

Investigation of Riser Leak
Platform Elly, OCS-P 0300
Pacific OCS Region
September 13, 2002



*U.S. Department of the Interior
Minerals Management Service*

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MMS
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Introduction

Brief Description of Incident

On July 7, 2002, at about 11:35 p.m., a 6-inch diameter oil pipeline failed at the riser-to-flange weldment, resulting in a 9-barrel oil spill. The break occurred approximately 10 feet above Elly's (+) 12-foot elevation lower deck (Attachment 1—Platform Elly). The pipeline is used to transport oil from Platform Edith, operated by Nuevo Energy Company, to Platform Elly, operated by Aera Energy LLC. The pipeline is approximately one mile.

Background

Nuevo operates Platform Edith on Lease OCS-P 0296, in the Beta Unit, offshore Huntington Beach, California. Oil production from Edith is sent to Aera's Platform Elly on Lease OCS-P 0300, via the 6-inch diameter pipeline, which is also operated by Nuevo.

The 6-inch oil pipeline was installed in 1983. The original nominal wall thickness was 0.375 inch and the maximum allowable operating pressure (MAOP) was 1440 psig. In 1998, Nuevo conducted a routine hydro-test in preparation for the pipeline's first high resolution internal inspection. As process changes on Platform Elly allowed the pipeline to operate at a lower pressure, the pipeline was tested at 1125 psig which translates to a lower MAOP of 900 psig.¹ The normal operating pressure of the pipeline is 400 psig.

Cathodic protection for the pipeline is provided by sacrificial anodes. An external subsea pipeline inspection in August 2001 confirmed that the CP readings were in conformance with NACE standard RP-01-69-96, Control of External Corrosion on Underground or Submerged Metallic Pipelines.

In January 2001, Nuevo contracted H. Rosen USA Inc. to perform a high resolution internal survey of the 6-inch oil pipeline. The survey did not detect significant metal loss in the weldment that eventually leaked.

After the leak occurred, non-destructive examinations were conducted on July 10 and 11, 2002. The July 10, 2002, examination revealed surface deterioration approximately 1" from the leak area and evidence of blistering and scale from the area of the leak to the first clamp (approximately 1 foot). The July 11, 2002, examination revealed areas of external corrosion on a 20-foot section of the pipeline riser. This section is located below the failed weldment in the salt

¹ Per 30 CFR 250.1003(b)(2), to up-rate or establish a new MAOP, a pipeline must be hydrostatically tested at a stabilized pressure of at least 1.25 times the targeted MAOP.

spray/splash zone, from approximately the (+) 12-foot elevation to the (-) 10-foot elevation subsea.

Findings

Incident

On July 7, 2002, at about 8:45 p.m., Platform Elly, operated by Aera, lost electrical power. The Nuevo-operated 6" pipeline that transports oil from Platform Edith to Platform Elly automatically shut down due to the loss of pneumatic pressure caused by the power failure at Platform Elly. The personnel on Platform Edith, operated by Nuevo, were not aware that the shutdown valve on Platform Elly had shut their pipeline in, so they allowed the pipeline pump that ships oil intermittently to begin a regular pumping cycle. At 10:08 p.m., a pressure safety high alarm caused the pump to shut down and close the pipeline's shutdown valve. Nuevo's operator acknowledged the alarm and checked on the pressure chart recorder and gauge. The operator then reset the pumps and shipping resumed at 10:13 p.m.

At 10:14 p.m., the PSH sensor actuated again and shut down the shipping pump a second time. Elapsed time between start-up and shutdown was 37 seconds. At this point, Nuevo's operator contacted Aera personnel who said that Platform Elly was down due to loss of power.

At 11:33 p.m., after Platform Elly restored power and pneumatics, Platform Elly personnel manually opened the pipeline valve and notified Platform Edith personnel that they could resume pumping. Within minutes, Aera's operator at Platform Elly observed oil leaking from the riser and immediately radioed Elly's control room, who in turn contacted Edith to shut down the pipeline. The pipeline was immediately shut down at 11:42 p.m.

After the pipeline was shut down, the flow from the riser decreased dramatically; however, some oil continued to escape. Elly personnel screwed an Adam's plug into the quarter-inch hole to completely abate the oil spill (Attachment 2—Adam's Plug).

Review of the chart from the pipeline pressure gauge on Platform Edith confirmed that there was a pressure surge in the pipeline due to the shutdown valve activating prior to the leak being discovered.

On-Scene Findings

On the morning of July 8, 2002, Camarillo District Inspector Ralph Vasquez and Regional Office Petroleum Engineer Cathy Hoffman flew to the Beta Unit to observe the response effort and to investigate the cause of the riser failure. Clean Coastal Waters was on-scene with oil spill response vessels, skimmers, and support boats.

Platform Elly

The MMS investigators first went to Platform Elly, operated by Aera, to examine the quarter-inch hole in the riser (Attachment 3—Failed Riser) and to interview Allen Knowles, the Aera operator who discovered the leak. The area around the riser was badly oiled. Oil was found to have sprayed as far as approximately 30 feet from the riser.

Mr. Knowles described the events that led up to discovering the leak (Attachment 4—Log of Events on Platform Elly-Aera Energy LLC). Mr. Knowles said that Aera and Nuevo did not have any communication procedures in place to notify Nuevo when Aera's Platform Elly or Nuevo's pipeline shut down.

Some obvious external corrosion could be seen on the riser (Attachment 5—External Corrosion on Riser). Aera had just completed painting the Platform Elly structure; however, the riser was not repainted because it was operated by Nuevo. Mr. Knowles said that he was not aware of Aera notifying Nuevo of the riser's condition nor were there any procedures in place for Aera to regularly communicate any concerns related to Nuevo's pipeline on Platform Elly.

Platform Edith

MMS personnel then flew to Platform Edith to interview Nuevo personnel about the incident. Tom Grennel, an operator on Platform Edith, described the events that led up to shutting down the pipeline. The operator confirmed that there were no notification procedures in place between the two platforms to cover shut-in of Platform Elly or the pipeline.

The July 4-11, 2002, chart from the pipeline pressure gauge on Platform Edith (Attachment 6—Pipeline Pressure Gauge Chart from July 11, 2002) shows that the normal operating pressure was 400 psig and that the pipeline shut in at 649 psig; substantially higher than 15% above the normal operating pressure. Upon further investigation, the MMS determined that the Pressure Safety High (PSH) sensors on pumps P-4 and P-5 were set too high, at 649 psig, and should have been set no higher than 460 psig, per MMS regulations at 30 CFR 250.1004(3).

The PSH settings were based on a 7-day proof chart conducted in 1992 (Attachment 7—Proof Chart for Platform Edith Oil Pipeline). The proof chart showed that an abnormal high pressure spike of 590 psig lasting approximately 5 minutes occurred once during the seven days of monitoring. Nuevo incorrectly interpreted this spike to be the high normal operating pressure and set the PSH accordingly at 649 psig. If that proof chart is actually representative of a typical week's pressure range and fluctuation, then ignoring the spike in determining the correct PSH setting would result in a weekly, unnecessary shutdown. However, the spike cannot be considered "normal"; the operator would have to establish, with additional pressure charts and/or explanation as to the cause of the spike, that

the higher pressure should be considered part of the normal operating pressure range. No further substantiation or investigation of the spike pressure was made by the operator.

The MMS verifies the PSH settings against the proof charts at least once a year during the annual inspection, but did not previously determine that the PSH was set too high in this case. Perhaps because no new proof chart had been run in more recent years and no PSH setting adjustments had made since 1992.

Nuevo also reported that the leak detection system for their pipeline has been out of operation since January 2002, because the Federal Communications Commission had cancelled their license for the microwave frequency used to transmit data from Platform Elly to Platform Edith.

Nuevo reported that they were not aware that the riser was in poor condition. They confirmed that Aera personnel had not communicated to them that the riser was showing obvious signs of external corrosion. Nuevo also confirmed that there were no specific procedures in place between the two platform operators for communicating any issues concerning the riser and pipeline.

MMS Regulatory Actions

Inspector Ralph Vasquez issued Nuevo the following Incidents of Noncompliance (INCs) for violating MMS regulations at 30 CFR 250.300(a), 250.107, 250.200, and 250.1004(b)(9).

E-100: "Pollution of offshore waters from ¼" hole in the 6" pipeline riser."

G-110: "Lessee did not perform operation in a safe and workmanlike manner and provide for preservation of property and the environment. Lack of proper operating procedures between Nuevo and Aera."

G-111: "Pipeline riser at Platform Elly not properly maintained resulting in rust, corrosion, cracks, and a leak."

G-116: "Operations are not being conducted in accordance with approved plans. Leak detection system has been inoperable since January 2002."

L-106: "Set point of PSHs on shipping pumps P-4 and P-5 are set at more than 15% above the highest operating range."

The E-100 and G-111 INCs also informed Nuevo that the oil pipeline could not be restarted until the MMS has reviewed the inspection data and the pipeline repair report to verify that the pipeline is safe for operation.

Aera was also issued an INC, for allowing Nuevo's pipeline to continue operating on Platform Elly in its deteriorated condition. The Camarillo District Supervisor determined that permitting the pipeline to operate put Platform Elly personnel at risk and violated the regulations at 30 CFR 250.107(a) which require that an

operator protect health, safety, property and the environment by maintaining all equipment in a safe condition.

G-100: "Pipeline riser at Elly was found to be badly rusted and corroded, posing a danger to the environment and to personnel and equipment at Platform Elly."

Ultrasonic Test Results

On July 11, 2002, ultrasonic tests conducted on the riser indicated that there were two areas of "major concern." In the first area, the test found severe external corrosion on the section of pipeline beginning at a weld just above the surf sleeve and extending down to just below the water line. There was no apparent internal metal loss. The second area is located on the pipeline support at the center leg of the platform. The survey showed severe external corrosion/pitting. Damage in these areas was visually verified.

Pipeline Inspection History

External Inspections

A subsea external inspection of the Platform Edith to Elly pipeline is conducted every two years. The last external inspection was conducted in August 2001. The Cathodic Protection survey conducted as part of the external inspection showed that the pipeline was adequately protected.

A visual inspection of the exposed section of the riser is conducted every year by a Nuevo employee. The 2000 and 2001 visual inspections reported light surface rust to no corrosion on the riser. In February 2002, the visual survey reported that the corrosion on the riser had increased slightly, to "Medium surface rust-measurable, but not detrimental." Nuevo could only speculate on why the visual inspection did not detect the riser's deteriorating condition:

- 1) The condition of the riser at Platform Elly was not bad at the time of the inspection; however, the external corrosion accelerated during the time period from the inspection to the riser leak due to a vulnerable spot in the coating or some other environmental factor(s), or
- 2) The findings of the last visual inspection were erroneous due to a misjudgment by the employee. Although Nuevo does have criteria to quantify the external corrosion, the inspection is very subjective. Without any wall thickness measurements, the employee would have to make a judgment on the severity of the corrosion.

The employee who conducted the visual inspection did not receive any special documented training from Nuevo on identifying and assessing corrosion.

Photographing the riser to document its condition was not done as part of the survey.

Internal Inspection

In January 2001, an internal inspection of the pipeline was conducted using a magnetic flux leakage inspection tool. This was the first internal inspection of the pipeline for wall loss.

The 2001 internal inspection detected 84 wall loss anomalies. The majority of the anomalies were determined to be external corrosion near the Platform Elly riser, in the 20-30% wall loss range, but the largest anomaly, 51% wall loss, was located near Platform Edith.

Using ASME B 31.G "Manual for Determining the Remaining Strength of Corroded Pipelines," Nuevo determined that no remedial action was necessary on the pipeline.

Conclusions

Cause

After review of the circumstances surrounding the incident we conclude that the probable cause of the riser leak was external corrosion. The riser had corroded to the point that it was insufficient to hold the maximum allowable operating pressure and ruptured.

Possible Contributing Cause

Lack of Communication Procedures between Operators

Lack of communication procedures between Nuevo and Aera resulted in Nuevo not being notified by Aera of the riser's deteriorated condition at Platform Elly in a timely manner. Nuevo is responsible for the maintenance of the riser, but the riser is located on a platform operated by Aera. Because the riser is not in the proximity of Nuevo's daily operations, routine inspection of the riser could be overlooked or forgotten. Aera recently repainted the lower deck areas where the riser is located on Platform Elly. The riser was not repainted because it was operated by Nuevo. Although one could see that the riser condition was in disrepair, Aera failed to inform Nuevo of this and Nuevo did not discover this prior to riser leaking.

Aera and Nuevo also lack notification procedures to cover instances when Platform Elly and/or the pipeline are shut-in due to operational difficulties. If Nuevo was alerted that their pipeline was shut-in, Nuevo could have stopped the shipping pumps and avoided over-pressurizing the pipeline, contributing to the leak.

Over-Pressurizing the Pipeline

The oil pipeline's high-pressure sensor located on Platform Edith was set higher than the 15% above the normal operating pressure range specified in our regulations, allowing the riser to experience higher pressures. As the normal operating pressure was approximately 400 psig, the high-pressure sensor should have been set at 460 psig instead of at 649 psig. Had the high-pressure sensor been set correctly, the pipeline pumps would have shut down at a lower pressure, a pressure that the riser's wall thickness may have been sufficient to hold.

Leak Detection System

Nuevo took its leak detection system out of operation in January 2002 without notifying the MMS. The leak detection system might have been able to detect the leak earlier, which would have resulted in a smaller oil spill.

External Corrosion Monitoring Program

The Platform Edith employee who performed the visual survey of the riser in February 2002 was not given any specialized documented training to identify and assess external corrosion. Because the inspection criteria are subjective, the employee may have misjudged the severity of the corrosion, and concluded that although the corrosion was measurable, it was not detrimental to the riser.

Recommendations

MMS Actions

Safety Alert

As this is the second incident of a pipeline riser leaking due to corrosion in three months², the MMS should consider issuing a Safety Alert to lessees concerning the incident. The Safety Alert should emphasize the importance of a comprehensive pipeline inspection program that includes regular visual and ultrasonic test inspections in addition to internal and underwater external inspections. These inspection techniques should be used in concert to provide an accurate and complete assessment of the pipeline's integrity and surrounding environment. The Safety Alert should also recommend the following:

1. Operators should consider performing a UT inspection on risers that have not been UT inspected in the last five years (or a lesser period, if the product being transported contains H₂S).
2. The minimum allowable wall thicknesses should be determined prior to UT inspections and conveyed to both the UT inspection technician and appropriate platform personnel.
3. The platform foreman should have authority to shut down any equipment and/or the platform immediately if an UT inspection identifies a riser with a wall thickness at or near the minimum allowable or a visual inspection discovers an area with severe corrosion.

Inspections

The MMS should consider incorporating the following into its inspection checklist(s).

Visual Inspection: During inspections for Potential INCs (PINC) G-110³ and G-111⁴, routinely perform visual inspections of pipeline risers to ensure that they are properly maintained.

² The first incident occurred on Platform C in May 2002. It did not result in a pollution release into the ocean.

³ PINC G-110: "Does the Lessee perform all operations in a safe and workmanlike manner and provide for the preservation and conservation of property and the environment?"

⁴ PINC G-111: "Does the Lessee maintain all equipment in a safe condition to provide for the protection of the lease and associated facilities?"

Pressure Charts: Under PINC L-106⁵, carefully review the proof pressure charts to ensure that the normal operating pressure range has been correctly identified, that the PSH is set accordingly, and that the pipeline is operating at the normal operating pressure range.

Leak Detection: Verify that the leak detection system is operational. If the leak detection system is not operating and a waiver was not granted by the Regional Supervisor, the inspector should consider issuing an INC under G-116⁶. The Regional Supervisor/District Supervisor may direct shutting-in of the pipeline, and/or recommend that civil penalty review be initiated.

Nuevo Energy Company Actions

Operations Plan

Nuevo's operations plan should include procedures for information exchange with Aera regarding the condition of Nuevo's oil riser and piping on Platform Elly and notification when Platform Elly shuts down. The plan should also include an inspection schedule of Nuevo's piping on Platform Elly and prescribe procedures to initiate an emergency shut-in of Platform Edith or a component when a pipeline inspection, either visual or UT, shows wall loss anomalies to be at or near the minimum allowable thickness.

Training for Monitoring Program

Nuevo should ensure that personnel performing visual inspections of piping and risers are adequately trained to identify corrosion or anomalies and can accurately assess their severity. Documenting the condition of the risers, including videotaping or photographing the risers, regardless of their condition, should be incorporated into the visual inspection program.

Aera Energy LLC Actions

Aera should work with Nuevo to ensure that there are effective procedures in place to expeditiously communicate pipeline conditions and platform and pipeline shut-ins.

⁵ PINC L-106: "Is the PSH on each pipeline pump set no higher than 15% above the highest pressure in the operating range and not above the pipeline's MAOP?"

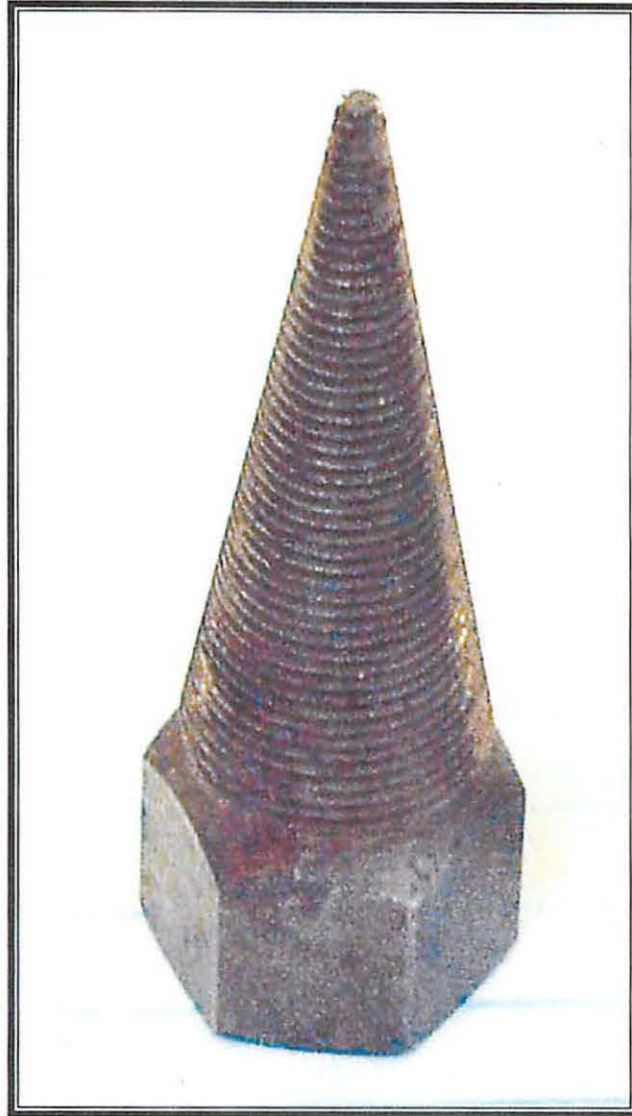
⁶ PINC G-116: "Are operations conducted in accordance with approved plans?"

Attachments

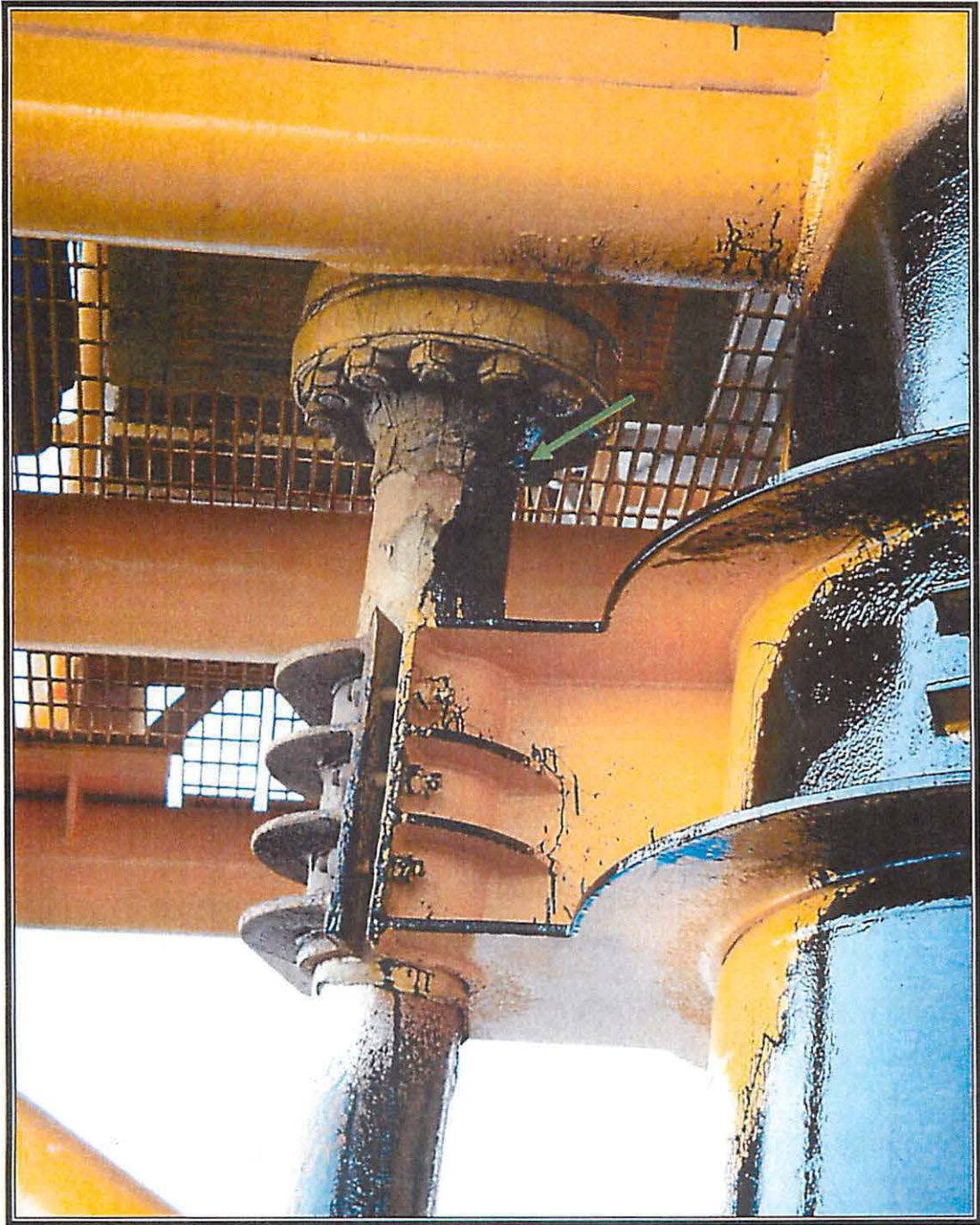
Attachment 1 – Platform Elly



Attachment 2 -- Adam's Plug (Device Used to Seal ¼-inch Hole in Pipeline Riser)



Attachment 3 -- Failed Riser



Attachment 4 -- Log of Events on Platform Elly, Aera Energy LLC

Sequence of events as extracted from Elly Control Room notes, Elly Facility Operator Notes and conversations with acting Aera Person In Charge (Allan Knowles)

7/7/02 Sunday

20:45 J01B went down on "high fuel gas pressure" while adjusting Gas regulator. Low gas pressure was noted earlier and an attempt was being made to increase the pressure. Made repairs to J01B.

22:45 J01C back up and running on diesel.

23:30 Edith given the go ahead to re-initiate shipping to Elly.

23:35 Allen Knowles was working with the mechanics on Turbines. When Allan stepped out of the turbine package on the N/W corner of the +45 Deck on Elly he looked through the grating and noted oil on leg of platform. Allen notified Control Room on Elly to call Edith and tell them to shutdown shipping operations.

➤ Allan went to Edith's S/D valve located on Platform Elly and closed their S/D valve to stop incoming fluid.
- Aut marker BuoyS in water

23:45 Elly Control Room Operator called MMS to inform them of the spill. Also called CCW to respond to spill. Tony DeVito was notified of incident at his home. Tony left message on Milan Steube's home phone and contacted Scott Corby.

** Installed Tapered plug in hole in A/AE ..*

7/8/02 Monday

00:05 Dave Redmond notified Control Room that the Clean Waters 1 vessel would be leaving their dock in Long Beach at 00:15.. */Ship Serv. Boat Also.*

00:15 Notified Coast Guard of spill incident. Left message on National Response Centers phone.

00:35 Platform Operator on Eureka called Control Room to report sheen in water between Elly/Ellen and Eureka.

00:45 Platform Operator on Eureka informed Control Room operator that sheen was approximately 100 ft. long and as wide as the platform.

01:55 CCW on scene and located sheen N/W of Eureka. CCW deployed their own boom and said they'd let us know if they needed any assistance.

03:50 4 Operations people from Edith/Nuevo came to Elly to inspect the pipeline leak area.

05:15 Arrived at Heliport in Huntington Beach to catch flight.

05:45 John Degner (CCW) and Dave Carr (Nuevo) arrived at Heliport. Tony DeVito spoke with Tony McCullough (Nuevo) about their plans. ACTI being mobilized by Nuevo to begin clean up of Platform Elly lower level.

06:45 Tony DeVito, John Degner and Dave Carr flew over platforms to inspect sheen area. (See Sketch)

7:15 Tony DeVito spoke with Carlos Carrion (State Lands Commission) who called to check on the incident.

07:30 Allan Knowles talked with Ralph Vazquez (MMS) about current situation

Attachment 5 -- External Corrosion on Riser



Attachment 6 -- Pipeline Pressure Gauge Chart from July 11, 2002

