



**Investigation of Blowout, Injuries, & Fatality,
Brazos Block 417
OCS-G 22190, Well 1
July 13, 2001**

Gulf of Mexico
Off the Texas Coast



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

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OCS-G 22190
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John McCarroll
Lee Fowler
Suzanne Moore
James Hail

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Investigation and Report

Authority On July 13, 2001, at approximately 0415 hours, an uncontrolled flow occurred on Well 1 during drilling operations on The William G. Helis Company's (Helis) Lease OCS-G 22190, Brazos Block 417, in the Gulf of Mexico, offshore the State of Texas. This resulted in a blowout, injuries, and a fatality that occurred aboard the jack-up drilling rig *Marine IV* (currently owned by Pride Offshore Drilling). 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. On July 13, 2001, the following MMS personnel were named to the investigation panel:

John McCarroll Houma District (Chairman)

Lee Fowler Lake Jackson District

Suzanne Moore New Orleans District

James Hail Lake Jackson District

Procedures Panel members and other personnel from the MMS Lake Jackson District Office interviewed the following personnel on July 13, 2001, at the Ramada Inn:

Mud engineer with Miller and Associates

Mud logger with Continental Labs

Night tool pusher with Marine Drilling

Three (3) floor hands with Marine Drilling

Driller with Marine Drilling

Derrick man with Marine Drilling

Statements from the following personnel were taken by the United States Coast Guard on the bus while *en route* to the Ramada Inn:

Company representative with Applied Drilling Technology Inc. (ADTI)

Company representative with The William G. Helis Company

On July 13, 2001, at 0700 hrs, a panel member and an inspector from the MMS Lake Jackson District Office conducted an aerial reconnaissance of the drilling rig and surrounding waters.

A panel member made continued flights by *Marine IV*, and requested that additional rig searches be conducted to try to locate the missing ADTI night supervisor.

On July 17, 2001, a panel member and the District Supervisor of the MMS Lake Jackson District Office attended a pre-spud meeting for the relief well on *Marine 304*.

MMS personnel continued to fly by the *Marine IV* and to visit the *Marine 304* on a daily basis throughout the incident. ADTI, Helis, panel members, and other MMS Lake Jackson District Office personnel held morning conferences.

On Sunday, August 5, 2001, a panel member and ADTI, Marine Drilling, and Helis personnel boarded the rig for inspection. No equipment was recovered, moved, or altered at that time; however, it was confirmed that the valve on the A section of the wellhead had been left open.

On August 8, 2001, a panel member and personnel from ADTI, Helis, Wild Well Control, the U.S. Coast Guard, and the barge *Hercules* returned to the *Marine IV*. All written documents related to this well, the TIW valve, the Petron mother board, and all other related materials and equipment were removed.

On August 21, 2001, panel members met at the New Orleans District office and interviewed the following individuals:

Helis's contract drilling engineer from Petroleum Professional Inc. (PPI)

Helis's contract rig supervisor from PPI.

On August 23, 2001, panel members met at The William G. Helis Corporation's office and interviewed was the following individuals:

Helis operations manager

Helis senior petroleum engineer

Helis president

The organization and communication process for drilling wells and handling of well control events were discussed.

On September 6, 2001, panel members interviewed the following individuals at the New Orleans District office:

Day driller, *Marine IV*

Senior toolpusher, *Marine IV*

Night driller, *Marine IV*

Night toolpusher, *Marine IV*

On September 26, 2001, the panel members visited with Helis's regulatory affairs representative, J. Connor Consulting Inc., in Houston, Texas. The panel members discussed the origination and communication process for preparing the Application for Permit to Drill package sent to MMS for the drilling of OCS-G 22190, Well 1, Brazos Block 417.

On September 27, 2001, the panel members met at the Lake Jackson District office and interviewed the following individuals:

Day drilling supervisor for ADTI

Night drilling supervisor for ADTI

Day drilling supervisor for ADTI

On October 25, 2001, panel members and the District Supervisor of the MMS Lake Jackson District Office traveled to Channelview, Texas, to witness the disassembly and testing of the rig floor safety valve.

The panel members convened at various times throughout the investigative effort and, after having considered all of the information, produced this report.

Introduction

Background Lease OCS-G 22190 is located in 26 miles from shore in Brazos Block 417, Gulf of Mexico, off the Texas coast, and covers approximately 5,760 acres. The lease was issued effective December 1, 2000, to Helis (35.0% interest), Houston Energy, Inc. (6.0% interest), and Duke Energy Hydrocarbons, LLC (59% interest) on November 28, 2000. On November 29, 2000, Helis was designated as the operator of Brazos Block 417. *For Lease location, see Attachment 1.*

Brief Description of Accident On July 13, 2001, at 0415 hours the well started to flow up the drill pipe after the floor hands had set the slips, unscrewed the kelly, and made it up to the next joint of drill pipe in the mouse hole. (The float valve had been removed from the bottomhole assembly prior to drilling out below the 10¾-inch surface casing.) The rig floor safety valve was stabbed, but would not close with two men applying torque to the handle. The two men were burned on their arms and back by the hot mud. (The mud flowline temperature was approximately 150° Fahrenheit). A third man assisted in the attempt to close the valve, and sufficient torque was applied to the closing handle to shear it off at the key opening of the valve. When the valve was recovered later, the shear direction of the key indicated that the torque was applied in the correct direction. Because of the hot temperature of the mud, the men had to put on slicker suits and were sprayed with water to continue working on the rig floor. The floor hands removed the rig floor safety valve and attempted to stab the kelly, but the mud flow was too strong and too hot to stab the drill pipe.

The mudflow increased until it was shooting over the top of the derrick. Gas began to flow with the mud from the drill pipe, and it became unsafe to continue work on the rig

floor. The rig abandonment alarm was sounded at 0425 hours. Both capsules were loaded and departed the rig at 0430 hours. Because of excessive noise, it was impossible to complete a roll call. After the rig was abandoned, it was discovered that the ADTI night supervisor was missing from Capsule 2. The crew was picked up by the Coast Guard at approximately 0630 hours and transferred to the work boat *Miss Melaine* and brought into the Tesoro base at Surf Side, Texas. The crew was transported by bus at 1030 hours to the Ramada Inn in Clute/Lake Jackson, Texas. The Coast Guard conducted a search for the missing person for two days, but the missing person has never been located and has been presumed dead.

Findings

Activities Prior to Loss of Well Control Planning **July 2, 2001** - The MMS Lake Jackson District approved The William G. Helis Lease OCS-G-22190, Well 1, Brazos Block 417 Application for Permit to Drill (APD). In the APD, Helis proposed drilling Well 1 to a measured depth (MD) and a true vertical depth (TVD) of 8,000 feet, using the *Marine IV* jack-up rig. The well would be located in 90 feet of water. Helis anticipated driving the 30-inch drive pipe to a depth of 390 feet MD/TVD, drilling a 20-inch conductor hole and setting 16-inch conductor casing at 800 feet MD/TVD, drilling a 13½-inch surface hole and setting 10¾-inch surface casing at 4,500 feet MD/TVD), and drilling a 9⅞-inch production hole and setting 7⅞-inch casing at 8,000 feet MD/TVD

Summary of Operations **July 2, 2001** - The *Marine IV* rig arrived on location and began rigging up for operations. No prespud meeting was held on the rig prior to spudding the well.

July 3, 2001 - The 30-inch drive pipe was driven to 427 feet MD/TVD and the 21¼ inch diverter was installed and function tested, and Well 1 was spudded.

July 4, 2001 - A 20-inch hole was drilled to 815 feet MD/TVD and 16-inch casing was run and cemented with 1,385 cubic feet of cement. The wellhead, diverter, and 16-inch conductor casing were successfully tested to 250 psig.

July 8, 2000 - A 13½-inch bit was used to drill to the surface casing point and the 10¾-inch casing was cemented with a total of 1,796 cubic feet of cement. Forty barrels of drilling fluid were lost to the formation while displacing cement, and no cement returns were seen at the surface. The 10¾-inch x 16-inch annulus was washed out to 223 feet

with no cement returns. A 1¼-inch wash string was run into the annulus to 320 feet or 120 feet below the mudline, and a 50-sack cement top job was performed. The new wellhead and BOP's were nipped up to the A section. The BOP's were tested to 3,500 and 5,000 psi, and the casing was tested to 2,600 psi as per the MMS-approved APD. A new drilling bottomhole assembly (BHA) with a 9⅞-inch bit (excluding a float valve) was made up for drilling the production hole. During interviews with the day pusher *Marine IV*, the day driller *Marine IV*, and the night pusher *Marine IV*, they said that night drilling supervisor for ADTI told them to leave the float valve out of the new bottomhole assembly for drilling the production hole. (A float valve had been run in the bottomhole assembly while the surface hole was being drilled.) During interviews with Helis and ADTI, it was stated there was no policy requiring the use of a float valve during drilling through a gas zone below surface casing. After the 10¾-inch surface casing shoe was drilled out of, the leak-off test (LOT) failed, and the shoe was squeezed with 250 sacks of cement and retested. The 10¾-inch surface casing shoe was then successfully tested to an equivalent mud weight (EMW) of 13.8 pounds per gallon (ppg) LOT. Helis's contract drilling engineer from PPI said during his interview that a loss returns zone at around 4,200 feet might have affected the cement job on the 10¾-inch casing. *For wellbore schematic, see Attachment 2.*

Loss of Well Control

July 12, 2001 – The well was drilled without problems to 7,314 feet, at which time the rig crew performed a simulated connection. The mud was cut from 10.9 to 10.0 ppg with 660 units of gas displayed on the driller's console. This occurred about 1900 hours, and the mud was weighted up to 11.2 ppg. The mud weight was again raised from 11.2 to 11.5 around 7,500 feet at 2400 hours.

July 13, 2001 – While it was being drilled at 7,667 feet with 11.5 ppg mud weight, the well kicked at 0415 hours during a drill pipe connection and flowed up the drill pipe. No float valve was installed in the bottomhole assembly. The sand came in 90 feet higher than expected. (According to log data from the offset well, the top of the gas sand was expected to be encountered at 7,690 feet but was drilled at 7,600 feet in this well.)

The sand was drilled with a 9/8-inch polycrystalline diamond compact (PDC) bit that has a reverse drilling break when drilling a sand. For example, a rock bit will drill a sand faster than shale, but a PDC bit will drill a sand slower than a shale. This can cause some confusion when a sand is encountered if the driller is not aware of the reverse drilling break.

The driller had drilled two kellys down into the gas zone, 67 feet, without circulating out the wellbore, which resulted in the mud being gas cut and the well becoming underbalanced, causing the well to kick.

The Petron chart indicates that mud returns had not stopped prior to breaking the kelly. However, the night driller stated that it was dark when he looked at the mud returns trough, and he stated that the flow had indeed stopped prior to breaking the kelly. *For a copy of Petron Chart, see Attachment 3.*

Attempts to Stop Well Flow

July 13, 2001 - The rig floor safety valve was stabbed. The valve would not close with two men applying torque to the handle. The mud flowline temperature was approximately 150° Fahrenheit and the two men were burned on their arms and back. A third man assisted in the attempt, and sufficient torque was applied to the closing handle to shear it off at in the key opening of the valves. *For photos of valve handle and*

sheared off portion, see Attachments 4 and 5, respectively. When the valve was recovered later, the shear direction of the key indicated that the valve was being turned in the correct direction. Because of the hot temperature of the mud, the men had to put on slicker suits and be sprayed with water to continue working on the rig floor. While being sprayed with water, the floor hands removed the rig floor safety valve and attempted to stab the kelly, but the mud flow was too strong and too hot for them to be able to stab the pipe. The mudflow increased until it was shooting over the top of the derrick. Gas began to flow with the mud from the drill pipe, and it became unsafe to continue work on the rig floor. The rig abandonment alarm was sounded at 0425 hours.

**Evacuation
and
Rescue**

July 13, 2001 - The rig floor was very slippery because of the water-base mud that was blowing out of the hole, and two Marine Drilling floor hands said that they slipped down while running to evacuate the rig. Both capsules were loaded and departed the rig at the same time, 0430 hours. Personnel mustered at the escape capsules, but because of excessive noise, a roll call was impossible to complete. After they left the rig, two-way, hand-held radio communication was maintained, and it was discovered that the ADTI night supervisor was missing from capsule No. 2. The capsule No. 2 assignment list was left in the galley, but capsule No. 1 did have its assignment list. The ADTI night supervisor was last seen at the stairs and instructing others to board capsule No. 2. Roll call was not conducted at capsule No. 2 before launch. The ADTI night supervisor did not board capsule No. 2. The Marine Drilling senior toolpusher said during his interview that he thought he saw someone in the water after capsule No. 2 was launched. The crew was picked up by the Coast Guard at approximately 0630 hours and transferred to the workboat *Miss Melaine* and brought into the Tesoro base at Surf Side, Texas. *For photos of the rig approximately four hours after the well began to flow, see Attachments 6, 7, and 8.*

Boots and Coots (under contract to Marine Drilling Companies, Inc.) personnel boarded the rig at noon, and made a first attempt to locate the missing person. Despite an extensive search of the rig and the water, the ADTI night supervisor was never found. Boots and Coots also shut down all equipment to secure the rig while visually assessing the situation.

Subsequent Activities

July 13, 2001 – The Helis Spill Management Team was mobilized to respond to the incident. Representatives from Wild Well Control were called in for expert support and to plan and carry out capping and kill operations. Several boats were deployed to the location by the Spill Management Team to spray the platform. The dynamically positioned derrick barge *Hercules* was contracted for well control support.

July 15, 2001 – The *Marine 304* jack-up drilling arrived on location to drill a relief well. The unit had been mobilized on July 13, 2001.

July 18, 2001 – The relief well was spudded on July 18, 2001. The derrick barge *Hercules* arrived on location July 18, 2001. Wild Well Control (under contract to ADTI) became the contract well control services company. Helis, ADTI, Marine, and Wild Well Control were continuing operations to assess the site. The motor vessels *Damon Choest* and *Lauren "E"* were on location to spray water and supply support for the operations.

August 5, 2001 - When MMS inspectors boarded the rig, they discovered the blowout preventers (BOP's) opened and the casing valve on the "A" section opened, and observed the failed rig floor safety valve. It was also discovered that sand had cut out the drill

pipe, BOP's, and bell nipple. *For a photo of the BOP's in an open position configuration, see Attachment 9. For a photo of flow through the "A" section valve, see Attachment 10. For a photo of the rig floor safety valve, see Attachment 5. For photos of cut drill pipe, see Attachments 11 and 12.*

August 8, 2001 – A panel member boarded *Marine IV* with other personnel, and at that time the rig floor safety valve was secured and shipped to Southwest Research Center for future evaluation. The motherboard from the Petron display at the drillers console was also removed. *For pictures of the Petron display and removal of the mother board, see Attachments 13 and 14, respectively.* When the rig was boarded on August 8, 2001, the Coast Guard and MMS were unable to verify life jacket count because water cannons had washed a life jacket storage box overboard.

August 23, 2001 - The panel members confirmed that the following contractors provided consulting services to Helis during the planning and drilling of OCS-G 22190, Well 1, Brazos Block 417:

J. Connor Consulting — Submitted Application for Permit to Drill

PPI — Provided drilling engineer and rig supervisor

ADTI — Turn-key drilling contractor

Marine Drilling — Provided the drilling rig and crew

September 1, 2001 - Well 2 was not required to kill the flow from Well 1, because Well 1 ceased to flow because of water influx through the sand cuts in the casings. Final abandonment of Well 1 was completed with five cement plugs, several annular squeeze cementings, and all casings cut and recovered to 22 feet below the mudline. Well 2

reached total depth (TD) on August 28, 2001, and was completed as a replacement for Well 1 September 11, 2001. *For a drawing of Well 1 final abandonment, see Attachment 15.*

October 25, 2001 – Panel members and the District Supervisor of the MMS Lake Jackson Office went to C&H Machine Shop in Channelview, Texas, to witness the examination of the rig floor safety valve that failed to close during the well control event that occurred on *Marine IV* on July 13, 2001. Other interested parties attending the examination included personnel from Global Marine, ADTI, Pride Offshore, Global Manufacturing of Arcadian Inc., and a private consultant. During the examination, cement and wet mud were found behind the ball of the valve. It was also noted that the rig floor safety valve had a service break in the body that requires proper torque, or the valve will not operate properly.

Tests performed on the rig floor safety valve have revealed that the valve was frozen open with cement, mud, and sand. (The primary purpose of the rig floor safety valve is to provide a means to shut in the well if it is flowing up the drill pipe.) The rig floor safety valve was last tested beginning at 1230 hrs on July 8, 2001, when the last BOP test was performed. However, the valve is also used during cementing and, in this case, had been used to squeeze cement in the 10³/₄-inch casing shoe at 0900 hrs July 9, 2001, when the LOT was insufficient. *For photos of lab tests on the rig floor safety valve, see Attachments 16, 17, and 18 respectively.*

Damages The *Marine IV* BOP stack, bell nipple, casing, and 7,667 feet of drill pipe were damaged by the high-pressure gas and sand that flowed out of the well. There were also damages to the grating on the Texas deck caused by the water and sand flow from the casing and

to the A valve on the wellhead. The water spray employed to keep the gas from igniting damaged several of the recording instruments. The water also damaged flooring in the quarters. *For a collage of photos showing damage to the recovered casing, see Attachment 19.*

Observations On July 13, 2001, when MMS made a fly-by observation of the blowout, gas flow was seen from the A section valve.

July 17, 2001 –Photos of Well 1 were also taken from the deck of a work boat. *For photo of rig from boat, see Attachment 20.*

The panel found no evidence to conclude that the rig floor safety valve was actuated daily.

The investigation revealed that there was not an additional rig floor safety valve on the rig floor.

The blowout preventers (BOP's) did not include blind shear rams.

Conclusions

**Part I
Blowout
Cause** The rig floor safety valve was frozen open and the inability to close this valve resulted in the loss of well control.

Failure of the driller to recognize the indications that the well was flowing at the time the kelly was broken from the drill string directly led to the loss of well control.

**Contributing
Causes** Neither ADTI nor Helis held a pre-spud meeting on the rig to communicate that the sand could be encountered at a shallower depth or to discuss whether to run a drill pipe float when a gas sand was being drilled.

Absence of a drill pipe float permitted wellbore fluids to flow up the drill string and contributed to the loss of well control.

Failure of the driller to recognize that the PDC bit had a reverse drilling break, and that he had already cut the gas zone at 7,600 feet, contributed to the well taking a kick.

Had the A section valve been closed, flow from the surface by conductor casing annulus could have been prevented or at least been substantially reduced.

There was no back-up rig floor safety valve available on the rig floor to use when the first valve failed to close. If another valve had been available, flow could have been prevented.

If the rig floor safety valve had been actuated daily, it would have been maintained or replaced. A functioning valve would have greatly reduced the severity or eliminated the incident.

Failure to illuminate the trough prevented the driller from noticing the well was still flowing.

Possible Contributing Causes No shear rams were installed in the BOP stack. Therefore, there was no final option to shut in the well by shearing the drill pipe, which could have prevented the blowout.

Part II Fatality The panel cannot make any conclusions regarding the cause(s) of the fatality.

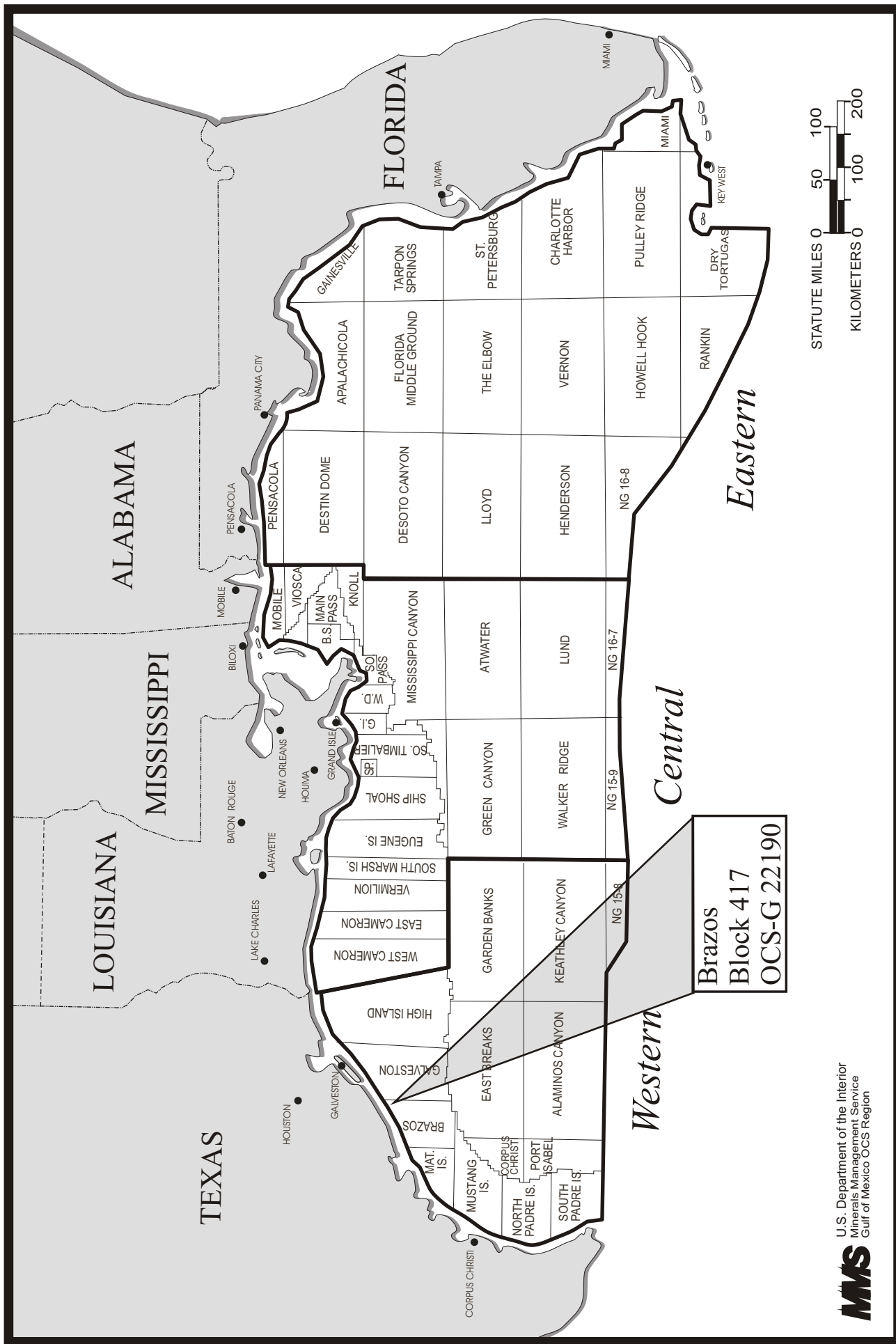
Recommendations

Safety Alert The Gulf of Mexico OCS Region should issue a Safety Alert recommending the following:

1. Maintain a primary rig floor safety valve to be used for well control purposes only. In addition, a second valve should be available for use during cementing, wire line, and other routine operations.
2. Function- and pressure-test both rig floor safety valves as part of the normal BOP tests. Note: Both valves should be actuated daily.
3. Check also that the rig floor safety valves with service breaks in the body are made up to the designed torque specification to ensure proper valve operation.
4. Operators should review their policy regarding the usage of float valves in the bottomhole assembly. The drill pipe float may be ported to assist in well control operations.
5. Review policy regarding pre-spud meeting on the rig. These meetings should be conducted to improve communications, training, and drills between the operator and the rig crew when a significant drilling event might occur, for example, but not limited, to the following:
 - A. When a polycrystalline diamond compact bit is being used to drill a pay zone.
 - B. When the depth of a target zone might come in higher than expected.
 - C. When a float valve may be omitted below surface casing.
 - D. That a procedure is in place to ensure that all valves on the wellhead and BOP's are in the proper positions.
6. Review night operations for sufficient illumination.

Studies

1. Study the need to and/or modify regulations to require a drill pipe float be used when a gas sand is being drilled.
2. Study the need to and/or modify regulations to require blind shear rams when a drill pipe float is not used.

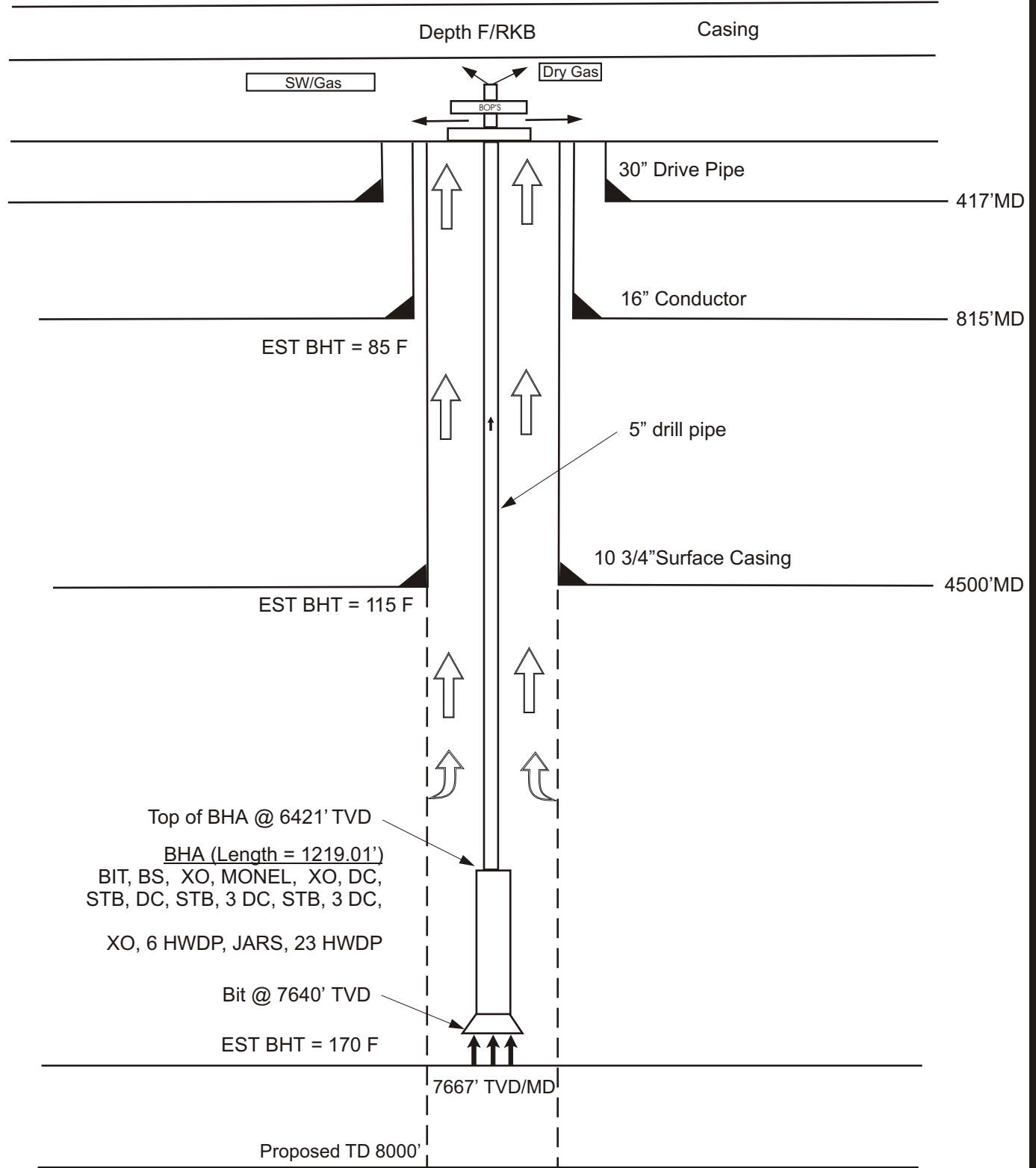


Location of Lease OCS-G 22190, Brazos Block 417

WellBore Schematic

WD = 91'
 RKB = 102'
 Rig: Marine 4

Area: Brazos Block 417
 OCS-G 22190 #1



WellBore Schematic, Well No.1



petron Industries Inc.

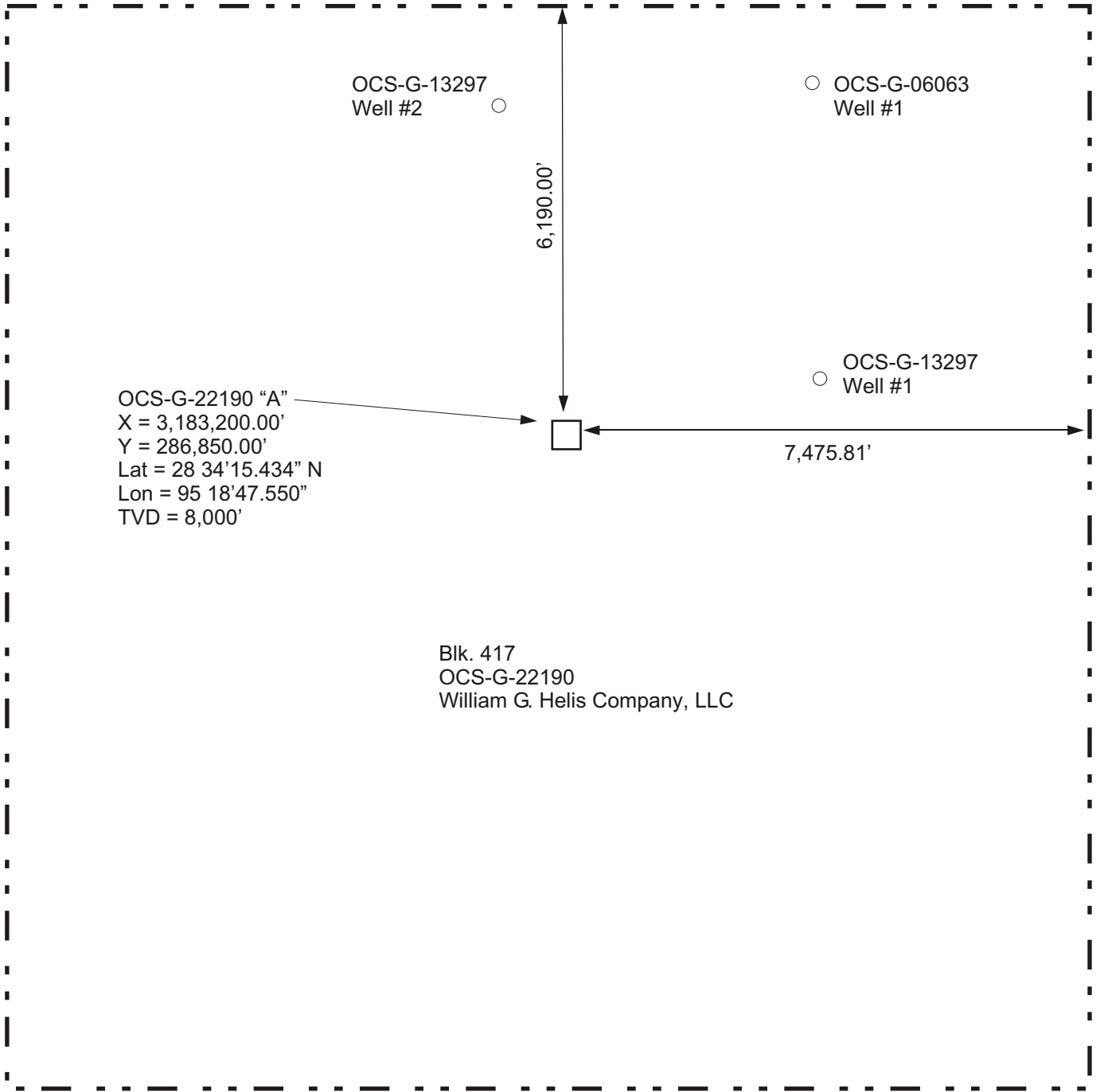
OPERATOR :
 CONTRACTOR :
 WELL NAME :
 WELL LOCATION :
 REMARKS :

DEPTH	FTG	TIME	HOOKLOAD	RPM TORQUE	PRESSURE PUMP OUTPUT	PVT FLOW	COMMENTS
			(KLbs)	(RPM)	(PSI)	(Bbls)	Printed on 16-Jul-01 12:43:36
			0 500	0 200	0 4000	0 1000	
				(Relative Unit)	(GPM)	(%)	
				0 1000	0 1500	0 100	
7510		01:00 13Jul01					
7520							
7530		02:00 13Jul01					
7540							
7550		03:00 13Jul01					
7560							
7570		04:00 13Jul01					
7580							
7590							
7600							
7610							
7620							
7630							
7640							
7650							
7660							

Kelly Broken

Copy of Petron Chart

BA416



OCS-G-22190 "A"
X = 3,183,200.00'
Y = 286,850.00'
Lat = 28 34'15.434" N
Lon = 95 18'47.550"
TVD = 8,000'

OCS-G-13297
Well #2

OCS-G-06063
Well #1

OCS-G-13297
Well #1

Blk. 417
OCS-G-22190
William G. Helis Company, LLC

BA430

The Williams G. Helis Company, LLC

OCS-G-22190 Well "A"
Block 417 - Brazos Area

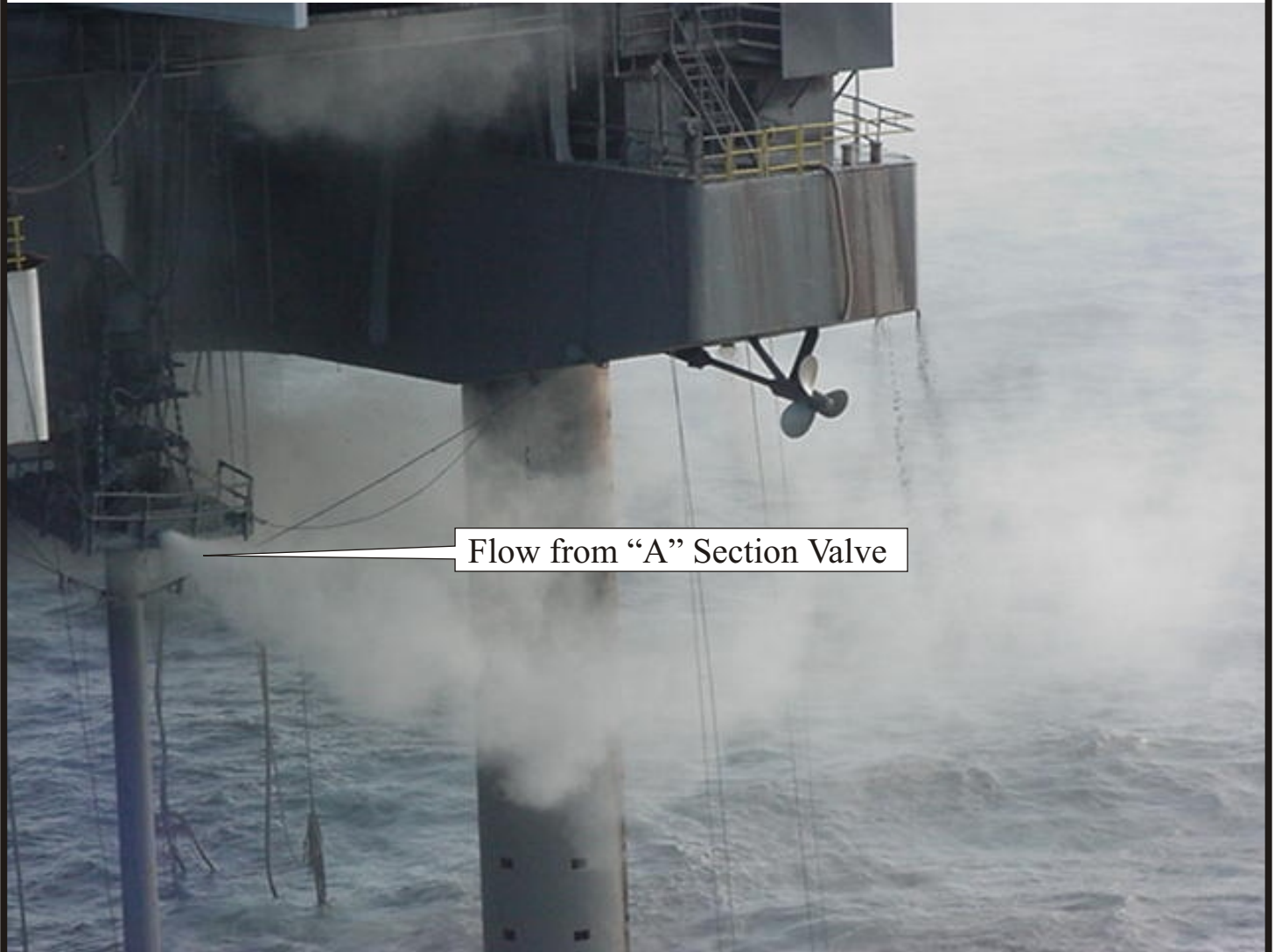


Photo of Valve Handle



Photo of Sheared
Handle in Key
Opening

Photo of Sheared Handle in Key Opening



Flow from "A" Section Valve

Photo of Rig after Well Began to Flow



Photo of Rig after Well Began to Flow



Photo of Rig after Well Began to Flow

BOP's in Open Position

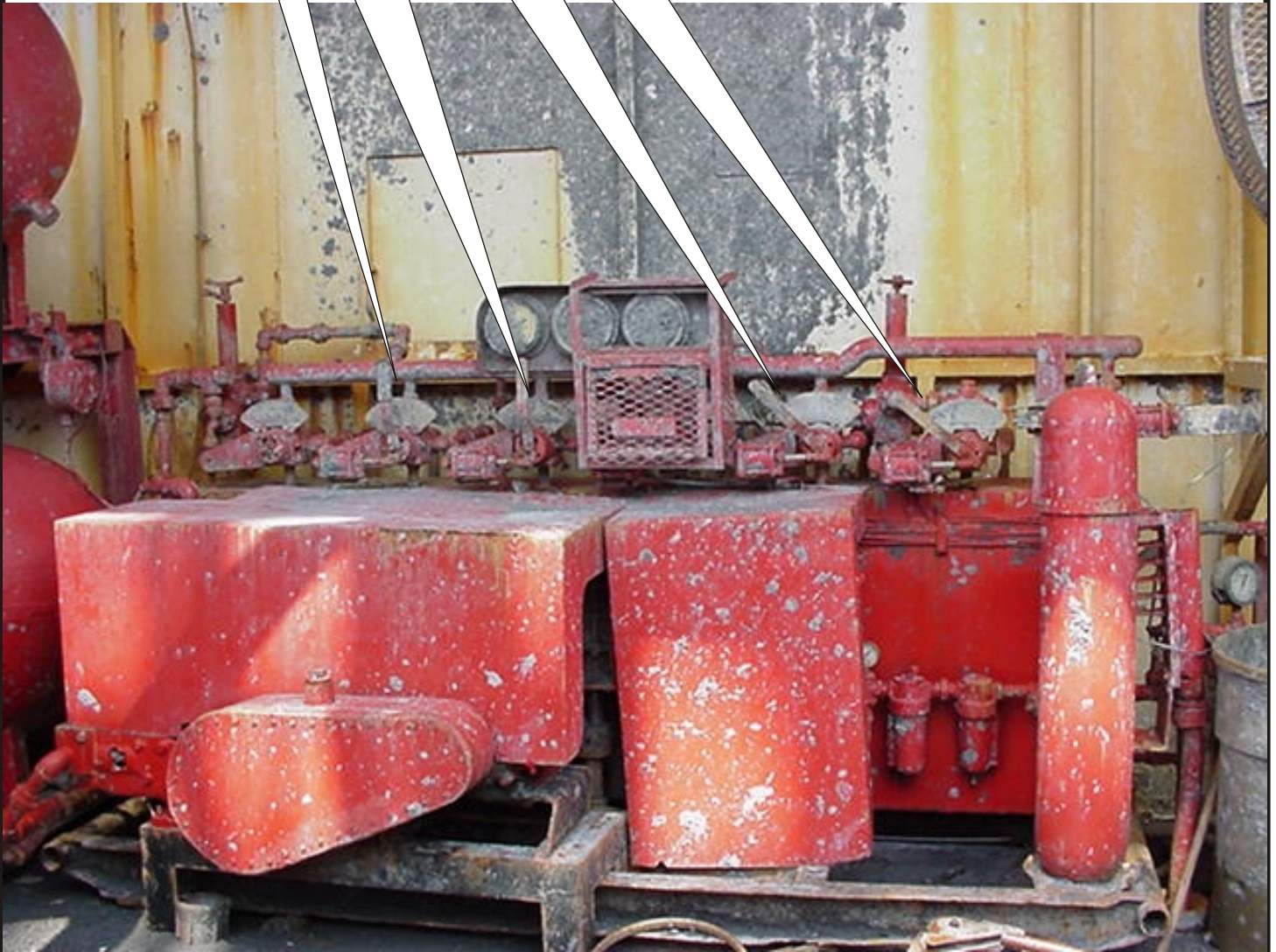


Photo of Opened BOP's.

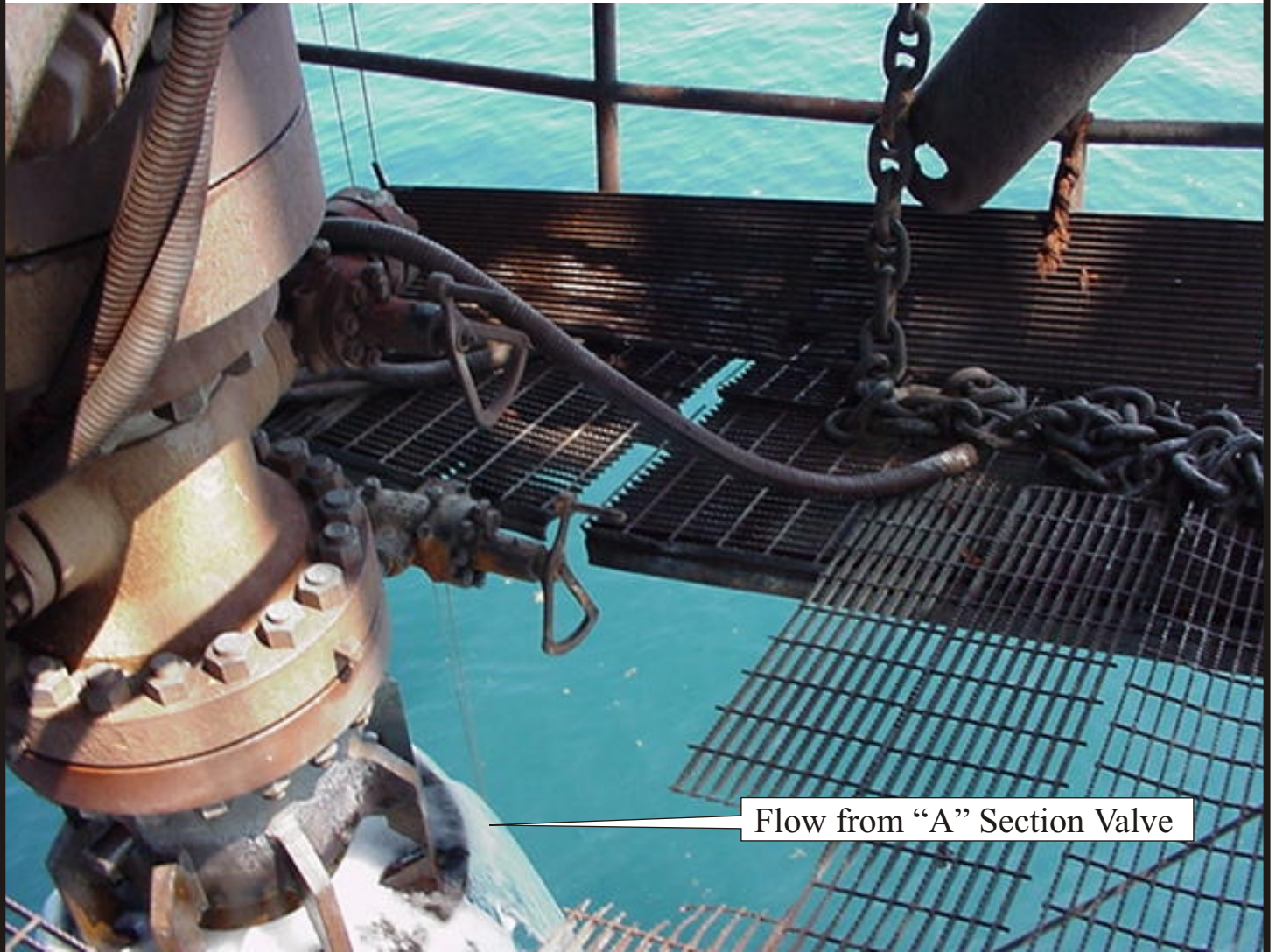
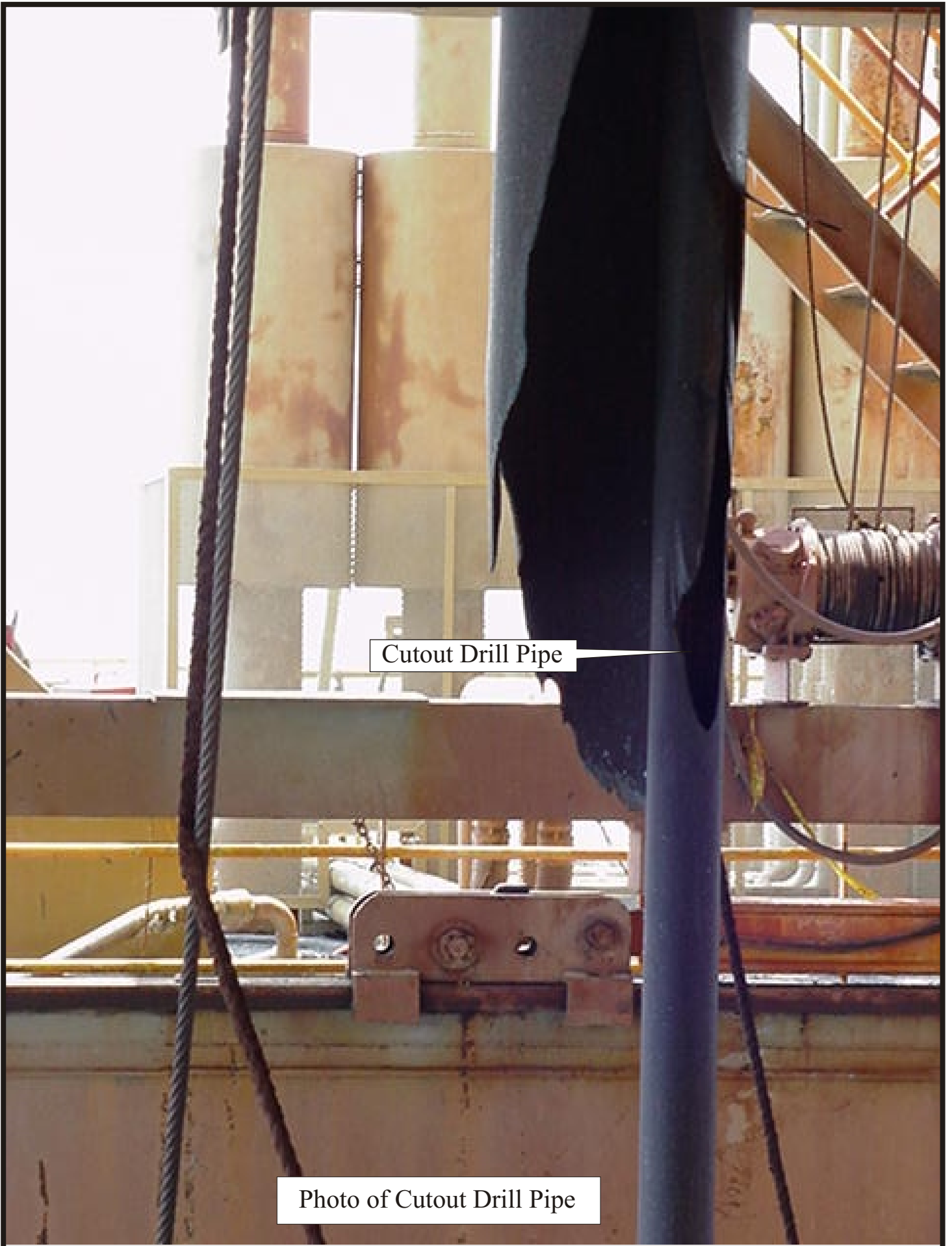


Photo of Flow from "A" Section Valve



Cutout Drill Pipe

Photo of Cutout Drill Pipe



Photo of Worn Drill Pipe Due to Flow up Drill Pipe

Petron Display



Photo of Drillers Console



Photo of Motherboard Being Removed from Petron Display

William G. Helis Company, L.L.C.

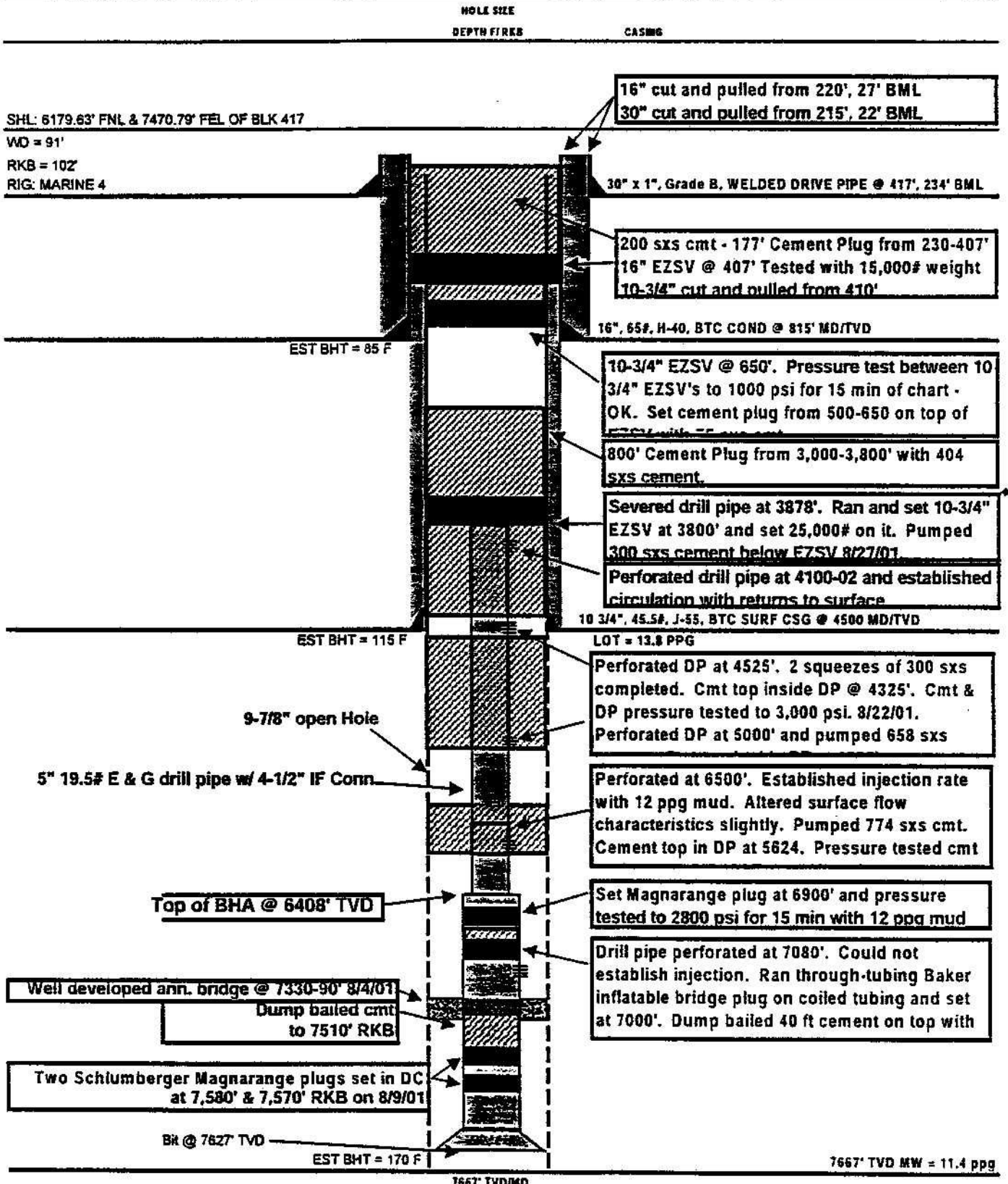
WELLBORE ABANDONMENT SCHEMATIC

COMPLETED 8/30/01

AREA: BRAZOS BLOCK 417

OCS-G 22190 #1

SHOREBASE: FREEPORT @ 23 nm



Drawing of Final Abandonment for Well #1



Photo of Rig Floor Safety Valve at C & H Machine Shop



Photo of Gentleman Trying to Turn the Key Opening on the Rig Floor Safety Valve

Dried mud and cement

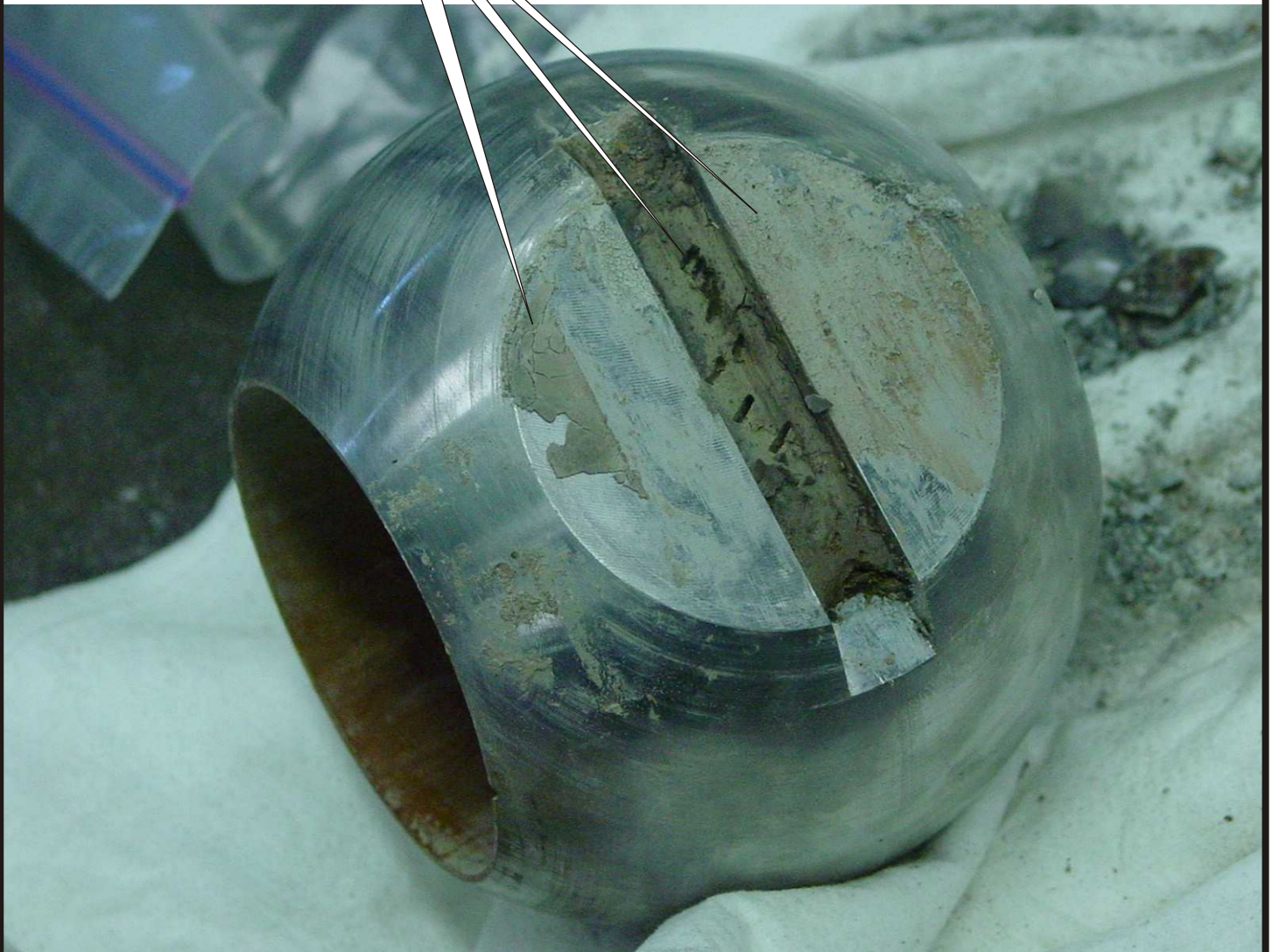


Photo of Ball from Rig Floor Safety Valve with
Mud and Cement on It



Collage of Photos of Damage to Recovered Casing



Photo of Well Flowing from Beneath BOP Stack