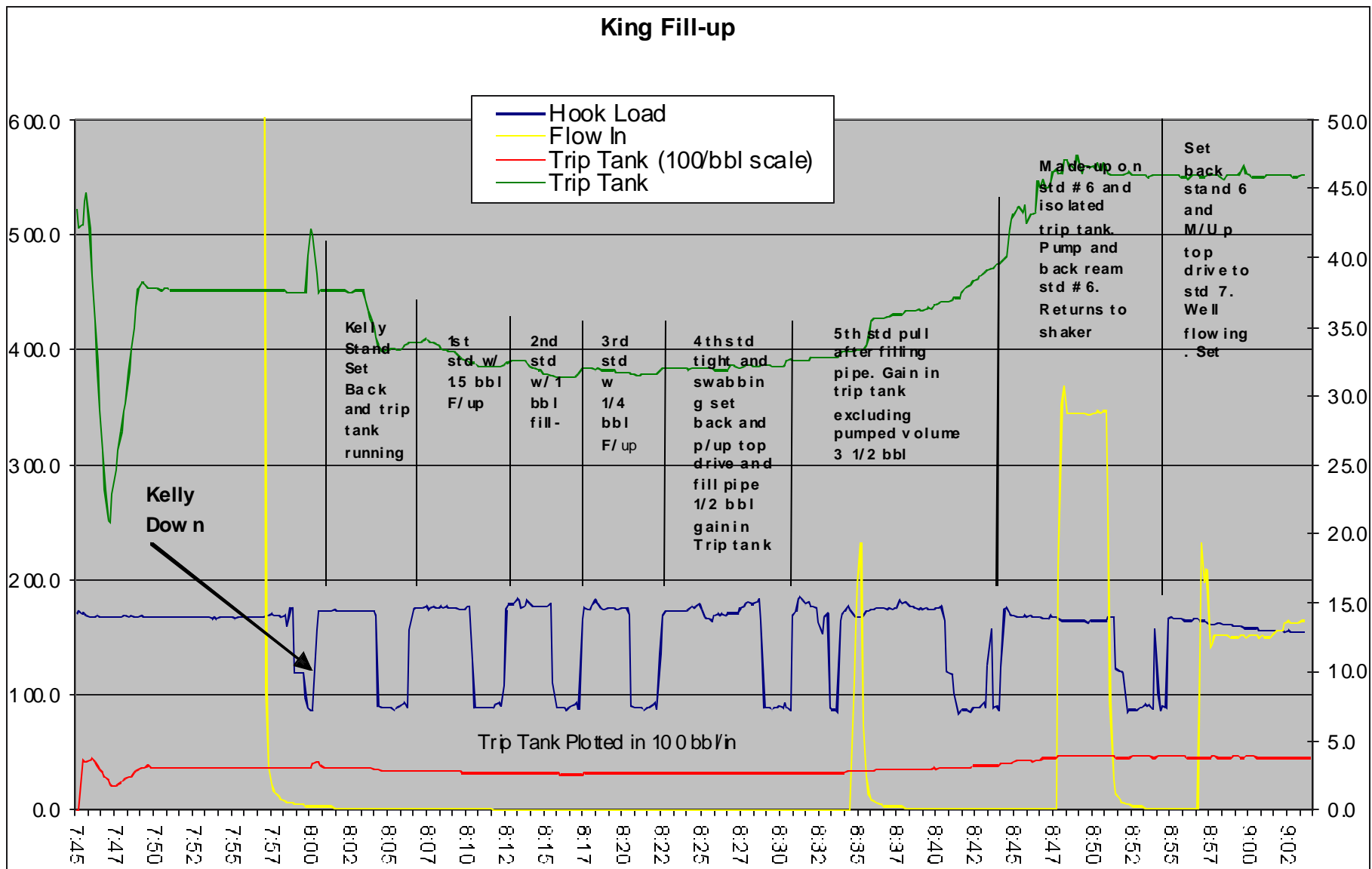
Log Measured from RT 38.50 Ft. Above Permanent

Drilling Measured from RT

Date	4-14-75	4-19-75	5-16-75
Run No.	ONE	TWO	THREE
Depth—Driller	1250	4600	10602
Depth—Logger	1247	4603	10577
Bottom Logged Interval	1241	4597	10571
Top Logged Interval	503	1239	6858
Casing—Driller	26" @ 504	16" @ 1245	10-3/4
Casing—Logger	503	1239	NL
Bit Size	12-1/4"	9-5/8"	9-5/8"
Type Fluid in Hole	GEL	SEA WATER	LIME
Density and Viscosity	9.0	NA	10.5
pH and Fluid Loss	NA	NA	13.0
Source of Sample	FLOWLINE	FLOWLINE	FLOWLINE
Rm @ Meas. Temp.	0.25 @ 76°F	0.32 @ 86°F	0.55 @ 86°F
Rmc @ Meas. Temp.	0.14 @ 76°F	0.24 @ 86°F	0.57 @ 86°F
Source of Rmf and Rmc	MEAS	MEAS	MEAS
Rm @ BHT	0.20 @ 95°F	0.25 @ 112°F	0.34 @ 112°F
Time Since Circ.	2 HRS.	4 HRS.	12 HRS.
Max. Rec. Temp. Deg. F.	95	112	115
Equip. No. and Location	8515	H/OS	H/OS
Recorded By	KUBENA	TRAHAN	KUBEN
Witnessed By	MC DONALD	CARPENTER	ROUND

Gas Production Zone





Rig, Trip Tank Fill-Up, 8 August 2002



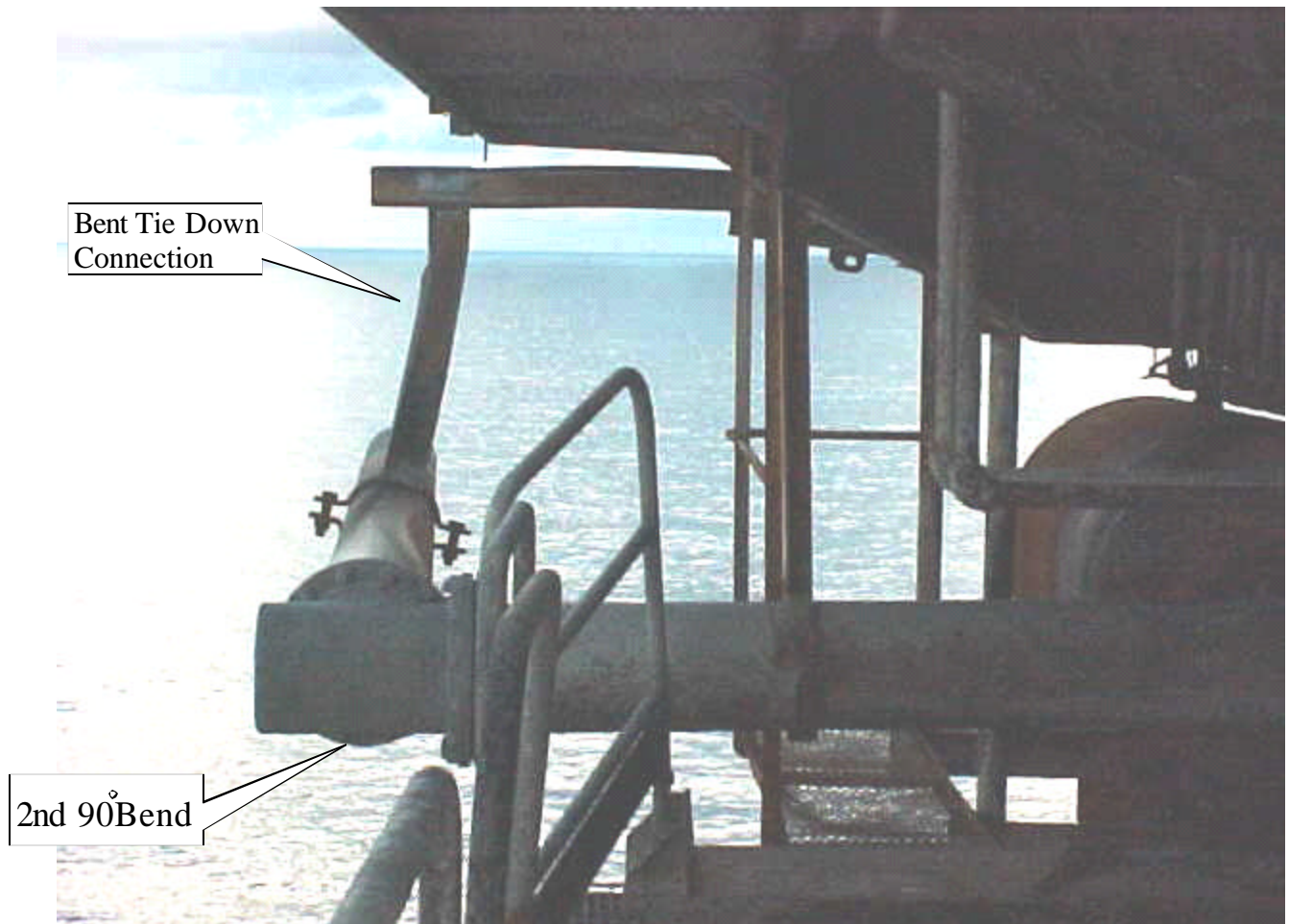
Rig on fire 8 August 2002.



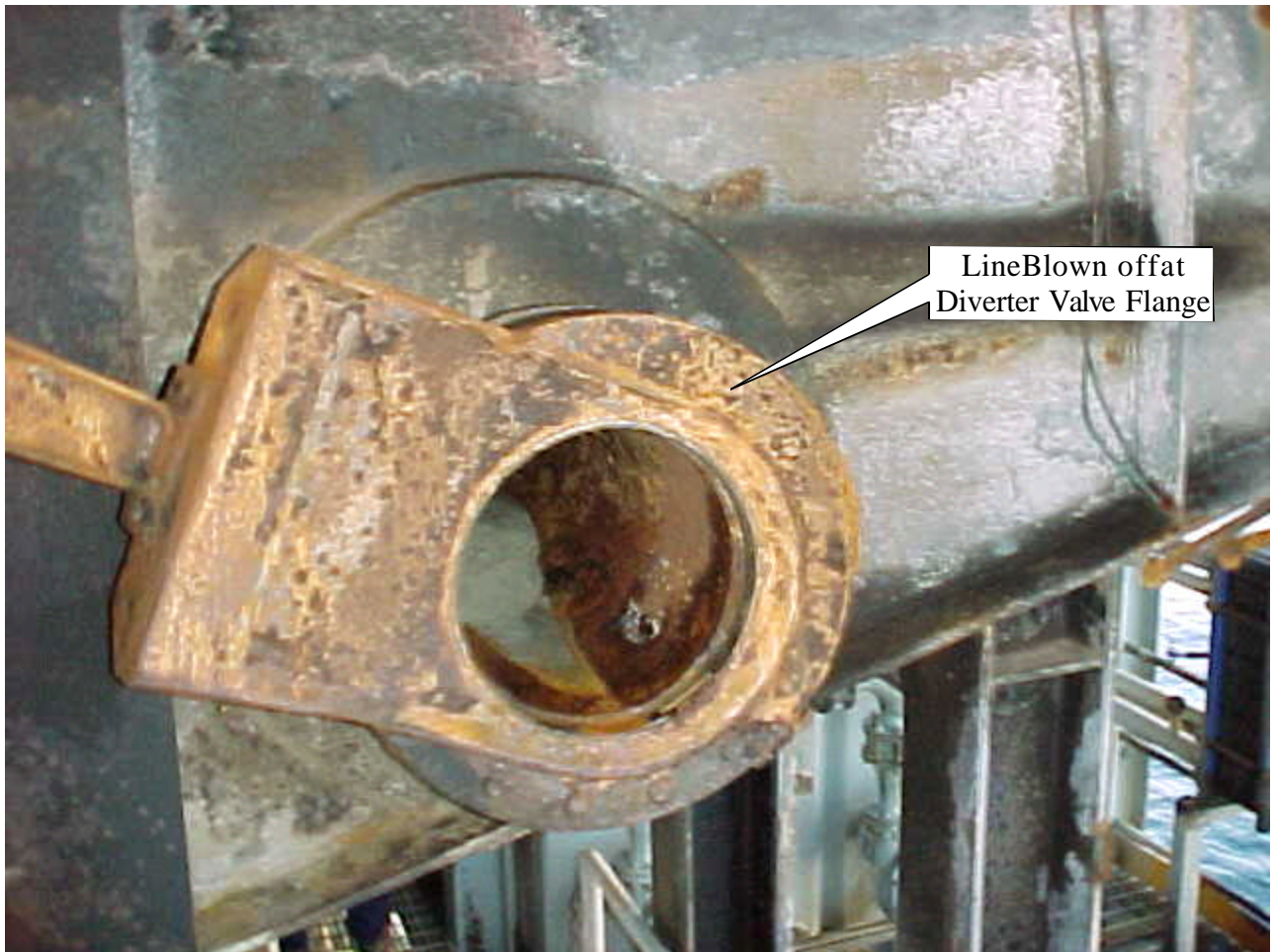
Rig fire after wildwell C-4 ST bridged.



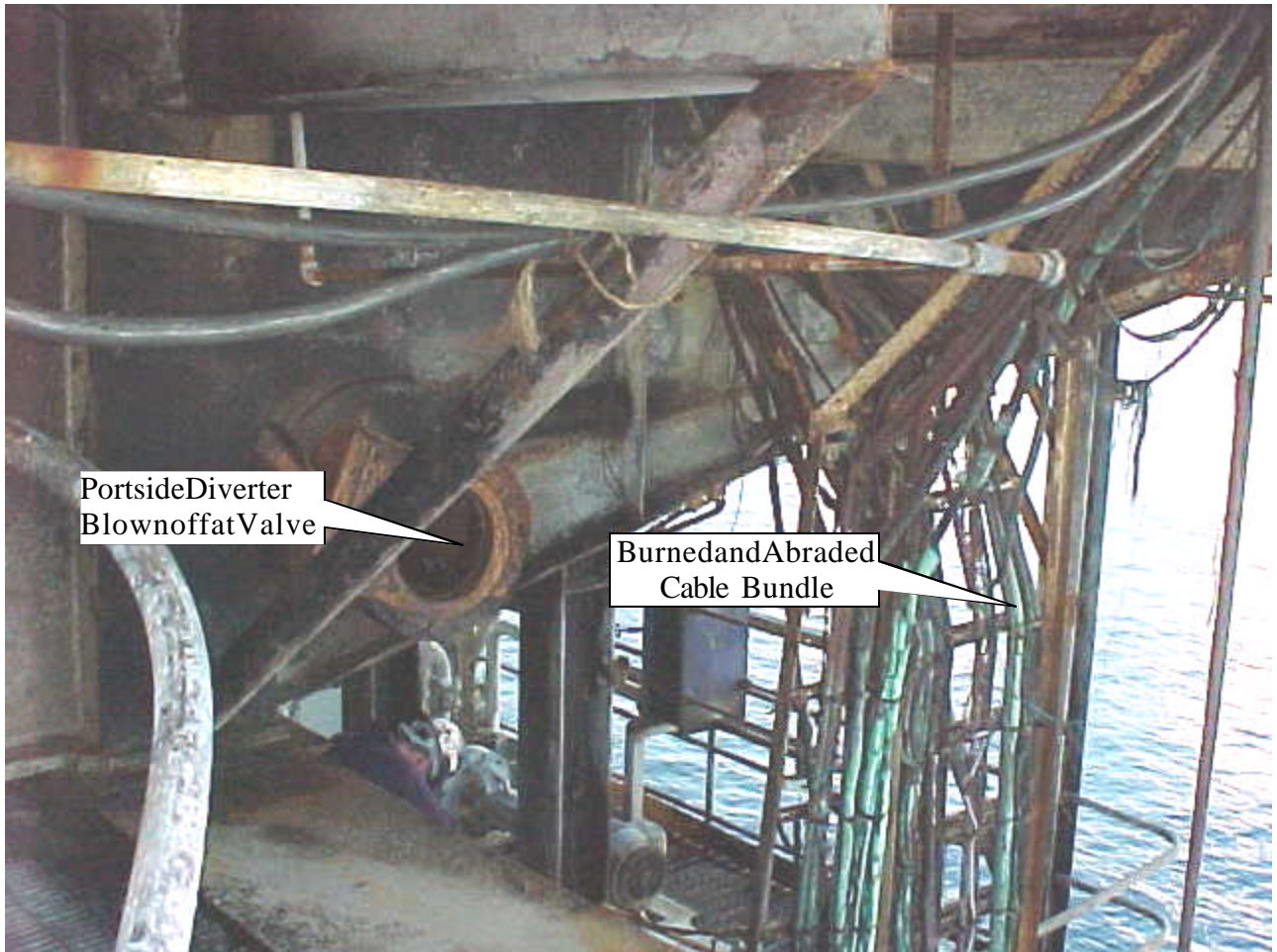
Rig fire and escape capsules navigating to rescue point.



Starboard diverter piping discharge after blowout.



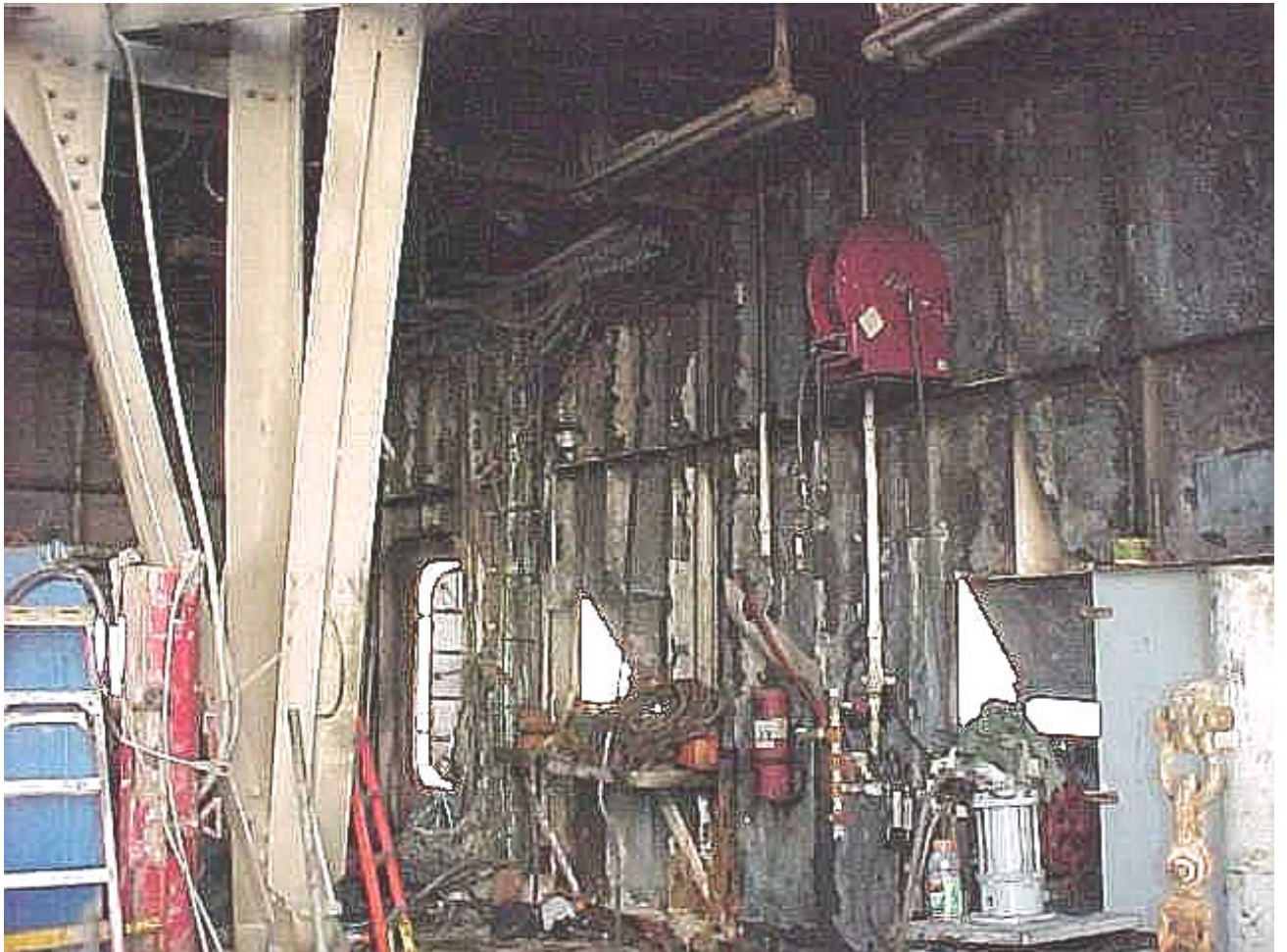
Portside diverter piping exit after loss of pipe end.



Portside diverter after blowout: and abraded burned cable bundles.



Portside floor adjacent to diverter, exploded acetylene bottles.



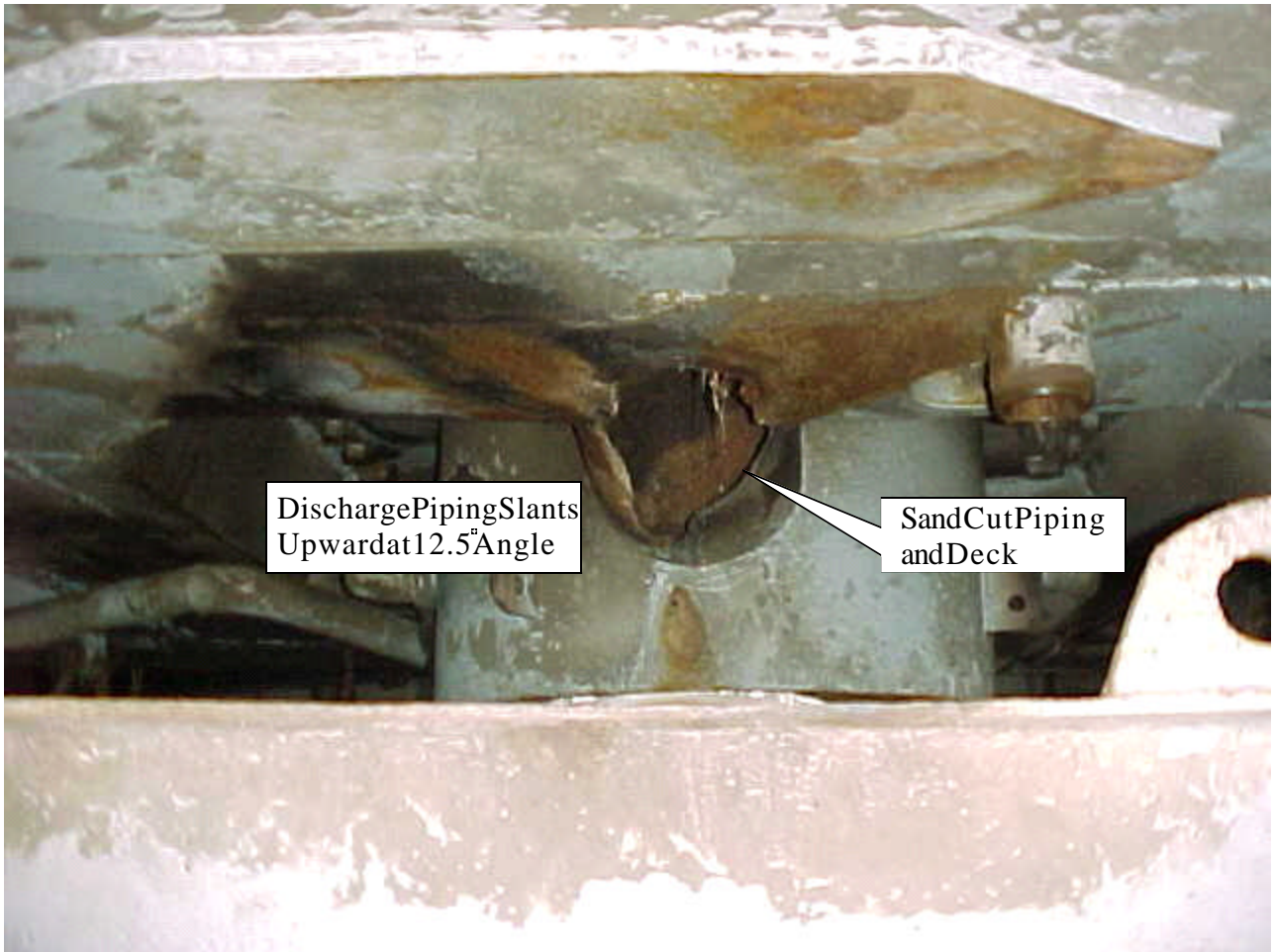
Portside drill floor motor shed, above diverter, after fire.



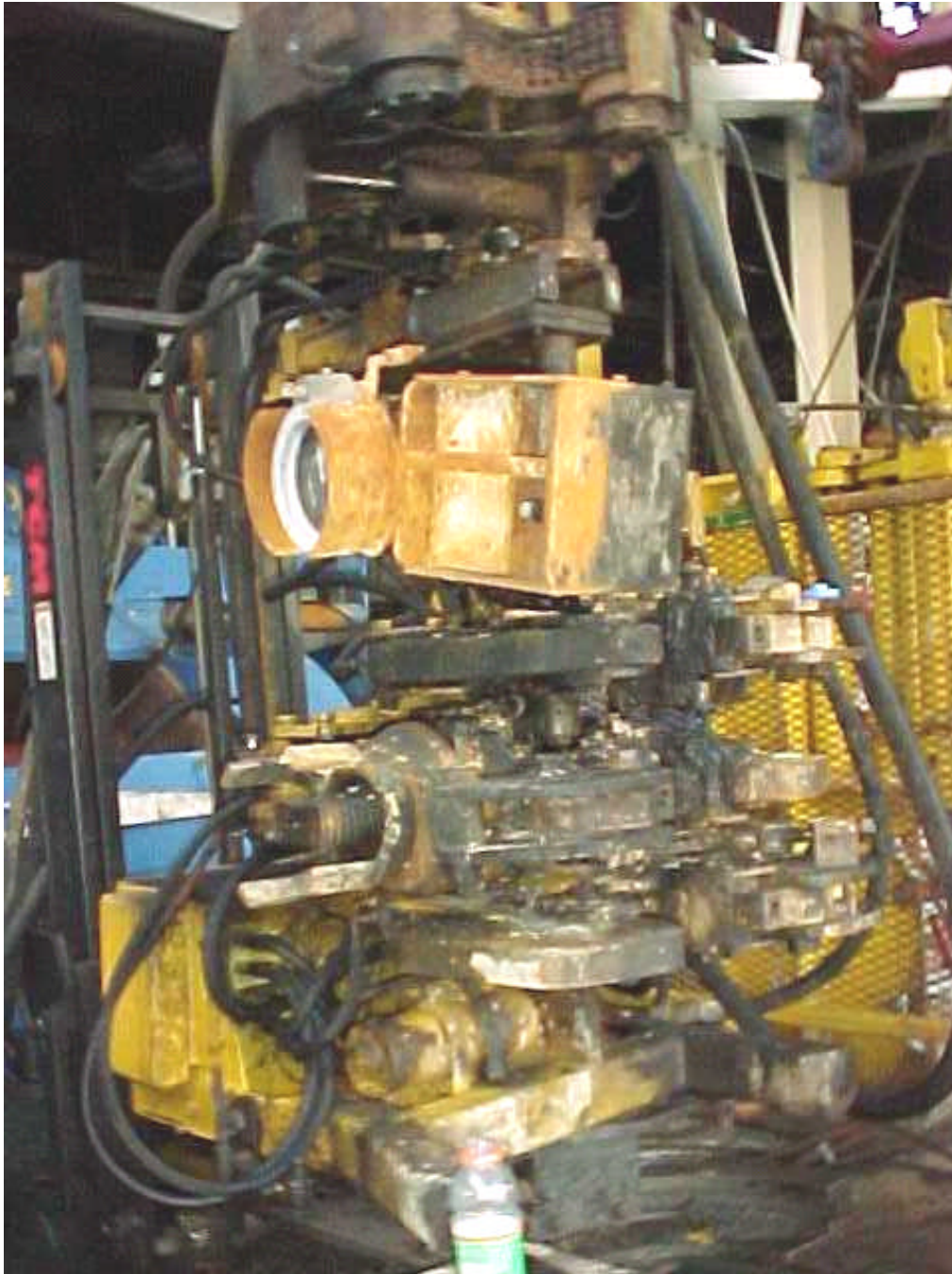
Portside drill floor motor shed aft above diverter. Destroyed cables and damage.



Fire damage to beam above port diverter, beneath drilling floor.



Diverter discharge piping, sand cut at exit from diverter housing.

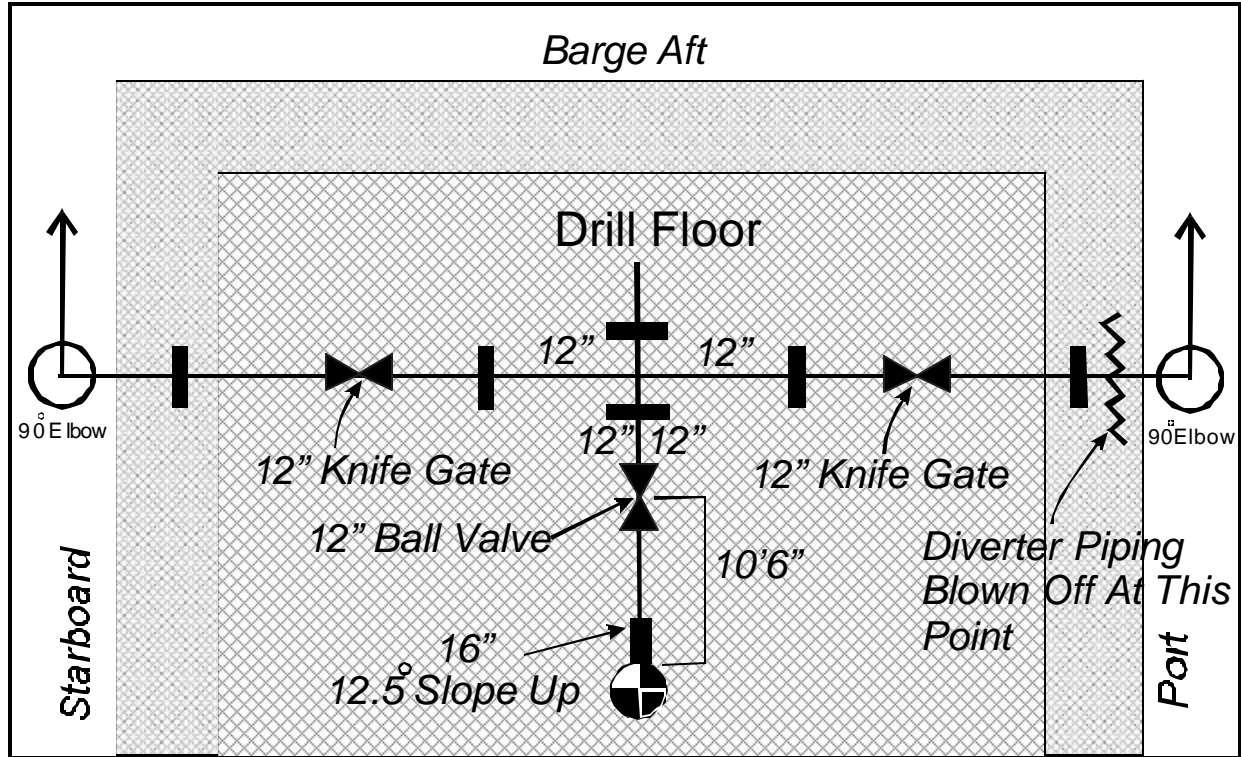


Fire damaged "Hawkjaw" above rotary table.

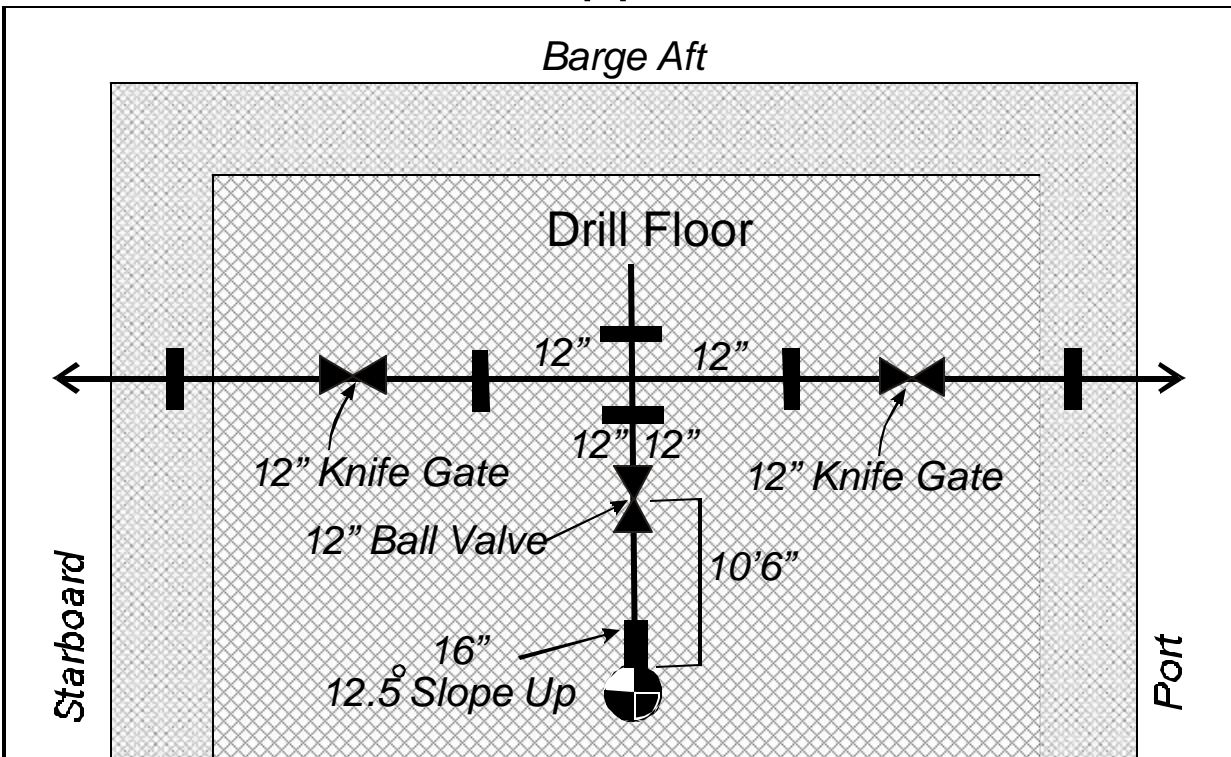


Fire damaged drill floor MCC Room.

"As Built"



"As Approved"



Diverter Piping System as approved, as built