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"ENVIRONMENTAL AND ECONOMIC ASSESSMENT OF DISCHARGES FROM GULF OF MEXICO REGION OIL AND GAS OPERATIONS"

Contract Number: DE-AC22-92MT92001

Continental Shelf Associates, Inc.
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Quarterly Technical Progress Report
Reporting Period: 1 October to 31 December 1992
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US/DOE Patent Clearance is not required prior to publication of this document.

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DISCLAIMER

EXECUTIVE SUMMARY

Tasks 3 (Environmental Field Sampling and Analysis of NORM, Heavy Metals, and Organics) and 4 (Monitoring of the Recovery of Impacted Wetland and Open Bay Produced Water Discharge Sites in Coastal Louisiana and Texas) activities have included the narrowing of the list of potential offshore platforms for study off Louisiana and Texas and a preliminary selection of three coastal sites in Louisiana. After an extensive search effort, it was concluded that no coastal sites are available in Texas. A meeting was held between the contractor, Department of Energy (DOE), and Brookhaven National Laboratory (BNL) personnel to discuss potential sites and sampling designs. A letter was sent to the Scientific Review Committee (SRC) providing a general description of the revised site selection process and sampling designs. Task 5 (Assessment of Economic Impacts of Offshore and Coastal Discharge Requirements on Present and Future Operations in the Gulf of Mexico Region) activities included continued evaluation of data types available for the economic analysis. Historical field basis data were acquired. The identification of permitted discharge points was also initiated. Task 6 (Synthesis of Gulf of Mexico Seafood Consumption and Use Patterns) activities have involved the completion of the literature review. Drafts of the fisherman and wholesaler surveys were prepared. It was determined with DOE and BNL personnel that the retailer survey would be eliminated and a subsistence fisherman survey would be added. Task 7 (Technology Transfer Plan) work has been delayed due to the Tasks 3 and 4 delay and cancellation of the annual U.S. Minerals Management Service (MMS) Gulf of Mexico Region Information Transfer Meeting. Task 8 (Project Management and Deliverables) activities have involved the submission of the necessary reports and routine management.

INTRODUCTION

This report represents the second quarterly technical summary for the study "Environmental and Economic Assessment of Discharges from Gulf of Mexico Region Oil and Gas Operations." Activities associated with Tasks 3 through 8 are discussed in this report.

PROJECT DESCRIPTION

Continental Shelf Associates, Inc. (CSA) was contracted to conduct a three-year study of the environmental and health related impacts of produced water and sand discharges from oil and gas operations. Data on naturally occurring radioactive materials (NORM), heavy metals, and hydrocarbons in water, sediment, and biota will be collected and evaluated. Health related impacts will be studied through field collections and analyses of commercially- and recreationally-important fish and shellfish tissues. Additionally, information on seafood catch, consumption, and use patterns for the Gulf of Mexico will be gathered and analyzed. The facilities to be studied will include both offshore and coastal facilities in the Gulf of Mexico. Coastal sites will be additionally studied to determine ecological recovery of impacted wetland and open bay areas. The economic impact of existing and proposed effluent federal and state regulations will also be evaluated.

The primary objectives of the project are to increase the base of scientific knowledge concerning (1) the fate and environmental effects of organics, trace metals, and NORM in water, sediment, and biota near several offshore oil and gas facilities; (2) the characteristics of produced water and produced sand discharges as they pertain to organics, trace metals, and NORM variably found in association with the discharges; (3) the recovery of four terminated produced water discharge sites located in wetland and high-energy open bay sites of coastal Louisiana and Texas; (4) the economic and energy supply impacts of existing and anticipated federal and state offshore and coastal discharge regulations; and (5) the catch, consumption and human use patterns of seafood species collected from coastal and offshore waters. The products of the effort will be a series of technical reports detailing the study procedures, results, and conclusions which contribute to the transfer of technology to the scientific community, petroleum industry, and state and federal agencies.

PROJECT STATUS

Task 3 activities have involved obtaining and analyzing the EPA Region VI database on produced water discharges for offshore platforms. A short list of platforms to be used as potential sites off Louisiana and Texas was also compiled. A revised sampling plan was developed for Task 3. This plan and the short list of sites were presented at a 15 December 1992 meeting in DOE's Metairie, Louisiana office to Dr. Brent Smith (DOE), Ms. Anne Meinhold (BNL), and Dr. L.D. Hamilton (BNL). The meeting produced agreement on the general sampling design and needed detection limits. A letter (**Attachment 1**) was drafted, reviewed by the previously identified individuals, and sent to the SRC members for comment. The letter discussed the general design for Task 3.

Task 4 activities included the identification of three Louisiana sites that meet the needed schedule for termination of discharge and appear to have suitable discharge characteristics. After an extensive search, it was concluded that no Texas sites meet the termination schedule needed for this study. A general sampling plan was also prepared for Task 4. The sites and plan were also discussed at the 15 December meeting and presented in the previously mentioned letter (**Attachment 1**).

Task 5 activities included an evaluation of the various types of data available as input to the economic analysis. It was concluded that a rigorous analysis would require extrapolation of historical (oil, gas, and water) data on a field basis, in all three areas of concern: offshore, state water, and coastal areas. These data were obtained in the necessary format from Petroleum Information Corp. The locations of all existing fields were identified and the identification of permitted discharge points using data acquired from the Louisiana Department of Environmental Quality, the Texas Railroad Commission, and other sources was initiated. In addition, a sample spreadsheet model to determine economic limit reserves for individual fields as a function of operating costs was developed and tested. A contract was also prepared between ICF Resources and Paragon Engineering Services. ICF also provided comments and suggestions to DOE concerning a draft EPA survey on costs and effluents from coastal areas.

Task 6 activities involved the completion of the literature review. Drafts of the fisherman and wholesaler surveys were also completed. The reevaluation of the data collection efforts with Dr. Brent Smith and Ms. Anne Meinhold was completed. The processors and wholesalers surveys were maintained, but the extensive retailer survey was eliminated. The retailer survey will only involve a series of spot checks to determine which species are being marketed and in what form (fillets, whole fish, etc.). A special survey to address subsistence fishermen was added.

Task 7 activities have been delayed due to the delays associated with Tasks 3 and 4 and the cancellation of the MMS Information Transfer Meeting. These

activities will be discussed with DOE and a new timeline proposed as part of a revised program schedule.

Task 8 activities have also been delayed due to the problems encountered in Tasks 3 and 4. The following deliverables were submitted as required to the DOE Document Control Center:

Deliverable	Number of Copies
Management Plan (Draft)	2
Milestone Plan	2
Cost Plan	3
Cost Plan Revised 31 August 1992 Amend. 1	3
Hazardous Substance Plan (Draft)	4
Status Report (through August 1992)	2
Status Report (September-Quarterly)	3
Status Report (October)	2
Status Report (November)	2
Cost Management Report (July)	3
Cost Management Report (August)	3
Cost Management Report (September)	3
Cost Management Report (October)	3
Milestone Schedule Status (September-Quarterly)	3
Progress Presentation Abstract (Postponed)	3

PLANNED ACTIVITIES

Tasks 3 and 4 planned activities in the next quarter include receiving comments by January 11 to the letter sent to the SRC. Detailed sampling plans and costs would then be prepared. The detailed sampling plans will be the subject of a second letter to the SRC members. A revised cost and management plan will also be submitted to DOE. Following approval, the revised Sampling and Analysis Plan will be prepared. Mobilization activities for Task 4 will be initiated in mid-March.

Task 5 planned activities will involve the completion of the characterization of the state water, offshore, and state coastal areas. This will include a field-by-field determination of the volumes of produced water oil and gas, the water discharge volume, and the economic limit reserves given existing treatment technologies and practices. The costs of various alternatives to current discharge practices will be quantified and the evaluation of their effect on economic limit reserves of both gas and oil will be initiated.

Task 6 planned activities will include field testing the wholesaler and fisherman surveys. The wholesaler surveys will be initiated following the field testing and the fisherman surveys will be initiated in the spring/summer. The processor surveys will also be drafted, field tested, and completed. The subsistence fisherman surveys will also be initiated.

Task 7 activities will be revised based on the revised program schedule.

Task 8 activities will include the submittal of revised management and cost plans.

SUMMARY

Tasks 3 and 4 activities have included the narrowing of the list of potential offshore platforms for study off Louisiana and Texas and a preliminary selection of three coastal sites in Louisiana. After an extensive search effort, it was concluded that no coastal sites are available in Texas. A meeting was held between the contractor, DOE, and BNL personnel to discuss potential sites and sampling designs. A letter was sent to the SRC providing a general description of the revised site selection process and sampling designs. Task 5 activities included continued evaluation of data types available for the economic analysis. Historical field basis data were acquired. The identification of permitted discharge points was also initiated. Task 6 activities have involved the completion of the literature review. Drafts of the fisherman and wholesaler surveys were prepared. It was determined with DOE and BNL personnel that the retailer survey would be eliminated and a subsistence fisherman survey would be added. Task 7 work has been delayed due to the Tasks 3 and 4 delay and cancellation of the annual MMS Gulf of Mexico Region Information Transfer Meeting. Task 8 activities have involved the submission of the necessary reports and routine management.

REPORT DISTRIBUTION LIST

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ATTACHMENT 1

23 December 1992

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Re: U.S. Department of Energy Project "Environmental and Economic Assessment of Discharges from Gulf of Mexico Region Oil and Gas Operations"

Dear Scientific Review Committee Member:

The purpose of this letter is to provide an overall description of the revised scope for Task 3 "Environmental Field Sampling and Analysis of NORM, Heavy Metals, and Organics" and Task 4 "Monitoring of the Recovery of Impacted Wetland and Open Bay Produced Water Discharge Sites in Coastal Louisiana and Texas" sampling efforts. Revisions of the scopes of work for these two tasks have been made considering comments from the following sources:

- Verbal comments received from the Scientific Review Committee during the 20 August 1992 meeting in New Orleans, Louisiana;
- Verbal comments received from U.S. Department of Energy (DOE) and Brookhaven National Laboratory personnel during a 14 September 1992 meeting held in Jupiter, Florida to clarify objectives of Task 3 and improve coordination among the participants;
- Written comments received from the American Petroleum Institute, the U.S. Fish and Wildlife Service, and the U.S. Environmental Protection Agency;
- Verbal comments received from DOE and Brookhaven National Laboratory personnel during a 15 December 1992 meeting held in New Orleans to review preliminary revisions of the Task 3 scope of work and study site criteria and to discuss potential sites for Task 4; and
- Guidance from the DOE Contracting Officer's Representative.

A update of our progress in revising the scopes is presented below. For Task 3, this progress includes revisions to the sampling efforts at the study sites and refining the list of candidate study sites based on specific criteria. For Task 4, study sites have been selected.

Task 3

The scope of work for Task 3 has been revised into four study components. An overview of these revisions is presented in **Table 1** (attached). Component 1 is similar to that presented in the draft Sampling and Analysis Plan. Lower detection limits for radionuclides in tissue and water samples and additional replication to assess spatial variability have been added to the sampling and analysis program. This sampling component will be conducted at three to four platform study sites. Candidate study sites located on the Texas and Louisiana continental shelf are presently being reviewed. Two sites off Louisiana will likely be selected from those studied in the 44 Platform Study.

Criteria for the final selection will be delivery of radionuclides in the produced water discharges. We are attempting to select representative platforms that have average or greater than average radionuclide deliveries (radionuclide concentration and discharge volumes) among the 44 Platform Study sites. For Texas sites, we have examined a produced water discharge volume data base provided by the U.S. Environmental Protection Agency, Region VI under the Freedom of Information Act. From this data base, we are developing a short list of candidate Texas sites. We plan to contact the operators of these short-listed sites concerning monthly average discharges. A refined short list will then be determined and with the aid of an industry representative (Mr. Brian Shannon, Offshore Operators Committee, Fisheries Subcommittee), produced water samples from the platforms will be collected with operator cooperation and analyzed for radionuclides. The results of these analyses will be used to determine the final study sites.

Component 2 study sites will be sampled to provide data concerning background levels in sediments and water. Their locations will be determined based on knowledge of active production fields and during-survey observations. We plan to sample at least 10 km (5.4 nmi) from production activities.

Component 3 will provide additional data for risk assessment and to examine the relationship between produced water and tissue concentrations of radionuclides. Six sites will be sampled in this component. We anticipate that one site will have average or greater than average discharge rates and the remaining sites will include sites with intermediate and no delivery of radionuclides. Risks determined for the never-discharging sites will represent the background risk in the absence of produced water inputs of radionuclides.

Component 4 is extended collection and analysis of produced water samples from the Component 1 sites. These data will be examined to determine temporal variability of radionuclides in produced water discharges.

Task 4

Three study sites have been tentatively selected as best sites for Task 4, contingent on confirmation of their respective termination schedules and receiving permission from the operator(s). These are

- Bay de Chene tank battery #5;
- Delacroix Island tank battery #1; and
- Golden Meadow tank battery #3.

These three study sites are located in Louisiana, and information received from the Louisiana Department of Environmental Quality indicates that all are scheduled for termination in 1993. The study sites at Bay de Chene and Delacroix Island are open water sites, and the Golden Meadow tank battery is located in a canal system.

Information received from Mr. Windle Taylor (Railroad Commission of Texas) was used to identify potential study sites in Texas. We surveyed the operators of these sites and determined that the operators presently do not plan to terminate their discharges.

We are developing the sampling designs for each study site. At some of the study sites there are other tank batteries that are scheduled to cease discharging about the same time as those selected for intensive study. We intend to incorporate sampling near these tank batteries to attempt to separate field-wide changes from tank-battery specific changes.

We are changing the Task 4 sampling design to incorporate one survey prior to the cessation of produced water discharges and three, possibly four, surveys after cessation. Our intention is to begin sampling by April 1993 to meet the objective of sampling once prior to discharges ceasing.

Please review this overall sampling strategy and send comments to Alan Hart by 11 January 1993. We intend to use your comments in preparing a final sampling and analysis plan. If you have any questions, please contact us.

Sincerely,

Alan D. Hart, Ph.D.
Senior Scientist

David A. Gettleson, Ph.D.
President, Scientific Director

Attachment

Table 1. Overview of the revised Task 3 sampling and analysis.

Component	Description	Purpose	Sampling and Analysis
1	Collection and analysis of produced water, produced sand, discharge plume water, sediments, and biological tissues at three or four oil/gas platform study sites located on the Texas/Louisiana continental shelf	Provide data for an expanded risk assessment by the Brookhaven National Laboratory	Produced water - radionuclides[1], trace metals, hydrocarbons, and total organic carbon Produced sand - radionuclides, trace metals, hydrocarbons, total organic carbon, and grain size Discharge plume - radionuclides and hydrocarbons Ambient water - radionuclides, trace metals, and hydrocarbons Sediments - radionuclides, trace metals, hydrocarbons, total organic carbon, and grain size Pore water - radionuclides Tissue (biofouling, benthic soft bottom, and mid-water fish assemblages) - radionuclides, trace metals, hydrocarbons
2	Collection and analysis of ambient water and sediment samples at four sites far removed from oil and gas activities	Gather reference data for radionuclides, trace metals, and hydrocarbons to compare with data collected at Component 1 reference stations	Ambient water - radionuclides, trace metals, and hydrocarbons Sediments - radionuclides, trace metals, hydrocarbons, total organic carbon, and grain size
3	Collection and analysis of produced water and tissue samples at four additional platform sites discharging produced water and collection of ambient water and tissue samples at two sites where produced water discharges have never occurred	Gather additional data for risk assessment including risk at sites never affected by produced water discharges	Produced water - radionuclides, trace metals, hydrocarbons, and total organic carbon Tissue (biofouling, benthic soft bottom, and mid-water fish assemblages) - radionuclides, trace metals, hydrocarbons
4	Collection and analysis of produced water samples over 6 months at the four Component 1 study sites.	Determine temporal variability of produced water	Produced water - radionuclides

[1] All produced water samples will be analyzed for ^{226}Ra, ^{228}Ra, and ^{210}Pb. Selected samples will also be analyzed for ^{210}Po and ^{228}Th.

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