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History of the Offshore Oil and Gas Industry in Southern Louisiana

Interim Report

Volume I: Papers on the Evolving Offshore Industry

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1. Introduction and Background

The evolution of the oil and gas industry and its movement to the offshore has been one of the fundamental forces shaping Louisiana's culture, geography, society and economy during the twentieth century. In the late 1920's and into the '30's, the lakes, marshes and bayous of southern Louisiana began to rival the famous Spindletop salt dome in neighboring Texas in the production of fossil fuels. Workers flocked in from northern Louisiana, Arkansas, Oklahoma, Texas – all of them "Texians" to the local shrimpers, trappers, and farmers. The locals, for the most part, accommodated the outsiders. And many soon found jobs as roustabouts, roughnecks, and drillers with the big operators - the Texas Company, the California Company, Humble, and Shell. Others put their invaluable knowledge of the waters and the marshes to good advantage. The Texians needed these skills to explore the foreign geography of the coast.

A consortium of companies led by Kerr-McGee and Phillips Petroleum completed the first out-of-sight-of-land well in 1947 off Morgan City, marking a new phase in the evolution of Louisiana's oil and gas industry. Hamlets and towns would be transformed to support the offshore industry, which now is producing oil and gas in water depths of 8,000 feet, 200 miles off the coastlines of Alabama, Mississippi, Louisiana, and Texas.

As a collection of structures, the more than 4,000 offshore platforms represent a significant part of the nation's stock of productive physical capital. As habitat for fish and other sea life, these structures are some of the largest additions to a natural ecosystem ever made as a consequence of human activity. The repercussions on labor markets and local economies of the movement offshore changed communities, institutions and businesses all along the coast of the Gulf of Mexico in fundamental and defining ways. New Orleans, linked to Harvey on the opposite bank of the Mississippi River, became a regional hub of operations for offshore activities, second only to Houston. Morgan City and Houma grew as fabrication centers and staging bases for the offshore rigs and platforms. Humble Oil Company built its headquarters on the barrier island at Grand Isle, as did Freeport at its company town of Port Sulphur along the lower Mississippi River. Lafayette aggressively led as a regional administrative oil center. In the often indeterminate edge between land and water, ports were built to access the Gulf. The envy of these now is Port Fourchon at the end of Highway 1 along Bayou Lafourche, supplying and servicing the newest expanse of deepwater exploration and production.

The history of the offshore oil and gas industry in Louisiana is also a story of national and international diffusion and influence. Corporations and businesses that were born in the Gulf grew and expanded to distant corners of the world. In addition to the oil and gas companies that made their home in the Gulf, regional entrepreneurs found a fertile ground for developing businesses to provide specialty services and supplies to the offshore oil and gas industry. Both the oil and gas companies and the myriad service and supply companies depended on ever-expanding technologies that were imported from, and later exported to, places outside the region.

Yet the story of how this came about -- how the offshore oil and gas industry progressed from humble beginnings to an information-intensive force whose ability to perform in hostile environments is often compared to the manned space program--is not well known or understood.

Even less well documented are the effects that the evolution of the offshore oil and gas industry has had on coastal communities and institutions.

1.1. Project Objectives

The purpose of this project is to study, document and explain this evolution in an objective and comprehensive way. A critical element of the history of the offshore industry resides in the memories of the "old timers." They were there. They remember how things were and how they have changed. Unfortunately, many of the people responsible for this phenomenal growth are passing away and their stories are being lost. There is a long list of innovators and pioneers from fabricators, port officials, helicopter pilots and catering crews, to divers, truckers, suppliers, boat captains and able-bodied seamen. They are all part of the growth and development of the industry. There are also civic leaders, business owners, spouses and family members who felt firsthand the impacts of this industry. The oral history record that has been built through this study has depended on the active participation of a diverse cross section of people with direct experience with the oil and gas industry and its effects.

1.2. Rationale

The Minerals Management Service (MMS) has sponsored and organized this study, and its motivation is in part internal. Both legally and operationally, the agency is required to evaluate and document how its activities and policies affect the communities and economies within which it functions. A comprehensive and accessible history of the evolution of the industry, and its effects on the people and institutions of the coastal economy, will assist those who are responsible for planning and managing the development of the offshore oil and gas reserves and understanding the consequences of such development on coastal institutions and the economy.

However, the project has value that extends beyond its use to the MMS. It fills a gap in the existing literature by addressing the growth and development of the petroleum industry and the related service industries in Louisiana that took exploration and development into the coastal zone and, then, into deeper and deeper offshore waters. In addition to its published reports and documents, this project is creating an organized archive of materials that can be used efficiently by other scholars and researchers. State agencies and local communities will also be able to use the materials to better understand the historical context of issues and problems of interest to them.

When the project initially was proposed, the Social Science Subcommittee of the Scientific Committee, several MMS Headquarters and GOM staff, members of the business and academic communities, and local civic leaders and educators argued that the project was timely and supported its funding. Reasons they gave included:

1) The offshore industry and its associated support industries are little known or understood and their dynamic role in the U.S. economy is virtually invisible. Research that gives this industry a "human face" would be a contribution to the OCS program, Louisiana, and the country.

2) The National Environmental Policy Act (NEPA) charges MMS with documenting the social and economic effects of the industry. The National Research Council's (NRC) assessment of the studies program noted that the fifty-year history of offshore oil provides a natural laboratory for studying its effects. To "calibrate" this laboratory, the changing dynamics of the industry (such as its technological evolution, changes in business practices, changes in financing) must be documented and analyzed.

3) MMS is charged by NEPA with assessing the cumulative effects of the industry. This history will provide what in many respects will be the most comprehensive and accessible source for discussing such cumulative effects.

approach, much of the effort has focused on the collection and analysis of oral histories and life stories. This reflects the study's goal of telling the story from the perspective of those who made the industry, who lived within its midst, and who now look back at the trials and accomplishments from a new century's circumstances and expectations.

Information collected in this project is being synthesized and summarized in a series of project reports. In addition, all of the primary information collected is being organized and cataloged in archives that will be available to scholars, industry analysts, community officials, local historians, and others interested in the industry or region. An interim archive for all materials collected for the project will be established in the Library of the Center for Energy Studies at LSU. A permanent special collection at the T. Harry Williams Center for Oral History will be established if the necessary funding can be secured. Other libraries and universities may establish archives in other localities in the region.

1.4. Organization of the Project

The project has been financed through a cooperative agreement between MMS and Louisiana State University (LSU). The Center for Energy Studies at LSU, under Allan Pulsipher, oversees the administration of the study and is responsible for the final deliverables. Harry Luton at MMS oversees the project and is the agency liaison.

The execution of the project, however, is decentralized with subcontractors supported via the cooperative agreement responsible for most of the research. The principal subcontractors are:

1) University of Houston/History International. Joseph Pratt and Tyler Priest are experienced historians who have specialized in the Gulf of Mexico oil and gas industry, producing several industry histories (the latest on Brown and Root) as well as more general studies. They are conducting interviews with corporate leaders, providing analysis and synthesis for the project and serving as liaisons to the Offshore Energy Center in Galveston, Texas.

2) University of Arizona, Bureau of Applied Research in Anthropology. Diane Austin and Thomas McGuire are experienced applied anthropologists who are experts in community-level studies. They conducted the MMS study of social and economic impacts (USDOI, MMS, 2002) and are responsible for collecting, cataloguing, summarizing, and synthesizing hundreds of interviews within the communities of southern Louisiana.

3) University of Louisiana at Lafayette, Public History Program and Department of Sociology. Robert Carriker directs the Public History Program and Robert Grambling, a sociologist, has long experience researching the social impacts of the Louisiana offshore petroleum industry. Their research efforts are focused in and around Lafayette.

In addition to administering the study, LSU researchers from the Center for Energy Studies, which has a history of successful research on Louisiana onshore and offshore oil and gas industry, are helping to gather and synthesize data. The Center maintains specialized databases and information on Louisiana energy industries. Also involved, as an initiator and participant, is Don Davis, a geographer who was studied Louisiana's coastal landscape and culture. He also directs the Louisiana Oil Spill Research and Development Program (OSRADP) and serves as a liaison with the State of Louisiana agencies, and the oil and gas industry.

1.5. Organization of the Interim Report

Because of the extensive amount of material included, the final report will be organized as a series of separate volumes. The interim report follows this format.

The first volume includes the introduction and four analytical papers. Each deals with an important aspect of the evolution of the offshore oil and gas industry. Although each paper is still subject to revision and extension, the papers exemplify the type of information the project will produce and the style in which it will be presented.

In the first paper, Joseph Pratt investigates the relationship between hurricanes and the development of industry culture, attitudes and practices. Next, Tyler Priest examines the history of federal leasing from a two-man operation to the creation of a full-blown federal agency. In the third paper, he analyzes the development of technologies and strategies for petroleum exploration in the offshore. The fourth analytical paper is Diane Austin's history of commercial oilfield diving and its relationship to the people and communities in which it developed and grew. Also included with these three papers are a description of the work plan and additional products that Pratt and Priest plan to include in the final report.

The second volume of the report is Thomas McGuire's *Bayou Lafourche: An Oral History of the Development of the Oil and Gas Industry*. It uses extended excerpts from oral history interviews for a broad look at the impact of the industry on a single geographic region. Monograph length, it provides an alternate format for presenting the rich data being collected in this study.

The third volume of the interim report, produced at the University of Arizona, illustrates how the information gathered during the interviews is being organized. It begins with a sample of the photos that were shared during some of the interviews and excerpts from interviews conducted with the individuals who contributed the photos. Together, these photos and descriptions provide a unique visual dimension to the history. The photos and excerpts are followed by samples drawn from the full database of interviews. Within that database, which includes background details and summaries of all the interviews, information about the interviewees and what they discussed is distilled for researchers and others interested in using the collected materials.

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2. The Brave and the Foolhardy: Hurricanes and the Early Offshore Oil Industry

When the oil industry moved offshore into the Gulf of Mexico after World War II, it plunged into an ocean of ignorance. Little was known about conditions in the Gulf. As the industry sought to adapt technologies developed onshore to the challenges of operations in the open sea, it also had to collect basic data about wind, waves, and soil offshore. Every-day operations offshore required engineering adjustments in the design of drilling rigs, pipelines, and construction equipment. And out there beyond the horizon loomed an engineer's nightmare, the extreme, unpredictable conditions generated by hurricanes (Veldman and Lagers 1997; Pratt et al., 1997).

Those seeking to develop a technological system capable of finding and retrieving oil and natural gas from underneath the ocean faced formidable challenges in defining basic design criteria. Traditional engineering calculations could estimate the environmental forces that would come to bear on the equipment and structures needed to produce oil, but such calculations could be made only after the collection of data about these forces of nature. How strong would the winds blow? How high could hurricane-driven waves be expected to crest? How solid was the foundation provided by the soft, sandy bottom of the Gulf of Mexico, and how would this soil be affected by hurricanes? Underlying these questions was another, more practical one: How much were oil companies willing to spend in order to develop safe, durable offshore structures?

It was at yet unclear if offshore oil could be developed in a way that made it competitive in price with oil produced onshore in the United States and with growing imports from Venezuela and

In developing new, the offshore industry could draw on previous experiences gained near the shore in California and in a variety of inland waters around the world. Before the 1930s, oil had been developed off the southern California coast near Summerland using a system of trestles that reached out into the edge of the Pacific Ocean to tap oilfields that extended from known onshore

The oil industry first stuck its toe into the Gulf of Mexico to test the waters before World War II, and the results of these early forays identified several key problems presented by storms. In the late 1930s, Humble Oil (then a Houston-based, majority-owned subsidiary of Standard Oil of New Jersey) constructed one of the first drilling sites in the Gulf at McFadden Beach, south of the giant refineries at Port Arthur, Texas. Borrowing from the approach that had proved successful in southern California, the company extended a trestle more than a mile out from shore, with drilling rigs at the end of the line supported by me coast from Cameron, meaning that all men and supplies came to the platform via a long and often rough ride out in shrimp boats leased for this purpose. A one-way ride might take up to an hour and a half. Without communication between the supply point, the boats, and the platforms, the shrimp boats often arrived at the platform only to find seas at the site too rough to allow workers to transfer from the boat to the platform. Rope ladders hanging from the platform could be lowered down to the deck of the shrimp boats in relatively calm waters, but not in rough seas. In the thick fog that often hovered over the platform, boat captains would at times simply cut their engines and listen for noise from the platform in order to find this man-made island. From the start, it was understood that in the event of a major storm, the men would be evacuated after the equipment on the deck had been secured.

The Creole platform proved quite successful in finding and producing oil. Using directional drilling to tap the field at several surrounding locations, it produced over four million barrels of oil over the next thirty years, during which time it was constantly upgraded as the offshore industry became more experienced at construction. Alcorn proved farsighted on one key point. In 1940 a small hurricane moved through the region, sweeping the deck into the ocean and badly damaging the piles. Crews drove some new piles, quickly rebuilt the deck, and the platform returned to production, the first offshore structure in the Gulf to survive a hurricane (*Offshore* 1963, pages 17-19).

World War II halted development in the Gulf. Workers on several small platforms being built offshore in 1942 remember scanning the horizon nervously in search of the periscopes of German submarines. But the war set in motion several processes that proved quite helpful to the offshore industry when peace returned. First and foremost was the work of the U.S. Army's oceanography and weather service, which created a corps of well-trained specialists who forecast wind, wave, and soil conditions for use in the amphibious landings in northern Africa, Normandy, and the Pacific. These "weather officers" accumulated data on the behavior of waves and soils in different storm conditions. From such information they sought to predict whether conditions at a specified place and time might be appropriate for an amphibious landing. Several of the weather officers led the industry's post-war efforts to collect and interpret better data on winds, waves, and soil in the Gulf of Mexico. Their methodology—using observations of past conditions to help forecast current and future conditions—evolved into much more sophisticated methods of "hindcasting" hurricanes as a way to more fully understand and predict the returned eager to get back to normal work and family lives. They came back with a sense of urgency and a sense of adventure, two characteristics required of those who leaped out into the Gulf in search of oil after World War II.

using chain two inches in diameter to hold these large vessels alongside small platforms. Company engineers designed the ship's anchoring system to withstand 100 mile per hour winds. To accommodate the height of the tender, decks on the small platforms were as high as 34 to 44 feet above the ocean. Men and equipment moved from the tender to the platform over a bridge that could be raised from the vessel to the deck. So difficult was passage over this bridge in rough seas that workers came to call it "the widow maker." If a hurricane seemed likely to affect

The API took the lead in the collection of other sorts of data on the soil in and along the Gulf. In 1951 the Institute launched what came to be known as Project 51, which spent four years undertaking basic work on conditions in the Gulf, using core drillings, serial mapping, and seismic surveys. This work, as well as that of McClelland Engineers, provided fundamental information vital to the safe construction of offshore structures. It did not, however, directly address a question that was later revealed as important: what would be the reaction of soil in various parts of the Gulf to the extreme conditions generated by severe hurricanes.

Other research studied the force of waves on offshore structures, both in normal times and in times of extreme weather. Here the oceanography department at Texas A & M University led the way. C.L. Bretschneider and Robert Reid, two more former weather officers, cooperated with several major oil companies to conduct field measurements to determine the wave forces exerted on vertical cylinders placed in the ocean. J. R. Morison later added considerations of inertial components to this work (Reid, personal communication, 1998).

Other primary research was much more directly tied to hurricanes. From 1947 into the 1970s, extreme wave heights remained a critical question on the minds of offshore engineers. This question was attacked from two directions. The first sought to develop better means to track storms and to predict where they would hit; the second sought better information about the maximum height of waves that could be expected in different parts of the Gulf. Weather forecasting in general had advanced steadily over the decades before World War II, but the offshore industry needed more detailed and more frequent forecasts than the U.S. Weather Service could make available to them. To meet this demand, A.H.Glenn, a former weather officer with graduate training at the Scripps Institute of Oceanography and U.C.L.A., mustered out of the U.S. Air Force and created Glenn and Associates, a New Orleans-based weather forecasting agency designed to meet the special needs of operators of offshore facilities. Glenn and others made great strides in using historical data about past hurricanes to “hindcast” the path and the intensity of future hurricanes. By analyzing all available information about past hurricanes with sophisticated theoretical models of the behavior of winds and waves, Glenn and a growing group of hindcasters gave platform designers a much-improved understanding of potential wave forces while beginning the process of categorizing Tw[(potent hi)]TJaricanes D0d

The king of the wave consultants in this era was W. H. Munk, a former weather officer who had forecast weather conditions for the Normandy invasion. After analyzing existing data with theoretical models of wave formation and behavior, Munk settled on a maximum wave height of about 25 feet and a recommended deck height of 32 feet above the water. With a wide range of "expert" opinions from which to choose, companies designed their platforms based on their a time when anyone was crazy enough to try to build a platform in the open ocean and place men and equipment on it…We had to go on theory, and the hurricane…caused Chevron to start thinking about placing wave measuring equipment on a platform offshore" (Besse interview by Offshore Energy Center, 2000).

Others agreed that it was time to obtain better measurements of wave heights. After Chevron installed three separate pilings in the Gulf with devices to sort out the key questions facing them? Were mobile drilling rigs vessels or drilling rigs? Should their workers be considered seamen or drillers? Was a blow-out of an oil well in the ocean the same as an explosion at sea? Providing legally binding answers to such questions was the first step in providing adequate coverage for offshore operations (Pike 1949, pages 49 and 108-109).

radar system and with the four daily observations submitted from the rigs of subscriber companies. The companies could have personal consultations with meteorologists if in doubt about storms. In this era before satellite observations, the offshore industry had far superior information about storms than was available to others; its special needs gradually led to the improvement of forecasting in general (*The Calco News* 1949, pages 3-4).

An overview of the response of this system of operations when faced with a hurricane comes from an article in the *Humble Way*, the employee magazine of Humble Oil. In this case, the weather forecasting service warned the company of a gathering storm that might ultimately pass over one of its major facilities. Careful monitoring of the storm convinced management to prepare for the worst. Workers then cleared the decks of the small platform in use at the site, storing some materials in the tender vessel, which was then battened down and moved away from the platform using winches on the mooring system. After anchoring the tender, workers evacuated in ships. Once the storm had passed with little damage, the workers returned and the platform was back in production the next day (*The Humble News* 1956, pages 18-21).

Humble was, of course, a major company with well-built platforms and well-developed safety procedures. The storm that threatened its facility was relatively small and did not score a direct hit. In 1956 and 1957, Humble and the rest of the companies in the Gulf had a more demanding test, as two fairly large hurricanes passed through areas with numerous offshore platforms.

The first was Hurricane Flossie, which moved through clusters of facilities offshore near the western edge of Louisiana in September of 1956. Labeled the “first real hurricane test” for offshore operators since drilling activity began in 1947, Flossie unleashed 110 mile per hour winds and 15 to 6H5ning act1595s3.D0.0001 Tcvity bega trade magazine writer gave an optimistic interpretation of the lesson of Flossie: “The greatest fears of the offshore oil operators have been dispelled by the arrival of Hurricane Flossie.” This “full-blown hurricane” had shown conclusively that the industry’s “engineering estimates were correct” (Bailey 1958; Calvert 1957b, pages 48-51).

Nine months later, Hurricane Audrey, the first major hurricane to skirt Louisiana’s “offshore alley,” inflicted expensive damage, reminding the industry that it still had not experienced the effects of the direct hit of a major storm. In June of 1957, this storm arose quickly in the Bay of Campeche, took a straight path up toward the Texas-Louisiana state line, and slammed ashore at Cameron killing 400 to 500 people. It is remembered in the region as the deadliest hurricane since the Galveston storm of 1900, and it remains the sixth deadliest hurricane in U.S. history. Yet damage offshore was relatively minor. One mobile drilling rig sank in the storm and four tenders suffered damage when they pulled loose from their moorings and ran aground. Estimated damage to all offshore facilities reached about $16 million (*Offshore Drilling* 1957; *Offshore* 1957).

What registered most clearly in the harsh aftermath of the storm was that the offshore industry had fared dramatically better than the communities along the coast. After helping clean up the carnage in Cameron, the industry reflected that “forethought minimized hurricane damage to offshore installations.” On the key issue, the industry’s record remained spotless: not a single life was lost offshore in Audrey. Two offshore workers reportedly died, but only after they had been evacuated from a platform to an interior location and then chose to return to Cameron to try to protect their homes. In its overview of the “scars” left by Audrey, one of the major offshore trade journals concluded that the “the industry has scored an overwhelming though costly victory” (*Offshore Drilling* 1957, page 25; *The Humble Way* 1957b, pages 8-9).

The industry could not be quite so optimistic concerning the performance of mobile drilling rigs. In quick succession in 1956 and 1957, five mobile rigs capsized--four in the Gulf of Mexico and one off Qatar in the Middle East. Some were in rough waters; one was at dock being readied for sea. These five disasters caused more than $7 million in damages, with 13 fatalities in the four accidents in the Gulf of Mexico. The first imp

To address such issues, the API committee engaged the services of Herbert Riehl, a professor of meteorology at the University of Chicago, to prepare a “think piece” on what was known about hurricanes and what sorts of research were needed to advance knowledge. In the years from 1956 through 1962, the committee explored these issues with the best available theoretical ideas about hurricane formation and motion and the creative use of data supplied by A.H. Glenn on past hurricanes and potential hurricanes that did not develop. The committee, like the oil industry as a whole in these years, made use of rudimentary computers. Computer analysis helped the committee improve the art and science of hindcasting, giving the designers of offshore equipment useful information on which to base design criteria. In 1962 the API decided to spun into the Gulf and grew into a very scary storm, with winds estimated as high as 150 miles per hour. As it moved over cooler waters toward landfall in central Louisiana, the storm lost force while slowly moving through offshore facilities valued at more than $350 million. In the words of one executive from a company that suffered severe damage, "Instead of spreading out over a big area…, she seemed to gather her energy into one tight mass and moved in and really tore things up."[5] When the sun came out after the storm, clean-up crews returning to the evacuated platforms found stunning devastation. Losses reached more than $100 million, with 13 platforms destroyed and 5 more damaged beyond repair. Hilda had delivered a jolt of reality to an industry grown complacent about the power of major hurricanes (*Offshore* 1965, pages 26-28).

One response was a meeting of concerned offshore operators at the Roosevelt Hotel in New Orleans in November of 1964. 64 people attended, including representatives of most of the major oil companies active in the Gulf, the major contractors, gas transmission companies with pipelines in the Gulf, oceanographic consultants, and several university researchers. No organization called the conference; it came about because Hilda scared individuals into action. Those who had previously been satisfied to go it alone in designing offshore platforms now

Near the end of the meeting Griff Lee took the floor to review “the complete failure” of a major platform that his company, McDermott, had recently built for Union Oil. Lee included a pointed reminder that McDermott had used A.H. Glenn’s predictions of the forces generated by a 25-year storm in designing the platform. An examination of the wreckage made it clear that Glenn’s estimates had been much too low. Working from severely flawed design data, the company had produced a severely flawed design with a lower deck that, at least in retrospect, had no realistic chance of surviving the fury of Hilda’s waves.

The analysis of the problems with the design of this destroyed platform had a hard practical edge, since its twin had been loaded on a barge awaiting installation at a nearby site when Hilda hit. Lee gave the audience a classic account of engineering on the run, relating how McDermott had carefully studied the destroyed platform to make “some reasonable modifications of the offshore industry as a whole received another unmistakable warning that it had not correctly understood the risks posed by major hurricanes (*Drilling* 1965, pages 46-48).

Insurance could ease the financial pain only if insurers continued to accept the extreme risks of providing coverage for moble drilling rigs. “Maverick’s” destruction was only the latest in a line of accidents involving such rigs, and underwriters had begun to revisit the question of whether this segment of the offshore industry might be uninsurable. A representative of John L. Wortham & Son, a major Houston-based insurance company, acknowledged that the “tremendous risks” required “extra efforts” from insurers. Others in the underwriting business continued to debate the basic issue of whether a mobile drilling rig should be insured as a vessel or as a drilling rig, its workers as “landlubbers or seamen.” The compromise gradually struck was to take greater care for making the rigs safer as they were towed to the drilling site by having inspections of them by experienced naval architects while th been had the storm taken a track 100 miles to the west through the heart of offshore alley. But the "quality," as well as the quantity, of damage drew as much attention as the astonishing reality of a 70-foot wave in the Gulf. Included in the platforms destroyed were three modern ones installed by Shell, the generally acknowledged leader in offshore design. One of these was only five months old and was at the time th about the power of severe storms in the Gulf, and the offshore industry responded by taking a hard, collective look at its traditional assumptions.

They did so within two important new venues for cooperation among oil companies, construction companies, and consultants. After its establishment in 1966, the API's Offshore Committee quickly grew into an effective instrument for defining, publicizing, and modifying the best possible standards for offshore operations. The definition of industry standards had been an important part of the work of the API, which was ideally suited to bring together experts from various areas of the industry to share information about best practices. The Offshore Committee simply extended this tradition to matters concerning standards of safety and design offshore. The sharing of basic research on various aspects of offshore operations went forward after 1969 at the Offshore Technology Conference (OTC), an annual meeting where industry specialists gathered to present papers about their research. Both researchers and standard-setters could take advantage of the growing power and availability of better computers.

Peter Marshall, a Shell engineer who entered the offshore industry in 1962, summarized the difference between the early days and the years after the coming of computer-assisted design: "Intuitive design and an entrepreneurial spirit gave way to computers and an era of no surprises." Marshall summarized the key change in attitude with the simple declaration that "we were less afraid of failure then." He lamented the passing of the days when offshore engineers had been given greater latitude to do their jobs more creatively while accepting more risk.

Marshall was even able to joke about his own strange experience with failure. He designed a platform installed in 1965 in 283 feet of water, earning the record for water depth. Two days after its installation, almost before he could brag about his efforts, the platform suffered severe damage during Hurricane Betsy. Examination of the platform revealed pieces of the "Bluewater 1." When built by Shell in the early 1960s, this semi-submersible had been an epoch-defining technological break-through in offshore drilling. Hurricane Flossie had capsized the vessel in 1964. As a new owner readied it to return to work the next year, Hurricane Betsy displayed a stormy sense of irony by sending it careening into its former company's record-holding platform (Marshall, personal communication, 2002).

Such events make good stories, at least after the passage of a few decades. But do they also illustrate the folly of "entrepreneurial engineering"? Looking back at the formative years in the Gulf of Mexico, several things stand out. Fortunately, the emphasis on good forecasting and early evacuation meant that few people died or were seriously injured offshore in hurricanes.[11] The scanty accounts that exist suggest pollution from storm-related damage was not extreme. With risks managed through insurance and improvements in designs, property damages were not high enough to stop the movement into deeper waters. All in all, taking "calculated risks" and then fixing mistakes exposed by hurricanes on the run allowed the offshore industry to push through its ignorance and develop much needed domestic oil and natural gas reserves.

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[11] Overall, the offshore industry had more serious safety problems in such areas as the development of deep water diving and blow-outs of offshore wells, especially in the early years, when mobile drilling rigs also presented

Looking back on this process from the perspective of fifty years of work on offshore structures, Griff Lee offers a sobering appraisal that suggests how little the industry knew as it plunged into the Gulf of Mexico: “In light of today’s data, the early load estimates were off (too low) by a factor of ten.” A factor of ten would seem to be well past the threshold where the brave become the foolhardy. But in the American offshore oil industry of the post-World War II era, this distinction was blurred by a combination of unusually good weather, extraordinary technical innovations, and the systematic efforts of good engineers and work forces to recognize and fix problems exposed by one of the strongest, most unpredictable forces in nature, the hurricane.

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3. History of U.S. Oil and Gas Leasing on the Outer Continental Shelf

3.1. Introduction

The ocean is the last earth-bound frontier. For all of human history, it has beguiled those who ventured across or beneath it, from Christopher Columbus to Chester Nimitz, from Captain Ahab to Captain Nemo. Traditional discourses on the ocean focus on its mysteries, its alien allure. These discourses see the open sea as undeveloped and lawless. It yields bounty and resources, but remains distinctly outside the realm of state territory or human institutions. It is a space *across* which trade is conducted and power is projected, void of social processes and antithetical to terrestrial land-space. The ocean, in the words of Philip Steinberg (2001, page 35), lies "outside the rational organization of the world, an external space to be feared, used, crossed, or conquered, but not a space *of* society."

Just as historians of the American West have challenged Frederick Jackson Turner's conception of the landed "frontier" as an empty place existing outside of (whose leasing and regulatory functions merged in 1982 with the creation of the Minerals Management Service) faced the challenge of managing the trade-offs over leasing submerged lands with much less information, personnel, and financial resources than the interest groups with an economic and political stake in the outc

through the theory of "implied powers." At least until 1938, however, congressional and executive policy assumed that littoral states held title out to three miles. In October 1934, Secretary of Interior Harold Ickes even rejected an application for a mineral prospecting permit off Huntington Beach, California from Joseph Cunningham, holding that the states retained title as laid down by common law and the Supreme Court and that any challenge to such title should be tried in the federal courts. During the next several years, Ickes reversed his earlier opinion, as he stepped up his campaign to assert greater national control over the oil industry. It is not clear

Everette DeGolyer, the famous oil geologist and geophysicist who as assistant deputy petroleum administrator during the second World War helped draft much of the federal legislation claiming the tidelands, championed the idea of holding offshore lands as an undeveloped reserve or as a federally regulated province in order to make room for large imports of Middle Eastern oil, which he believed were essential to long-term national security. DeGolyer feared reckless leasing by the states and declared that he "preferred federal development of the tidelands if that meant a more gradual development" (Kreidler 1997).

Almost immediately after Truman's proclamation and executive order, U.S. Attorney General Tom Clark filed an original action against the State of California in the U.S. Supreme Court, challenging the state's right and title in submerged lands below the low-water mark. In 1947, the court rendered its decision, whose majority opinion was written by Justice Hugo Black, sidestepping the question of who had the best legal claim to title in the submerged lands, California or the federal government. The court majority focused on the question of rights and jurisdiction, rather than ownership. Using Hobbs's theory of nonownership as a foundation, Black argued that the federal government had "paramount rights" in and over the submerged lands below the low water mark, out to and beyond the three-mile belt, off the coast of California. Similar decisions in the cases of *United States v. Louisiana* and *United States v. Texas* set off a raging political controversy that lasted six years. On December 11, 1950, the Supreme Court issued a supplemental decree prohibiting further offshore operations without the authority of the United States. The decree prompted the Department of the Interior to ban new explorations but permit wells being drilled to continue to completion. As rental payments and royalties from offshore leases were impounded awaiting final disposition, and as offshore development came to a virtual standstill, advocates of state ownership and control attempted to legislate a return, or "quitclaim," of the submerged lands to the status they held prior to the decisions.

The so-called "tidelands" controversy was a misnomer, because nobody disputed the state's claim to lands lying between low and high water. The issue was control over the marginal sea below the low-water mark. If federal control were upheld, it involved the added complexity of determining where the low-water mark was and sorting out state leases that already had been issued. At first, the sympathies of most oil companies lay with the states. The independents and smaller integrated companies explicitly opposed a federal role in the tidelands. Many majors already held offshore leases issued by California, Texas, and Louisiana, the latter two having leased almost 5 million acres of offshore lands, with 300 leases more than three miles offshore, most in Louisiana's deltaic plain. Oil companies, mainly the major integrated ones, had made some astounding oil finds on those leases, discovering an average of nearly 38 million barrels for every wildcat well, far above the discovery rate for onshore fields in the United States (Attanasi and Attanasi 1984, page 438). Giant oil fields had been discovered on Shell Oil's leases on South Pass Blocks 24 and 27 and Eugene Island 18, The California Company's (Socal) Bay Marchand 2 and Main Pass 69 leases, and Humble Oil's (Jersey Standard) Grand Isle 18 lease. All except Eugene Island 18 straddled or lay beyond the three-mile line. Attorney General Tom Clark's announcement in early 1949 that the Truman administration would recognize prior state leases somewhat allayed these concerns, to the point where the *Austin Report* observed in July 1949 that the "oil companies have long since abandoned the States' side in this fight" (quoted in Kreidler 1997). Supporters of quitclaim enjoyed majorities in both houses of Congress, and a

in direct contact with the open sea and the line marking the seaward limit of inland waters." Where the coast was in direct contact with the open sea, the coastline would follow the line of low tide. But where the coast was interrupted by rivers, bays, estuaries, inlets – most notably in Louisiana – determining the location of the base line separating inland waters from the open sea would be the subject of difficult legal and engineering problems (Orn 1954, page 81).

The Department of Interior used the "Chapman Line," named after Secretary of the Interior Oscar Chapman (1942-1953), as a baseline for demarcating federal from state waters along the coasts of Texas and Louisiana. Developed in the summer of 1950 for the Department of Justice for use in the Submerged Lands case before the Supreme Court, the Chapman Line was drawn along the "natural shoreline," or line of low tide, on coast charts issued by the U.S. Coast Guard and Geodetic Survey. State waters were then determined to be inside a line drawn three miles from the Chapman Line into the sea. To determine the point of contact between inland waters and the open sea where the shoreline was interrupted, the survey employed the so-called "Boggs Theory," which essentially marked a straight line across headlands entrances no more than ten miles wide or across a span nearest the entrance which did not exceed ten miles.[13] The department awarded exclusive jurisdiction to the State of Louisiana on leases lying inside the three miles line, and section 6 of the OCSLA provided for the federal recognition and validation of leases issued by states outside the line. In 1954, Interior received 404 applications for continuance or validation of leases under section 6, and close to 270 were continued or validated, specialized bureaucracy, regulations, or models to follow, other than what the states and companies were already doing offshore.

The first order of business called for establishing the regulations to govern leasing. The Bureau of Land Management and the Conservation Division of the U.S. Geological Survey were the two federal agencies responsible for conducting minerals leasing on federal lands in the Department of the Interior.[15] The BLM handled the issuance of leases and pipeline rights of way, as well as

OCS conference meetings in July and August, 1954, presided over by Assistant Secretary for Mineral Resources, Felix Wormser, and Assistant Secretary for Public Land Management, Orme Lewis, decided specific procedures and issues for that first sale which would become the norm in the federal leasing program. Conferees agreed that the first leases would offer a 16 2/3 percent royalty rate and a $3/acre annual rental fee. After years of offering leases based on this rate and fee, officials in the program later lost track of how they had been initially established. It appears that the 16 2/3 percent royalty was the sum of the mandated 12 ½ percent royalty plus an amount equal to the severance tax that had been levied by the State of Louisiana. "Never have I known where the $3 per acre came from," confessed John Rankin. Early Louisiana leases charged a rental fee of one-half of the cash bonus. Many of these bids went for around $7,500 per block, which meant a $3,750 annual rental or less than $1/acre for a 5,000 acre block. Texas, meanwhile, charged a $2/acre rental fee. A figure of $3-5/acre was suggested in the early meetings in Interior, and $3/acre was agreed on because $5/acre simply seemed "too high" for leases that had a shut-in gas well. Another figure arrived at somewhat arbitrarily, at least for the first sale, was that of the "minimum bid." Although Interior had the discretionary authority to reject any and all bids, some department officials expressed concern that unnecessary administrative time would be spent rejecting "token" or low-ball bids. At a July meeting of the assistant secretaries and directors, the figure of $15/acre was proposed and accepted as "unobjectionable"(Rankin 1986, page 29).[18]

The other major issues for the first sale were the size of the blocks and the number and location of acres to be opened for leasing. The first OCS leasing maps were extensions of the leasing maps of Texas and Louisiana as authorized by the OCSLA. These states had adopted the Lambert Grid Coordinate System, developed by a Frenchman in the late 18th century for artillery firing. A regular block offshore Louisiana consisted of 5,000 acres and those offshore Texas were sized at 5,760 acres, the maximum allowed by the OCSLA. After drawing the maps, which blocked off acreage extending out to 120 feet water depths, questions arose as to where should the department accept nominations. Should it accept nominations or put up blocks for lease in the "twilight zone," the area between three miles and three leagues that was still disputed by Louisiana and Texas? More specifically, should it focus on areas adjacent to existing production or merely on areas adjacent to state-owned leases? The department received nominations from 14 companies and decided to offer most of the acreage nominated beyond the three leagues or 10 ½ mile line (many companies in fact notified the department that they would not bid inside the line because of the uncertainty as to the claims of the State of Louisiana). This acreage ranged out as far as 50 miles. On August 10, Assistant Secretary Orme Lewis approved the offering of 748,000 acres (and 520,000 acres for sulfur leases), consisting of 199 tracts ranging in area from 1,250 acres (partial blocks) to 5,000 acres (full blocks) (*World Petroleum* 1954, page 86).[19]

Just as the list of tracts to be offered was announced on August 18, the dispute between the state and federal government over jurisdiction entered into a new phase, as the State of Louisiana enacted a statute redefining Louisiana's seaward boundary even further beyond its earlier claim

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(see below). The Interior department briefly lost its nerve. It withdrew the offshore Louisiana offering just a few hours after announcing it, explaining that Louisiana's claim to an extended boundary deserved further study. Then, in early September, department heads changed their minds and reissued the offering, exactly the same as before including the tracts inside Louisiana's newly claimed border. Withdrawing the tracts would have implicitly conceded that the state had a valid claim, which upon closer examination seemed dubious, before the courts or Congress ruled on the question (Linz 1954).

The first federal OCS sale, held as planned at the BLM in Washington on October 13, 1954, surpassed Interior's expectations and gave exceptional promise to the new federal offshore leasing program. The BLM collected $129.5 million on bids submitted by 23 companies for 417,221 of the 748,000 acres offered for oil and gas. Although unimpressive compared to later sales in the 1970s where that much could be laid out for a *single* tract, this represented a significant new source of revenue for the federal government. The Forest Oil Company of San Antonio, Texas made the highest cash bid – $6.1 million or $1,220 per acre for a tract in the Eugene Island area. Gulf Refining ($35.7 million for 22 tracts) and Shell Oil ($18.7 million for 13 tracts) offered the highest total winning bids. Phillips Petroleum, Kerr-McGee and Humble Oil rounded out the list of the top five successful bidders. The money exposed by the companies, at an average high bonus of $310 per acre, signaled that they were serious about the prospects of offshore oil and gas in the Gulf (*World Petroleum* 1954, page 86).

Kerr-McGee, however, did not stay in the top five for long. As the winning bids were read at the auction, the company's exploration managers sitting in the audience realized with horror that they had submitted bids on the wrong tracts. Leases were offered by tract number, which was not the same as the block number. For example, where the sale notice read "LA-41, Block 92, Vermillion Area, 5000 acres," with LA-1 designating the tract number, Kerr-McGee bid on tract LA-92, mistakenly substituting the block number. They had no competition on nine tracts in which they bid this way. Kerr-McGee's attorney, Clark Clifford, wrote in a petition to the director of the BLM immediately after the sale that the company's written bids "did not in truth and in fact express the intention of Kerr-McGee to be tracts desired by them, but instead constituted bids on tracts in which Kerr-McGee had no geological information or interest whatsoever." This being the first federal sale, and considering that the acceptance of the bids under the circumstances would not have constituted a binding contract, the U.S. Comptroller General forgave Kerr-McGee, disregarded the bids, and returned the company's deposits. The incident nevertheless caused a bit of a commotion for several weeks. As the Gulf Coast Region of the Conservation Division reported to the USGS in Washington: "The New Orleans office received numerous inquiries for information whether the money submitted with the bids would be retained or refunded and some very positive opinions as to what should be done."[20]

The next two federal lease sales further demonstrated oil operators resolve to push forward with offshore exploration. On November 9, 1954, the Washington office of the BLM opened the bids for leases off the coast of Texas. Only four companies had nominated tracts, as most were preoccupied with action off of Louisiana. Nevertheless, the department took in high bids of $23.4 million on 19 of the 38 tracts offered, all outside the three league line. The Magnolia

[20] Clark Gifford to Director, BLM, October 14, 1954, Box 513, CCF, 1954-1958, RG 48 and GCR, MEP, November 1954, A-1 – A-2.

Petroleum Company paid $3.18 million for a single tract, or $2,209 per acre, the highest per acre price paid for a state or federal lease in the Gulf of Mexico up to that point. The third sale, offering lands offshore both Louisiana and Texas, took place for the first time in New Orleans, in the Main Post Office Building on July 12, 1955. By this time, the BLM had opened a regional OCS office in New Orleans managed by Sidney Groom as basically a one person operation. The 1955 sale collected total high bids of $100 million on 94 tracts off Louisiana and $8.4 million for 27 tracts off Texas. Combined, the first three sales of OCS lands held by Interior brought the Federal Treasury more than $252 million in bonuses and first-year rentals on oil, gas, and sulfur leases (Wahl 1955, page 986).[21]

Even before the third OCS sale, the conflict between the federal government and the states over offshore jurisdiction was becoming intractable. On May 18, 1955, the State of Louisiana held a lease sale in which 9 of the 22 tracts offered lay over three miles seaward of the Chapman line. Despite official protest from Secretary of the Interior Douglas McKay in a telegram to the State Mineral Board, three of the blocks were leased. The State Mineral Board retaliated by protesting Interior's July offering, in the form of a Resolution dated May 19, demanding that the United States rescind and abandon its call for bids and warning prospective bidders that the state would take legal action to protect its "property rights" in the contested area of submerged lands.[22]

The year before, in August 1954, Louisiana's state legislature had asserted those rights by passing a statute, Act No. 33, which redefined the state's seaward boundary as a minimum of three leagues beyond the coastline, as described in the act of admission of Louisiana to statehood and union. The novel aspect of the legislation was the definition of the coastline, which the state argued was the dividing line between inland waters autobiography, carefully examined the proceedings of the Constitutional Convention, and purchased from the Library of Congress a copy of every Louisiana coastal chart in their files" (Jeansonne 1977, page 166).

Perez resisted the assertion of federal jurisdiction with the same kind of fervor that he pressed the cause of racial segregation. His ideological commitment to "states' rights" was as strong as his administration of the submerged lands and natural resources or from slandering the plaintiff's title and from offering for lease or accepting or receiving or awarding bids for leases, and from bidding or offering to bid on mineral leases on the land described in the petition which is the Act 33 boundary." The U.S. attorney in Shreveport removed the case from the State to the Federal District Court, which released the corporate defendants from the temporary restraining order but held all other aspects of the order in effect. Upon appeal, the U.S. Supreme Court enjoined the State of Louisiana and the federal government from leasing and operations until the court had made a final determination in the case of the United States' original complaint and the Louisiana coastline or until the parties had reached a working agreement (Rankin 1986, pages 26-27).[25]

Strong economic pressures forced the two sides together. During 1954-1956, the offshore industry had come alive again in southern Louisiana, in both state and federal waters. Oil and gas companies discovered 34 new fields in 1954, 57 fields in 1955, and 72 fields in 1956. The success rate for wildcat exploratory wells was exceptionally high (34 percent in 1956), much higher than onshore. New-fangled drilling and construction vessels were being designed and launched to support exploration and production. Construction yards were ramping up the assembly of steel jacket platforms and beginning to lay marine pipelines. All kinds of new companies, from helicopter services to geophysical contractors to offshore caterers, were emerging as part of this rapidly expanding industry. Both the federal government and the state had a pressing interest in setting aside their differences to keep from nipping offshore development in the bud (Meier and Meier 1955, page 988; Waters and Waters 1956, page 1,253; Waters and Waters 1957, page 1,190).

On October 12, 1956, after months of feverish negotiations, the two parties constructed an "Interim Agreement" enabling the resumption of operations and leasing in the contested area pending final resolution of the controversy. The agreement created four zones. Zone 1 comprised the area out to three geographical miles seaward of the Chapman Line. Zone 2 session. But to determine the adequacy of bids, the Interim Agreement established a procedure whereby the director of the BLM presented to a six person committee, composed of three representatives from the federal government and three from the state, a report on the bids he proposed to accept or reject. The committee's majority vote would be the last word. In the case of a three-to-three tie, the federal position would prevail. In Zone 3, the federal government did not need to justify drainage or obtain the state's agreement to hold a lease sale, but the same procedures as in Zone 2 governed the consideration of cash bonus bids. The revenues derived from leases, rentals, and royalties in Zones 2 and 3 would go into a special account that would be held in escrow until the federal-state boundary question was settled (Rankin 1986, pages 47-48).

The Interim Agreement offered a temporary spatial reconciliation between the State of Louisiana and the federal government over offshore leasing in the Gulf of Mexico. Offshore oil and gas development, which was strongly desired by both parties, could not go forward without at least a provisional territorial regime to guarantee the security of the massive fixed investments that such development would require. Although the "Tidelands Controversy" was by no means over – in fact, it would endure another thirty years before it was finally resolved – the Interim Agreement advanced the political and legal process to a point where conflicting claims to submerged lands would no longer limit the pace and scope of offshore leasing.

3.3. Sales that Revived the Gulf

Just when the Interim Agreement appeared to break the impasse, the industry's enthusiasm for leases evaporated. During 1957-1958, economic recession, an oversupply of crude, a series of hurricanes, and declining oil finds in deeper waters forced a slowdown in offshore exploration. Both dry holes and capital costs were increasing in water depths beyond 60 feet. The percentage o eTJ12..67y[(Both0.205 (hurrira0ef Tchen8.3nch0.205 TJ-26.3–D(5o Tct. 50.00105 bg6-31.955p0571ncr58

Rankin, who had taken over as regional manager of the BLM's New Orleans OCS office in January 1959, remembered the sale very well. "First, it was held on my birthday," he said. "Second, and probably first, my youngest daughter was born the night before. And third, to my consternation, I opened a bid from Shell Oil Company and didn't know whether I could handle such a figure." Shell Oil had bid $26 million for a single, half-block tract adjoining the company's producing leases in the South Pass area. "I gulped twice and read that historic bid which was the record high price per acre bid [$10,442] for many a year [until 1964]."(Rankin 1986, page 48) In all, the BLM leased 19 tracts (39,000 acres) for $88 million. The average bid per acre, $2,267, shattered previous average bids. Combined with the $141 million paid by operators for Zone 1 leases in three sales held by the State of Louisiana in 1959, the August 1959 drainage sale sent a clear message that the offshore play was on again.

Immediately after the sale, oil companies indicated that the time was right for a general lease sale with nominations in Zones 3 and 4. This would be the first general sale since 1955. Some government officials, however, did not appreciate just *how* eager the companies were to expand the offshore horizon. The director of the USGS cautioned against offering too much acreage, especially in the deeper waters of Zone 4. Operators were not ready to drill much beyond 100-foot depths, he insisted, and thus bonus bids for deeper acreage would be reduced. "Any leases acquired at this time in water depths exceeding 100 feet will probably be for speculative reasons."[26] But as the nominations came in for an announced February 1960 sale, John Rankin compared the tracts nominated in the ill-fated 1956 lease sale with those nominated for the proposed sale. He found that there was very little overlap, which demonstrated to him how much the industry had learned in the intervening three years. The move into deeper waters might not be so speculative after al should lease sales be held? How large should lease offering be (should blocks be offered in less than 5,000 acres)? Should minimum bids be eliminated? Should bids be taken on a sliding royalty rather than on a bonus, or a combination of both? Should bonus bids be financed through installment payments? Should the government waive its inherent right to reject any or all bids? (Rankin 1986, pages 50-51).[27]

"Certainly, we got diverse answers," remembered Rankin (Rankin, personal communication, 2000). The only real consensus was that the BLM should establish a regular schedule for lease sales and forget about installment plans or royalty bidding. The apathy for royalty bidding by the smaller companies was surprising, considering the arguments advanced in some trade journals that cash bonuses created a barrier to entry in offshore leasing. Beyond the issues of agreement, the recommendations for the frequency of sales ranged from once a month to once a year. Opinions on the size of tracts split between offering whole blocks of 5,000 acres and half blocks of 2,500 acres. Seismic information, the companies agreed, was still not accurate enough to allow them to bid large bonuses on unproved areas in smaller tracts of 1,250 acres. Recommendations as to size of sales ranged from specific acreage amounts to offering the whole Gulf of Mexico at each lease sale. "I wanted to offer all unleased blocks in a particular and different map area on a month-by-month basis," said Rankin, who had just come from a program where there was as sale every week. "Fortunately no one listened to me"(Rankin 1986, page 52).[28] For the most part, the discussions with industry convinced the BLM to maintain its leasing procedures but eventually to move the sales onto a more regular schedule.

One of the most controversial issues was the rejection of bids, which had happened for the first time in the 1959 drainage sale. Then in the 1960 sale, the BLM-State of Louisiana committee rejected 10 bids in Zone 3 and the BLM rejected 16 bids in Zone 4, all of which met the minimum bid requirement. However, as explained above, the minimum bid figure was quite arbitrary and was not an accurate estimation of prospective value for any given tract. The rejections created sore feelings and many companies appealed the decisions. Upon reviewing the appeals, as George Abbott, the departmental solicitor, pointed out, some people in the department realized that the BLM "does not have – and perhaps cannot have – precise yardsticks for determining adequacy of bids."[29] But the BLM had a duty to try to insure that the government received fair value for its leases. The OCS office had better information on resources and structures in Zones 2 and 3 than in Zone 4. The federal-state committee that considered the recommendations of the director in Zones 2 and 3 used information furnished by Louisiana's state geologist. Louisiana had been leasing submerged lands for many years and possessed well logs and geologic data which greatly aided the evaluation of bids. For the deeper areas of Zone 3 and for all of Zone 4, however, the government had very little information. The number of people in the Department of Interior with OCS responsibilities, both in Washington and New Orleans, only totaled about 35. The entire regional BLM office in New Orleans consisted of John Rankin, his assistant regional director, Bill Grant, and two support staff. As

[27] Under Secretary Elmer Bennett to Assistant Secretary Ernst and Assistant Secretary Hardy, April 22, 1960, Box 283, CCF, 1959-1963, RG 48; Assistant Director, BLM, to Under Secretary Bennett, July 28, 1960, Box 283, CCF, 1959-1963.

[28] Assistant Director, BLM, to Under Secretary Bennett.

[29] George Abbott, Departmental Solicitor, to Secretary of the Interior, April 7, 1960, Box 283, CCF, 1959-1963, RG 48; USGS Oil and Gas Supervisor, Gulf Coast Region, to Chief, Conservation Division, April 21, 1961, Box 284, CCF, 1959-1963, RG 48.

Florida's constitution upon its readmission to the Union after the Civil War. These decisions, however, did not determine the location of the coastline along these states, and Zones 2 and 3 offshore Louisiana continued to be administered under the Interim Agreement. Although final determination of Louisiana's coastline would consume many more years of litigation, the state was forced to drop its liberal territorial clai map with all the nominated tracts shaded in wells in state waters. The majors also accounted for nearly 100 percent of the discoveries in 48

From the oil industry's perspective, the 1962 sale turned the Gulf of Mexico into the major focus of oil and gas exploration in the United States. "One could speculate," wrote Shell Oil's production manager in New Orleans in 1963, "that perhaps this area or province offers the best place to find large oil and gas reserves in this country, and maybe one of the last places" (Pittman 1963, page 9). Oil companies acquired almost 2 million acres of new leases, much of them in unprecedented water depths (the average water depth of leases in the 1962 sale was 125 feet, compared to 67 feet in 1954-1955 and 89 feet in 1960). The sale also opened up larger areas in the Western part of the central Gulf – Eugene Island, South Marsh Island, Ship Shoal areas – in addition to the delta regions which had been the scene of the most activity until then. This inventory of leases would keep the industry busy for the next five years. Indeed, the BLM did not hold another general sale until 1967. Meanwhile, all phases of exploration and development offshore Louisiana enjoyed boom times. Oil companies wasted no time drilling their leases. By September 1963, there were nearly 90 drilling operations in progress. According to one estimate, the industry was spending $1 million per day on drilling alone (Pittman 1963).

commercialization of the technology. The costs and risks were so high that no one company could venture alone into deepwater. Other oil companies, as well as suppliers, manufacturers, and construction firms could only progress deeper together. “We realized that the only way we could ever have access to those frontier areas was to share our

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4. Technology and Strategy of Petroleum Exploration in Coastal and Offshore Gulf of Mexico

> It takes luck to find oil. Prospecting is like gin rummy. Luck enough will win but not skill alone. Best of all are luck and skill in proper proportion, but don't ask what the proportion should be. In case of doubt, weigh mine with luck (Everette DeGolyer, quoted in Knowles 1978, page 300).

Combined with developments in drilling and well logging, geophysical technology pushed the industry from onshore marine environments into offshore waters of the Gulf of Mexico. In the 1940s and 1950s, the move from onshore leasing from various private and public landowners to offshore leasing by competitive bid from state and federal governments placed an even greater premium on geologic and geophysical capabilities, as incentives for speculative leasing were fewer offshore. Oil firms and their companion service companies faced unprecedented challenges and made rapid strides in learning how to drill and produce hydrocarbons from increasing water depths offshore, but not without steep rises in the costs of development, which mandated greater accuracy and effectiveness in exploration.

geologists at work in the United States were most concerned with the origin and age of the earth, the mechanics of mountain formation, or the classification of rocks. Prospectors employed doodlebugs, divining rods, or other instruments of metaphysical prognostication in the search for oil, and they often adhered to superstitions which held that drilling sites be kept close to cemeteries or on the right-hand forks of creeks. Leading geoscientists of the day believed that the unconsolidated sands underlying the Gulf Coast area could not contain oil and that drilling anywhere in the region was a waste of time. Beaumont trader Patillo Higgins, who persevered in drilling at Spindletop, “had the faith and the determination to pursue his belief in face of lay and scientific criticism, and he proved to all, especially those geologists who called him “fool,” that the so-called “oil experts” were not looking ahead, much less keeping up with current developments” (Halbouty 1957, page 19). Or, as oil historian Edgar Wesley Owen writes, “the story is of astute geological hunches by nonprofessionals and lack of intuition on the part of more expert scientists” (Owen 1975, page 195).

Higgins had read enough geology to believe that the prominent hill seeping gas a few miles from Beaumont might be a favorable structure for the presence of petroleum. His partner, Captain Anthony Lucas, had witnessed oil showings from

Yucatan shelf platforms, deposition during the Tertiary period (2 to 65 million years ago), which represents the largest sedimentary section, was predominantly clastic, composed of non-marine sands and shales. The landward extent of the Gulf Coast geosyncline is the outcropping Cretaceous and basal Tertiary sediments approximately 200 miles north of the shoreline. The southern extent is located beyond 400 miles into the deepest water (12,000 feet) of the Gulf near the Sigsbee Scarp. Drill down 20,000 feet under the shallow seafloor off Louisiana and one is friends and colleagues, published dozens of geological and geophysical papers during his career, but in the early years he was most interested in the origin of salt domes. After extensive reading about the concept in European geology, DeGolyer wrote influential articles beginning in 1918 that changed the thinking of American geologists about how salt domes developed. Still, geologists had few tools for understanding the subsurface. Outcrops could not be found in the region, and drillers' logs were unreliable. According to Halbouty: "the only real tools that were available for scientific study were the bit, the few honest drillers' logs and micropaleontology" (Halbouty 1957, page 19). Furthermore, the discovery of the huge Caddo Lake field in 1904 shifted the attention of geologists in this region to northern Louisiana. By the early 1920s, no important new fields were being developed in southern Louisiana, and low crude prices tempered the enthusiasm of oil operators to hunt for more (Steinmayer 1957).

The introduction of new geophysical techniques rejuvenated exploration for buried Gulf Coast salt domes. In fact, geophysical exploration with the torsion balance and refraction seismograph achieved its first notable success on the Gulf Coast in the mid-1920s, after previously demonstrating the capability to map subsurface structures in Europe. The first geophysical contracting firm in the United States actually appeared in 1921, when four talented scientists who had studied reflected blast waves to detect the location of enemy artillery for the U.S. Bureau of Standards during World War I – William P. Haseman, John C. Karcher, E.A. Eckhardt, and Burton McCollum – organized the Geophysical Engineering Company (GEC). GEC did experimental work, underwritten by Marland Oil Company, employing reflection seismology (see below) to search for petroleum in Oklahoma. However, their results were inconclusive, and geophysical prospecting in the United States soon turned to the Gulf Coast and to other equipment and methods, though the principals in GEC would go on to shape the evolution of geophysical technology in profound ways. In July 1924, Amerada Petroleum Corporation and its affiliate, Rycade Oil Corporation, used the Eötvös torsion balance, named after Baron Roland Eötvös, a professor of experimental physics at the University of Budapest, to locate the Nash dome in Brazoria County, Texas.

Seismos supplied the instruments and outfitted most of the crews for this burst of exploration, and improvements to the method allowed for more rapid surveying. One weakness of the early

Expanding rapidly and spreading its crews far and wide, Amerada's GRC firmly established itself as *the* seismic contractor in the United States, and especially on the Gulf Coast. In addition to its work for Gulf, GRC made its mark with another "water job" for the Louisiana Land and Exploration Company (LLE). This company was created in 1927 when Colonel E.F. Simms, a shrewd, independent oilman from Houston who had purchased from the State of Louisiana oil and gas leases on over 1 million acres of the coastal plain, joined forces with H.H. Timken, who controlled some 700,000 acres of fee land foreclosed from failed agricultural ventures. Shortly after its formation, LLE hired GRC for a seismograph survey of its vast holdings. Everette contemplating the use of geophysics to search for oil and gas bearing structures other than salt domes.

Geophysics as both a science and commercial enterprise was beginning to come into its own. In the mid- to late-1920s, several major oil companies established geophysical departments. Marland Oil had the strongest organization, led by William Haseman and E.A. Eckhardt, who had left the Geophysical Engineering Company. This, however, did not guarantee financial rewards for Marland, which was taken over by Continental Oil Company in 1928. Eckhardt then moved on to head a new geophysical division at Gulf Refining, another early adopter of geophysical technology. The other notable geophysical group to emerge at this time was at Humble Oil. Organized in 1924 by the company's chief geologist and legendary oil finder, Wallace Pratt, Humble's group was unique in developing its own instruments and techniques rather than relying on outside contractors. This delayed Humble's progress but eventually made the company a major force in seismic exploration. In 1926, the Colorado School of Mines, with help from some oil companies, established the first department of geophysics to provide research and training for a new generation of petroleum explorationists (Owen 1975, pages 506-510).

The new phase of geophysical exploration on the Gulf Coast was characterized, most significantly, by the commercialization of reflection seismology. After the war, the Geophysical Engineering Company had experimented with this technology in Oklahoma. GEC's founders – Haseman, Eckhardt, Karcher, and McCollum – along with their associates continued to build on this work in the 1920s. Developing a reflection technique was a main objective of the Geophysical Research Corporation, directed by Karcher, when it was created by Amerada in 1925. The reflection method offered much more seductive possibilities than refraction. Whereas refraction measured the differences in the velocity of energy waves through different rock strata, reflection measured the time it took for a wave to travel from the sound source at the surface to a hard underground layer and back to the surface again. An acoustic wave would be reflected or bounced back toward the surface, much like an echo, from any place where there was a change in the elastic properties of the medium through which the wave traveled. It was harder to interpret data from the refraction method because refraction waves travel in three distinct paths, in contrast to reflection waves which travel in only two paths. Moreover, the angle of refraction is governed by the relative velocity of sound at the interface of two different kinds of rocks, whereas the angle of reflection is geometrically determined. Using a series of recordings and a knowledge of wave velocities through various formations, the reflection method made it possible to plot the contour and depth of reflecting layers (Klotz 1952, page 20).

Early reflection seismology had its flaws. Verifying reflections required correlating events from two or more seismic traces on separate paper records, cranked at different speeds. Equipment was too primitive to allow for easy discrimination between the desired reflections and undesired ones. When dynamite was exploded in a shot hole, the waves recorded by the geophones traveled along a variety of paths, the undesired ones creating what geophysicists called "noise." Acoustic waves were created by dynamite detonated in shallow holes dug by hand, and thus the effectiveness of the shot depended on near-surface

sedimentary beds thus could be detected. "A new vista of the petroleum potentialities of the Gulf Coast petroleum province of Texas and Louisiana has been opened by the developments of the past few years," wrote Donald C. Barton, in a 1930 appraisal for the American Association of Petroleum Geologists. A pioneer in Gulf Coast geology and geophysics with Amerada and Humble before striking out on his own as a consultant, Barton described the expansion of the salt-dome and Tertiary producing area southward and eastward, venturing a radical upward revision of recoverable reserves from only two years earlier when he had estimated them to be 2.3 billion barrels. "The ultimate production of oil in the area," he now wrote, "surely will be at least 3.5 billion barrels; probably at least 5.5 billion barrels; and possibly at least 10 billion barrels." This proved to be a discerning guess. Although for some years Barton appeared to have placed too much faith in the impact of geophysical technology, by 1965 cumulative production plus proved reserves along the upper Gulf Coast, excluding offshore, was 15 billion barrels (Barton 1930, page 1,380).

In the early 1930s, reflection surveying slowly but steadily demonstrated its effectiveness in detailing deep Gulf Coast prospects which the refraction seismograph and torsion balance had indicated with less precision, such as the Iowa field in Louisiana (Vacuum, Shell) and the Tomball (Magnolia-Vacuum, Humble) and Anahuac (Humble) fields in Texas. On the heels of these discoveries, oil companies set out to reevaluate one dome after another with reflection seismic. Even during the great depression, with the price of oil plummeting, reflecting crews and leasing agents were busy throughout the region. Detailed mapping with the reflection seismograph required much closer spacing of shots and detectors. But improvements to equipment and technique – most notably "continuous profiling," which recorded a continuous set of reflection points along a profile line, as opposed to "correlation shooting" or "spot shooting" – increased the speed and decreased the cost of surveying, making the reflection method economical for wider-ranging reconnaissance. California inventor and geophysicist Frank Rieber developed the "sonograph," based on the technology used in early talking motion pictures, which recorded the seismic traces as reproducible sound tracks and subsequently reproduced them in phased combinations and through filters that reduced interference noises. Along with the discovery of the great East Texas field, reflection seismic work in south Texas and Louisiana turned the decade of the 1930s into the most prolific period for oil discoveries in U.S. history. In 1940, GSI geophysicist E. Eugene Rosaire estimated that the reflection seismograph had found 131 fields on the Gulf Coast, many of them major ones, at an average geophysical cost of $164,000 per discovery (Owen 1975, pages 511-514 and 794-797; Lawyer et al. 2001, pages 21-24).

The technology was not foolproof. It yielded many dry holes, and success rates in some places were no better than other methods of prospecting. Some geologic areas simply did not lend themselves easily to reflection. Soft, unconsolidated sands in many places on the Gulf Coast did not generally provide strong reflections. Most crucially, early reflection techniques had problems detecting faults, which became a serious concern as evidence by the late 1930s was showing that fault blocks were more productive than salt domes. However, ongoing innovation and refinements to the technology, especially in continuous profiling, which enabled more accurate mapping of faulted horizons, would ultimately give the reflection seismic method much broader range along the Gulf Coast and into the Gulf of Mexico.

Mississippi River. "A stubby, 125-mile-long thumb of lushly green, creamy delta earth, Plaquemines pokes out into the Gulf of Mexico, spurting out the Mississippi as from the nozzle of a hose," wrote a *Collier's* feature in 1949. "Plaquemines contains fabulous riches of oil, sulphur and natural gas, much of it on public lands. But most important for Plaquemines' fame: it is the bailiwick of Leander H. Perez" (Velie 1949, page 10). In 1929, shortly after oil had been discovered in Plaquemines by GRC Party No. 2 for Gulf Oil, Perez helped Governor Huey Long defeat an impeachment attempt in Baton Rouge by devising a filibuster strategy and arranging "rewards" to local legislators. In return, Long assisted Perez's attempt to seize the potential oil wealth of Plaquemines Parish.

This required complex legal and financial machinations. The public lands in question had been deeded by the state in the late nineteenth century to levee boards organized into statewide districts. The levee boards, somewhat of an anachronism since the Army Corps of Engineers had taken over levee work elsewhere, used revenues from leasing and taxing the deeded land to finance the construction of levees. The problem for Perez was that the Governor's office controlled the levee boards through appointments. Huey Long was understanding, however, and helped Perez push through a harmless seeming piece of legislation at the state house in Baton Rouge which amended Louisiana's constitution to permit local police juries to assume the bonded indebtedness, and consequently the assets, of levee districts within the parish. This amendment opened the way for Perez, who controlled the police juries. As oil companies came calling for permission to lease and drill on levee board lands and as financial control of those lands passed to police juries, Perez frantically organized numerous land corporations, technically owned by friends, family members, and cronies. All chartered out-of-state, thus making them difficult to trace, with anonymous officers and stockholders, these dummy corporations developed a remarkable knack for obtaining leases from the local boards for nominal fees. Perez acted as legal advisor to the boards and also earned "legal fees" from representing the land corporations, which would then sublease the land to oil companies for a price much higher than the original lease plus an overriding royalty of typically 1/16 or 1/32 of all production if oil were discovered. And it was discovered. By the late 1940s, Plaquemines was producing ten percent more oil than any other parish in Louisiana (Smith 1958, page 152; Sherrill 1968, pages 12-13; Jeansonne 1977, pages 74-77; Velie 1949, page 11).

Thus did Perez, nicknamed the "Swampland Caesar" or "Delta Dictator," amass his legendary fortune and expand his political power. The judge would subsequently wield his power not only locally over almost every aspect of life in the so-called "rotten boroughs" of Plaquemines and neighboring St. Bernard parishes, but statewide and nationally on behalf of segregationist organizations such as the Dixiecrats and White Citizens' Councils. After World War II, he would lead the fight against federal control over submerged lands offshore. Beginning in the early 1930s, all oil companies operating in the deep delta, including prominently Shell, Texas, Humble, Gulf, and the California Company, became beholden to Perez. They "handled him like a demijohn of nitroglycerin," wrote *Fortune* magazine in 1958. "If they want to lay a pipeline or put up a terminal in Plaquemines, Perez has the power to block them. If their leaseholds are being challenged, as consistently a hazard of life in Plaquemines as the cottonmouth moccasin, then Perez may be behind it – and what they can save of their holdings lies substantially in his hands" (Smith 1958, page 144).

Rather than discouraging the hunt for oil, the proliferation of leases along the Gulf Coast held by the more aggressive and deep-pocketed oil companies or by opportunistic, if not boldly corrupt, political barons like Leander Perez, provided new inspiration to enterprising companies and

leaves. "Instruments, explosives, pumps and pipe for drilling, cables, and all the other paraphernalia of the seismologist's art must be carried distances often of miles, and at a rate rarely exceeding one mile per hour," wrote a *Shell News* feature from 1939. "These are the longest miles in the U.S.A.! The number of helpers in a crew is generally measured by the difficulties to be overcome in local transportation" (*Shell News* 1939, page 15).

This was suffocating, back-breaking, and dangerous work, especially as exploration techniques changed from the torsion balance to the seismograph and all the heavy instrumentation and equipment it entailed. "In the mountains, they used these pack mules; well, that's what we were in the swamps," recalled Nelson Constant, who worked on survey and geophysical crews for several companies. "We had motors and pipes that we had to carry on our backs. We had all these instruments" (Constant, personal communication, 2001, page 6). Not to mention cases and cases of dynamite. When they reached a location, still submerged up to their armpits, a crew would set out the geophones, or the "jugs," very sensitive equipment that had to be handled with great care. "Every 200 feet we'd put a yellow flag, and that is where we'd put one of these jugs," said Constant. "Then we'd go 1,200 feet and we'd put out a red flag and that would be a shot point" (Constant, personal communication, 2001, page 5).

With the jugs planted and cables rolled out at the recording locations, the next job was to wrench a heavy section of casing into the muddy floor at the shot location and pump water at high pressure into the casing to make a shot hole for the dynamite. Then, anywhere from 5 to 50 pounds of dynamite were set and detonated in the hole, the explosion creating a tall geyser of water, mud, and plant particles. "No job would be complete without its own peculiar assets and liabilities," wrote *Shell News*. "'Dynamite's' job has in its favor a lack of monotony and a constantly changing scene; but ask anyone who has contracted a dynamite headache through breathing too freely the fumes of an explosion and he will have no difficulty in naming at least one liability"(*Shell News* 1939, page 15). Dynamite posed ever-present risks for the hearty crews, and not just from being too close to an immediate blast. Explosions could leave large craters in the mud floor, often 30 to 50 feet wide in diameter. "If you didn't know about it, and you walked across it, you'd go right on down," explained Constant. "And if you had a load on your back, it was pretty doggone hard to get up again out of the water" (Constant, personal communication, 2001, page 25).

The rewards of this work outweighed the risks for many young men in the Bayou communities. It offered decent pay and opportunities for advancement and the acquisition of new technical skills. When asked why he did not immediately return to easier work at his father's store, Nelson Constant replied: "Once I got in there, I liked it. I really did. Maybe after a year, I don't believe they could have kicked me out if they wanted to" (Constant, personal communication, 2001, page 6). Men like Constant developed a new sense of self-worth, as this dynamic enterprise of geophysical exploration drew on their knowledge and talents. The companies hired them as surveyors and permit men as well as "pack mules." They applied their familiarity of the local terrain and people to determine lease lines and help the companies acquire permits to explore outside the leases. Constant had experience cutting property lines in the swamps and he speaking Cajun than it was from an English-speaking company man from Texas. “In some cases,” Constant recalled, “contract companies had come out and busted up their roads and fences and one thing or another.” Other residents were worried about protecting their oyster beds. “Some guys would say, ‘I’m not going to let you have it [the permit].’ So I just stayed and talked with them and just kept talking and let them get it all out. First thing you know, they almost asked you to go ahead and do it” (Constant, personal communication, 2001, page 3). Constant’s facility with the land and people was such that within a year or two he had acquired wide-ranging responsibilities, which included hiring local laborers, arranging locations for boat landings, and drafting maps of bayous, property lines, and oyster leases.

The average cost of operating a seismograph party in the Louisiana low country was substantially higher than on dry land. In 1939, Shell Oil estimated the difference to be $350/day versus $250/day. Moreover, the acquisition of data was much slower in the swamps and marshes. Increased mobility, therefore, was the key to cheaper and more efficient operations. As was often the case in oil and gas operations in coastal and offshore Louisiana, homegrown innovation offered the needed solution. One of th gas industry managed to conquer some of the forbidding elements of the wetlands, but not without environmental consequences. Trappers complained that buggy wheels damaged habitat and destroyed “sets” (traps). The marsh was resilient and often grew back. “We once went back to these areas that we had torn up,” recalled Willy “Dub” Noble, a longtime Humble seismograph crewman, “and it was in 3-4 times better condition than the surrounding marsh because we had stirred up this floating marsh stuff. When it grew back, it was a beautiful pad.

After a couple years of drilling prospects in this costly manner, G.I. McBride, an engineer in Texaco's Shreveport division, envisioned the possibility of achieving mobility in wetland drilling using a barge, equipped with a derrick and drilling equipment, that could be floated and submerged as a stable drilling base, thus eliminating the time and expense of fixed foundations. In pursuing this concept, Texaco discovered with amazement that it had been patented four years earlier by Louis Giliasso, a native of Italy and captain in the merchant marine. Giliasso conceived of a "practical apparatus for drilling oil wells in lake bottoms and other submerged lands" after having observed the difficulties encountered by oil companies in establishing foundations for drilling operations in Lake Maracaibo, Venezuela. A months-long search eventually found Giliasso operating a saloon in Colon, Panama. In 1933, Texaco coaxed Giliasso back to the United States and obtained an agreement whereby the company acquired an exclusive license to use the submersible barge and the right to license it to other companies. Soon, a barge christened the *Giliasso* was floated from a shipyard at Leesdale, Pennsylvania, down the Ohio and Mississippi Rivers to Lake Pelto in Terrebonne Parish, Louisiana (Lankford 1971).

The *Giliasso* was constructed by fastening together the twin steel hulls of two standard transportation barges, leaving space in the middle for drilling. Concerned about the risk attendant upon use of the first unit, Texaco decided to use two barges which could be salvaged in case of failure, rather than design an odd-shaped barge for this single purpose. Towed to location, the lower compartments of the hulls were flooded, sinking the barge to the bottom. The upper compartments remained above the water and provided a platform to hold the drilling structures, equipment, and power plant. The *Giliasso* demonstrated its drilling capabilities immediately in Lake Pelto, reducing by 20 percent the time spent on a well not related to drilling or completing, and afterward proved its ease of mobility in being towed to Lake Barre. By 1935, Texaco had built and deployed a fleet of seven such barges along the Louisiana coast, each drilling 6 wells per year. G.I. McBride estimated that the barges provided an annual total saving over ordinary pile-supported structures of $600,000 (McBride 1935).

Other companies followed Texaco's pioneering example, and by the late 1930s dozens of "floating derricks" could be seen moving through the bayous and newly constructed canals of south Louisiana. By 1938, the industry had drilled 3,300 wells in parishes adjacent to the Gulf, 700 of which were surrounded by water. The most active areas were in the Lake Barre, Terrebonne Bay, Pelto Bay, and Timbalier Bay areas of Terrebonne Parish (Flood 1939, page 98). Success with mobile drilling led oilmen to ponder cautiously the utility of submersible barges in the open waters of the Gulf. "The present design is adequate for territory inside and in water up to 10 feet deep out in the Gulf," claimed McBride in 1935. "We feel that, for drilling a well beyond the last sand bars, drilling barges offer the only satisfactory protection to equipment exposed to Coastal storms. We prefer for the present, at least, not to try to predict the size and shape of barges which might venture well out into the Gulf" (McBride 1935, page 45).

Nobody as yet, however, was willing to tempt fate in the Gulf by trying to drill from a barge. But in the late-1930s companies did begin to experiment with drilling in open water using "land operations." In 1932, the Indian Oil Company, drilling off Rincon, California, became the first company to drill in the ocean from an independent platform supported on pilings. A few years later, a joint operation by Pure Oil and Superior Oil placed a similar structure in the Louisiana

Gulf. The project began in 1934 when geologists from the Pure Oil Company discovered evidence of salt domes west of the little town of Creole, Louisiana. Further surveying with reflection seismic along the shore suggested that the prospect extended out into the Gulf. In 1936, Pure and Superior persuaded the State of Louisiana to lease the combine 7,000 acres on land and 33,000 acres offshore. In 1937, the companies hired Brown & Root, an engineering and construction firm out of Houston, to construct a relatively massive (180 feet by 300 feet) wooden platform for the Creole field in about 15 feet of water -- one mile from shore, thirteen miles from nearest supply point at Cameron (Lankford 1971; *Offshore* 1963, pages 17-19).

As an exercise in "stickbuilding" – that is, using work barges to piece together a wooden structure out in the ocean, this project was only a distant cousin to the metal structures of later eras, but it helped oil men identify the key problems that would have to be overcome to operate in the Gulf. The most obvious of these was the impact of hurricanes. Lacking any reliable data on wave heights in the Gulf, the designer of the Creole platform settled for an interesting compromise made possible by the fact that the work force commuted daily to the platform and

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5. Work Plan: Tyler Priest and Joe Pratt, History International

Based on the oral histories and archival research conducted for this project, History International is drafting a series of "working papers" on three thematic areas relating to the history of the offshore oil and gas industry in southern Louisiana: 1) the history of exploration technology and strategy in the Gulf of Mexico; 2) the history of state and federal leasing in southern and offshore Louisiana; and 3) the history of hurricanes and environmental issues in the development of offshore platform technology. Detailed below is a prospectus outlining the drafts completed and projected work for inclusion in the final report.

5.1. Technology and Strategy of Petroleum Exploration in Coastal and Offshore Gulf of Mexico

5.1.1. "Salt Domes and Salt Water: Gulf Coast Exploration Technology to 1945"

This chapter addresses the oil industry's exploration for oil on the Gulf Coast, beginning with the discovery of Spindletop in 1901. Profiling the leading oil companies and the emergence of the geophysical contractors, it examines the science and technology of exploration for oil reservoirs associated with salt domes, from the torsion balance to the refraction seismograph to the revolution brought about by the reflection seismograph. By the late 1920s, geophysics as both a science and a commercial enterprise had come into its own. Geologists and paleontologists also made valuable contributions to understanding the stratigraphy and sedimentary sequence. The chapter also describes the early methods of exploration in coastal marine environments using pirogues, marsh buggies, and submersible drilling vessels. Other developments in the 1930s such as electric well logging and rotary drilling were crucial to finding new sands in known major fields. The effects of changing technology had a dramatic effect on the strategy of exploration and the development of leasing, pushing it into the open waters of the Gulf of Mexico.

5.1.2. "The Pursuit of Data: New Methods of Seismic Exploration and Prospect Evaluation, 1945-1962"

This chapter details the rapid changes in geophysical technology after World War II and the increasing sophistication of offshore exploration. At the end of World War II, the industry began making its first offshore seismic surveys in shrimp boats and using radar positioning technologies developed during the war. Multi-boat operations soon brought down the costs of data collection, and by the end of the 1950s, Western Geophysical had introduced group surveys.

1960s allowed companies to focus on geology rather than water depths in extending the offshore play further out into the Gulf.

5.1.3. "Seeing the Subsurface: The Digital Revolution and Its Impact on Exploration in the Gulf of Mexico, 1962-1988"

In 1962, Geophysical Services Inc., the undisputed leader in geophysical innovation by this time (it spun off computer research into a separated company called Texas Instruments), performed the first digital recording on a two-year proprietary contract for Mobil and Texaco, and by 1965 most oil companies were working with digital field recordings. Digital computers enabled a quantum leap in the amount of data that could be handled and manipulated, leading to an almost continuous innovation in seismic processing and interpretation, with the "deconvolution" of signals caused by reverberations in water in the early 1960s, the "direct detection" of hyrdocarbons ("bright spots") in the late 1960s, and three-dimensional seismic in the mid-1970s. Brights spots, though not foolproof, radically improved the accuracy of exploration and contributed as much as the spike in oil prices to soaring bonuses paid for offshore leases in the 1970s. To compete offshore by the mid-1970s, oil companies had to be proficient with digital seismic technology and advanced geophysics. Although the first truly 3-D seismic survey was conducted in 1973, the high costs of the technology delayed its widespread implementation until the mid-1980s, when commercial development of interactive workstations cut interpretation time from months to weeks.

5.1.4. "Beyond the Shelf: Taking Geologic and Economic Risks in Deepwater, 1974-2000"

In 1974 in the Gulf of Mexico, oil companies acquired the first deepwater leases – in the modern sense of the term deepwater – in 1,000 ft of water, extending from the upper continental slope to the abyssal plain. The key to the industry's move into deepwater was a combination of shrewd geological investigations, advances in deepwater production technology, and a willingness by managers to take risks that would be hard to imagine in the tough, quarterly profit-oriented business of today. Probe studies of deepwater turbidite geology, beginning in the 1960s, by a number of universities and oil companies, led by Shell Oil, had confirmed the potential for an exploration play. Several factors came together in the early 1980s to spur interest in the play, including the discovery of several significant turbidite fields on the shelf margin and upper slope, the recognition of great reservoir potential in deeper waters, and a rosy outlook for prices. Leasing activity was subdued until 1983, when the move to the area-wide system sparked a flurry of deepwater leasing, again led by Shell Oil, who, more than any other company was willing to take on the large risk of exploring in deepwater. Progressive improvements in drilling and production technology, especially the tension-leg platform, allowed Shell to develop its leases, with stunning well production rates coming from Auger in 1994. Thereafter, the deepwater rush was on, abetted by royalty relief in 1995 and continuing improvements in production technologies (subsea tie-backs and directional drilling) and 3-D seismic capabilities.

5.2. History of State and Federal Leasing in Southern and Offshore Louisiana

5.2.1. "The Harvest from the Hayride: Louisiana's Leasing of Petroleum Lands, 1908-1945"

This chapter surveys the leasing of public lands for petroleum development by the State of Louisiana from the first lease in 1908 by the Caddo Parish Levee Board, to the President Harry Truman's 1945 proclamation challenging the State's jurisdiction offshore. It focuses on the centralization and almost total discretionary authority over leasing in the Governor's office and the abuse of that authority in the late 1920s and early 1930s when huge swaths of land in South Louisiana, where significant oil reserves had been discovered, were leased in corrupt and complex deals to members of the Long machine who then transferred those leases, with overriding royalties, to oil companies. Texaco acquired the largest acreage, including one giant lease in the Ship Shoal area, State Lease 340, which extended three leagues into the Gulf of Mexico and whose validity would become the subject of legal wrangling for years. Meanwhile, in Plaquemines Parish, the ruthless political boss Leander Perez used complex legal and financial machinations to amass wealth from the leasing of public lands by levee boards. In 1936, after Long's assassination, the state finally reformed the leasing program through the creation of the State Mineral Board. The upshot of all these deals was the rapid extension of lease claims over much of the land in South Louisiana by a few companies and interests, forcing the rest of the industry to look offshore by the late 1930s to expand the play.

5.2.2. "Claiming the Coastal Sea: From the Tideland's Controversy to the Landmark 1962 Sale"

This chapter analyses the emergence and development of federal jurisdiction and leasing over the outer continental shelf in the Gulf of Mexico. It details the political and legal battle between the State of Louisiana and the federal government over the "tidelands." In 1937 North Dakota Senator Gerald P. Nye introduced the first congressional resolution to declare lands under the marginal seas of all the coastal states to be part of the national public domain, and in 1945 President Truman issued a proclamation officially asserting it. The chapter chronicles the Supreme Court decisions validating these claims and the passage of the Tidelands Act and Outer Continental Submerged Lands Act (OCSLA) enabling federal leasing and regulation offshore beyond the three-mile limit of state jurisdiction, as well as Louisiana's challenges to the state-federal boundary line in the 1950s. Leasing and regulatory functions were established in the Department of the Interior's Bureau of Land Management and U.S. Geological Survey, respectively. The federal government first offered OCS leases in 1954, but Louisiana obtained an injunction against further leases in 1956. An "Interim Agreement" advanced the political and legal process to a point where conflicting claims to submerged lands would no longer limit the pace and scope of offshore leasing. In 1960, the Supreme Court upheld the three-mile limit to Louisiana's jurisdiction over submerged lands, but state-federal conflict would continue for years over the location of the three-mile line and the division of escrowed revenues. In 1960 and 1962 sales, the federal government leased a tremendous amount of OCS acreage, firmly establishing offshore oil as a new major area of federal regulation in the oil industry.

5.2.3. “Searching for ‘Fair Market Value’: The Tract Selection System, 1962-1978"

This chapter discusses the “second phase” of the federal offshore leasing system, which began after the 1962 sale. The next sale was not held until five years later in 1967, and in the intervening years, the Department of the Interior developed a new system referred to as “tract selection,” in which DOI officials imposed acreage limitations on sales to increase cash bonuses. The government recognized offshore leasing as a significant source of revenue, and as the costs of the Vietnam War escalated, the DOI was pressured to increase its take from bonuses and search for a more scientific estimation of “fair market value” for the public lands being offered. The primary criterion for the acceptance or rejection of bids was the DOI’s independent estimate of the value of each tract, and not the magnitude of the highest bid, though the DOI’s fair market value estimates tended to be quite lower than winning high bids, especially as bullish projections of oil prices and bright spot technology drove bonus bids to ridiculously high levels in the mid- to late-1970s. National Environmental Policy Act (NEPA) regulations following the Santa Barbara blowout in 1969 complicated the work of leasing officials, but leasing in the Gulf continued. The industry often cried foul at the “checkerboarding” of blocks offered under the tract selection system, and fair market value proved to be an elusive concept, but the system brought in substantial revenue for the government and kept demand for offshore leases high. However, by the late-1970s, it became clear that the system was creating an artificial shortage of exploration opportunities, especially as the environmental concerns severely restricted leasing off the Atlantic and Pacific coasts.

5.2.4. “Reviving the ‘Dead Sea’: The Origins and Development of the Area Wide Leasing System, 1978-2000"

This chapter analyzes the “third phase” in the federal offshore leasing program -- the “area-wide leasing” system. In the late 1970s, the second oil shock had hit and there was growing concern about declining U.S. production, as well as mounting concern for environmental protection of coastlines. Resistance by some coastal states to OCS leasing forced Congress to pass in 1978 the Outer Continental Shelf Lands Act Amendments (OCSLAA), which opened the decision-making process to a wider audience and authorized the DOI to experiment with alternative bidding systems, and mandated a five-year plan to govern the pace of leasing. In 1981, controversial Secretary of the Interior James Watt carried out further reforms, instituting the “area-wide leasing” system, which opened the leasing process to entire planning areas (e.g., the central Gulf of Mexico) and consolidated all the leasing, regulation, and study functions in a single DOI agency, the Minerals Management Service. Beginning in 1983, major offshore acreage was leased in the Gulf of Mexico planning areas at sharply reduced bonus prices. Shell Oil acquired a large majority of these leases and in 1994 brought production in at Auger, which led to a steep increase in deepwater leasing. Despite early criticism of area-wide leasing, the new system,

6. History and Evolution of the Offshore Oil and Gas Industry in Southern Louisiana: A Brief Look at Commercial Diving and the Role of People, Technology, and the Organization of Work

6.1. Brief Overview

The offshore oil and gas industry is an extension of the vast U.S. petroleum industry, and it has been and is influenced by the operational, technological, economic, political, and moral issues that characterize that industry (see Yergin 1993; Olien and Olien 2000). Still, the move offshore produced its own unique contests (see Freudenberg and Gramling 1994; Gramling 1996).

The oil and gas industry benefited from national and international demand for its products – it, in turn, has provided sufficient economic, social, and political support for the development of specialized sectors such as commercial oilfield diving. Capturing the hist

6.2.1. Diving as a Factor in Offshore Oil and Gas Development

The first diving operations in the Gulf of Mexico

Outside the industry, the U.S. Navy was the principal source of technology and personnel. As early as the 1930's, the Navy began experimenting with gas mixtures that would allow divers to go deeper and stay underwater longer. Diving was an important responsibility of the Navy in WWII, and divers conducted salvage operations, helped construct ships, cleared ship channels, and performed numerous other tasks. During the war, new techniques of underwater welding, burning, and the use of explosives were advanced, and new tools and equipment were developed

> anything done. Offshore, everything around you is dangerous; you've got to take your chances there (Schouest, J., personal communication, 2002).

When the U.S. Merchant Marine began to decline (Gibson and Donovan 2000), some mariners turned to the offshore oil and gas industry for work. The wages paid to offshore mariners were far below those to which seamen had become accustomed, so some took up commercial diving because it required many of the skills they had developed on ships and offered more lucrative financial opportunities than work on oilfield vessels. Though some of the early divers enrolled in commercial diving schools, formal training was not considered a necessity and some even argued they could better prepare divers themselves. Walt Daspit, a career diver, describes his path through the Merchant Marine:

> It was sound powered. We worked with hand signals most of the time (Brown, personal communication, 2002).

While maintaining communication with the surface was vital to a diver, controlling that communication was a key point at which the diver could assert his autonomy, control the work setting, and enhance his status. In the early days, everyone depended on the diver to report conditions at the bottom, the time the job would require, and the progress he was making. To regain some of the control, companies began hiring inspection divers to assess initial damage and report on work completed. By the mid-1950's, underwater photography was recognized as a valuable means of augmenting a diver's description of the situation, but it was rare in the Gulf of Mexico. Its widespread use in the 1960's was another feature that marked the maturation of the oilfield diving industry.

Though technologies were borrowed and adapted from commercial diving operations elsewhere, rigid forms of work organization were actively resisted. In the early days, a diver needed only his equipment and a trustworthy "tender," someone who would stand at the surface to monitor his hose and compressor and pass him tools. Numerous small companies, comprised of one or two

6.3. Innovation and Adaptation

As both the depths and the level of offshore act

Divers worked in confined spaces at high pressure, lived for up to several weeks at a time in close quarters, and took risks relying only on the word of supervisors and company doctors that new methods were safe. Every new invention required additional human capacities and experimentation on divers, and many innovations were motivated by injuries and deaths. Still, as each new innovation came along, divers could be found to try it out. Macho pride, the desire to be the first, prospects for higher pay, and a love of diving all played a role:

> I like the gas work. I quit doing anything above 150 feet of water. Greed overcame my fear. You could go down and work an hour or two and you would get paid more than you spent working a week in some waters (Daspit, personal communication, 2002).
>
> [Being in diving] a long time starts to define who you are almost (Taylor, G., personal communication, 2002).

Problems with heat were addressed through the use of suits that were heated either by surface-supplied hot water or electric wire. Hot water suits were preferred even though they initially scalded the divers; divers reported that they would leave the front of their suits open to allow cold water to mix with the heated water coming from the surface.

The introduction of new gas mixtures meant new mechanisms for generating and then delivering those gases to the divers; standard air compressors were no longer adequate and gas mixtures had to be purchased from elsewhere. Significant invention and innovation accompanied the development of diving masks and helmets. One of the first Navy artifacts to be modified for oilfield work was the Mark V helmet, which had been developed prior to WWI and remained in use until the 1980's. The helmet and full diving suit with which it was used weighed as much as 200 pounds. Working in the Gulf of Mexico around rigs and platforms, divers needed flexibility and the ability to climb up and down, in and out among platform legs and tangled pipes. In addition, divers were frequently given a small area on the barge from which to work; in this space they had to cram their air compressor, tanks, radio, and everything else they brought along. Masks that were originally designed for SCUBA were adapted for use with hoses and compressors because they were smaller and used less air; however, the lack of any head protection was a disadvantage in construction work. Beginning with the end of WWII, Gulf Coast divers acquired access to Japanese helmets, and these became popular among some divers.

By the 1960's, several Gulf coast divers had designed and built their own hats. Walt Daspit, who was motivated by Joe Savoie to design and construct his own hat, describes why:

> The first guy that came out with a lightweight diving helmet was Joe Savoie. We were working on one of McDermott's barges with Chuck Gage and we saw Joe. Joe was explaining to us what he was going to build. He was going to use an aqualung, which was a sterile diving dress that was used at the time. It was a front entry and you would wrap up tight and you would stay dry. Joe was going to put a neck ring on it… He wanted to build a helmet out of a race car crash helmet. Then he was going to the faceplate visor and a neck ring and tie it. He was explaining that to us and drawing it. I said, "Joe, you can't do that because

> having that half opening of the dress, when you lean over air is going to go to the highest point. It is going to flip you upside down and you are going to come floating up to the surface upside down." That was one of the things about diving with heavy gear. You had to be careful. If you leaned over too far, the air went to your feet. You were out of control then. You couldn't exhaust it… I am trying to explain this to Joe who has never had any formal diving training. When you argued with Joe, all he did was talk louder. Once he gets something in his head that is where it stayed. He was a hard-headed coonass and I was a hard-headed coonass. I tried explaining to him that he couldn't do that. He said that he was going to put valves on the feet and relieve the air through the feet. I told him he couldn't do that because it wasn't going to work. You have to have a seal around the neck. Joe just kept getting louder. Joe eventually found out that I was right so he made a neck ring for his hats. He made a very good helmet but it took him a while to evolve it into something. What he first had in mind just wasn't going to work (Daspit, personal communication, 2002).

Though Joe sold a dozen helmets and Walt and a couple of other local divers sold a few more, Kirby Morgan of California achieved the greatest success. He visited Gulf Coast divers and convinced some of them to try his helmets. Soon Kirby Morgan hats were in widespread use.

Introduction of new gas mixtures required changes to communication devices. Though divers and their tenders learned to understand each other even with the distortions caused by breathing helium, barge superintendents and others at the surface did not. Unscramblers were employed to facilitate communication.

As jobs began to require many divers, supervisors were hired to manage both the work and the divers. Some supervisors managed all communication with the divers, both to maintain control over the job and to ensure diver safety. During the development of new procedures, the highly competitive environment of offshore construction and the huge profits to be made from substantial breakthroughs made secrecy paramount. One supervisor recalls a time he wrote down instructions for a welder inside the chamber:

> I have always been of the opinion that you like to keep information confidential, but in order to gain information you've got to tell the welder what he's doing, why he's doing it, and what you're looking for. So I had written down for a welder and he was in the tank welding. And [the CEO's] got a stool pigeon works for him, that found my note, and he took it to [him]. And [the CEO] called me in his office, and [the CEO] was setting holding his head like this and he goes to screaming at me about confidential information.

Gas mixtures and helmets continued to be developed and modified, and so did the search for efficiency and ways to keep divers underwater for longer periods of time and maintain continuous operation. Throughout the 1960's as the chambers were common in the Gulf, divers reported being on jobs where either no chamber was present or no one knew how to use the chamber correctly.

The diving bell provides physical protection for the diver and a more comfortable environment

Saturation diving also changed the nature of the relationships among divers and between divers and their supervisors. Instead of one diver working alone, as many as six divers and a tender would work from a diving bell. Communication was managed via unscramblers on the radio and took place between the divers and the topside supervisor and not with tenders in the bell. Tenders

Dry habitat welding progressed through several stages, beginning with the gas tungsten arc. This process was considered too slow, so alternatives were tried until the shielded manual arc became the accepted standard. Under pressure, the welding arc becomes constricted. In addition, weld metal chemistry, weld notch toughness, and hardness all are affected by pressure. Different gas mixtures were tried. At increased pressure, hydrogen's solubility increases and leads to cracking. Helium's conductivity is six times that of air, and rapid heat loss from the weld area increased hardness and the risk of cracking. Nitrogen leads to nitrides in the weld deposit and destroys the properties of the weld because molten metal will preferentially absorb nitrogen and form nitrides. To complicate matters, as the welding process was evolving to respond to increased depth, so, too, was the type of metal being used in pipes and structures.

At each stage, both weld procedures and diver/welders had to be qualified to perform to specific standards under specific conditions. The use of x-ray technologies to inspect welds required that some divers be qualified as radiographers. Anthony Gaudiano, who worked as an engineer for Taylor Diving and Salvage from the late 1960's until 1984, describes the environment of the time:

> And you have to understand that when all this was going on, and people were working like 11-12 hours a day, we didn't have meetings where we sat down and made presentations. We didn't do all of that planning and all of that critical path charts, none of that stuff. You just did it. You got it done… People did some very impressive things, really very impressive things. Innovative things. And I

> of scary and I don't know if I would do that today. The other divers flat out refused to do it. I said that I would do it (Daspit, personal communication, 2002).

Maryann Galletti, wife of John Galletti and co-owner of J&J Diving, describes how the company evolved:

> We started working out of a garage with two sets of diving equipment and no vehicle. We gradually acquired equipment, property, a building. Within a span of ten years, we had also bought a tractor trailer truck. John informed me he was going to buy this tractor trailer truck for $12,000 and I liked to have a heart attack. He had the sights to see the work that was out there and all I could see was more money, more money. It was like you would pay for one thing before you moved onto another (Galletti, personal communication, 2002).

The era of the small companies was short lived. The rapid advance to deeper waters required specialized equipment and knowledge to enable divers to work safely at ever-increasing depths. Thus, during the 1950's and early 1960's the diving companies went through the process of getting organized (Batteau 2001). A steady increase in offshore activity during the 1960's drove up demand for divers and meant that existing companies expanded and new ones formed. "The explosive growth of offshore oil exploration and development brought round-the-clock overtime and deep diving premiums. There was a lot of money being made by the younger divers, though it was often at great risk" (Parker 1997, page 115). Divers were put into the water with little, if any, training, and the greater depths substantially increased the risks associated with inexperience.

In addition, divers were under tremendous pressure to perform. The hierarchical nature of the industry and separation of those with the ultimate authority over decisions from those on the barges, rigs, platforms, and vessels led to circumstances within which divers were pushed to dive even when conditions would dictate otherwise. Both when divers were called out in an emergency and when they performed routine tasks such as laying pipelines, the work of people at the surface was halted until the diver was out of the water. Entire crews were held captive on barges and platforms while divers completed their work. Though the situation gave divers a certain amount of autonomy, it also resulted in significant peer pressure to get the job done quickly. Walt Daspit captures the sentiments expressed by most of the early divers:

> [The barge captain] can't say [to a diving company] you have to put this man in the water. But, the next time they call for divers, he can say that he doesn't want whoever out here. So, you have to keep the barge captain happy. The main thing in keeping the barge captain happy is getting the job accomplished….The barge was surging. It was going up and down. The water was picking up. They wanted

Nevertheless, diving was attractive to many young males looking for an exciting career, and would-be divers were not hard to find. Andre Galerne, a company owner and early member of the Association for Diving Contractors, commented on the problems associated with low diver pay and benefits in the Gulf of Mexico:

> The price we were paying the divers was in my book much too low, and if a guy can make the same amount of money by selling hamburgers to Big Mac, than to be a diver, I think it's exploiting the fact that the guy likes diving. [If we advertised this as something other than diving], then the people will not be doing that for the pleasure, so they will demand money. Diving is a different thing. The guy is ready to dive at any price, because they want to dive (Galerne, personal communication, 2001).

Joe Schouest (personal communication, 2002) confirmed this, "I love diving. I'd dive for nothing. Sometimes I've done it. I like the challenge."

Though divers and welders were easy to find, engineers were not. Several companies struggled to find people to enter the industry. According to Anthony Gaudiano,

> Of course, you have to understand in those days, nobody wanted to be associated with us. We were kind of wild outla

successfully claimed submarine divers among their numbers. The unions are credited with establishing better working conditions for divers on the west and east coasts. However, the move offshore undermined union activity and influence over the offshore oil industry because oil companies and drilling contractors operating drilling vessels were not signatory to pile driving and diving union agreements. “Other than establishing the fledgling oil divers with standards of safe work rules and pay scales precedent, the union had little influence over the offshore oil diving industry” (Parker 1997, page 115). Despite significant efforts in the 1970’s, the unions were never able to organize the labor force working in the Gulf of Mexico.

The push into deeper water drove technological development, and the larger companies responded by establishing research divisions. J&J Marine Services, one of the few early Texas companies that also worked out of south Louisiana, was among the few small companies that invested substantially in research. The company owners hired an independent scientist in the early 1960’s to help develop decompression tables. At that time, the company employed only a few divers, but the owners recognized the critical role that science and technology would play in the diving industry.

6.6. Discussion and Conclusions

Divers and companies in oilfield diving and underwater construction began by adapting technologies and patterns of work developed elsewhere and have continued to maintain links to the U.S. Navy and to commercial diving and construction interests operating outside the oil and gas industry. The steady march from shallow to deep water supported a continual process of innovation and change in both the equipment and methods required to put and keep divers underwater and those required for constructing, installing, repairing, and salvaging offshore structures. Within this gradual evolution ... c“l63c0rs i i ture of

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epartment of the Interior has responsibility
natural resources. This includes fostering
otecting our fish, wildlife, and biological diversity;
values of our national parks and historical places;
hrough outdoor recreation. The Department assesses
nd works to ensure that their development is in the best
couraging stewardship and citizen participation in their care.
major responsibility for American Indian reservation communities
island territories under U.S. administration.

als Management Service Mission

bureau of the Department of the Interior, the Minerals Management Service's (MMS) rimary responsibilities are to manage the mineral resources located on the Nation's Outer Continental Shelf (OCS), collect revenue from the Federal OCS and onshore Federal and Indian lands, and distribute those revenues.

Moreover, in working to meet its responsibilities, the **Offshore Minerals Management Program** administers the OCS competitive leasing program and oversees the safe and environmentally sound exploration and production of our Nation's offshore natural gas, oil and other mineral resources. The MMS **Minerals Revenue Management** meets its responsibilities by ensuring the efficient, timely and accurate collection and disbursement of revenue from mineral leasing and production due to Indian tribes and allottees, States and the U.S. Treasury.

The MMS strives to fulfill its responsibilities through the general guiding principles of: (1) being responsive to the public's concerns and interests by maintaining a dialogue with all potentially affected parties and (2) carrying out its programs with an emphasis on working to enhance the quality of life for all Americans by lending MMS assistance and expertise to economic development and environmental protection.