

SEMI-ANNUAL TECHNICAL PROGRESS REPORT

For

REPORTING PERIOD
BEGINNING MARCH 1, 2006
ENDING AUGUST 31, 2006

Prepared by Mark A. Carl

Report Submitted September 31, 2006

For

DOE Award No. DE-PS26-04NT15545

*Identification, Verification and Compilation
of
Produced Water Management Practices for
Conventional Oil and Gas Production Operations*

Report Submitted
By The
Interstate Oil and Gas Compact Commission
P.O. Box 53127
Oklahoma City, OK 53127-3127

This page left blank intentionally

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights,. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do no necessarily state or reflect those of the United States Government or any agency thereof.

ABSTRACT

The project is titled "Identification, Verification and Compilation of Produced Water Management Practices for Conventional Oil and Gas Production Operations." The Interstate Oil and Gas Compact Commission (IOGCC), headquartered in Oklahoma City, Oklahoma is the principal investigator and they have partnered with ALL Consulting, Inc., headquartered in Tulsa, Oklahoma in this project. State agencies who have also partnered in the project are the Wyoming Oil and Gas Conservation Commission, the Montana Board of Oil and Gas Conservation, the Kansas Oil and Gas Conservation Division, the Oklahoma Oil and Gas Conservation Division and the Alaska Oil and Gas Conservation Commission.

The objective is to characterize produced water quality and management practices for the handling, treating and disposing of produced water from conventional oil and gas operations throughout the industry nationwide. Water produced from these operations vary greatly in quality and quantity and is often the single largest barrier to the economic viability of wells. The lack of data, coupled with renewed emphasis on domestic oil and gas development, has prompted many experts to speculate that the number of wells drilled over the next 20 years will approach 3 million, or near the number of current wells. This level of exploration and development will undoubtedly draw the attention of the environmental community, focusing their concerns on produced water management based on perceived potential impacts to fresh water resources. Therefore it is imperative that produced water management practices be performed in a manner which best minimizes environmental impacts.

This will be accomplished by compiling current best management practices for produced water from conventional oil and gas operations and to develop a geographic information system (GIS) based analysis tool to assist in the understanding of watershed issued permits thereby allowing management costs to be kept in line with the

specific projects and regions which increases the productive life of wells and increases the ultimate recoverable reserves in the ground.

A case study will be conducted in Wyoming to validate the applicability of the GIS analysis tool for watershed evaluations under real world conditions. The results of the partnered research will be shared utilizing proven methods, such as on the IGOCC Website, preparing hardcopies of the results and distribution of documented case studies and development of reference and handbook components to accompany the interactive internet-based GIS watershed analysis tool. Additionally, there will be several technology transfer seminars and presentations. The goal is to maximize the recovery of our nations' energy reserves.

Table of Contents

DISCLAIMER	3
ABSTRACT	4
LISTS OF GRAPHICAL MATERIALS	6
INTRODUCTION	7
EXECUTIVE SUMMARY	8
EXPERIMENTAL	9
RESULTS AND DISCUSSION	10
CONCLUSIONS	13
REFERENCES	14
BIBLIOGRAPHY	15
LISTS OF ACRONYMS AND ABBREVIATIONS	17
APPENDICES	17

LISTS OF GRAPHICAL MATERIALS

None

INTRODUCTION

This is the fourth semi-annual Technical Progress Report for the Department of Energy (DOE) project titled *Identification, Verification and Compilation of Produced Water Management Practices for Conventional Oil and Gas Production Operations* submitted by the Interstate Oil and Gas Compact Commission (IOGCC) under DOE Cooperative Agreement No. DE-FC26-04NT15545. This report details progress for the months of March, 2006 through August, 2006 completed by the IOGCC and ALL Consulting (ALL) team for the project. This report details the tasks completed, tasks in progress, problems encountered, problems resolved, miscellaneous project activities, and tasks to be conducted over the next six months.

EXECUTIVE SUMMARY

A Project Advisory Council (PAC) kickoff meeting was held on November 1, 2004 at the Department of Energy (DOE) National Environmental Technology Laboratory (NETL) offices in Tulsa, Oklahoma. Discussions during this meeting involved additional PAC members and phase I tasks, schedules and work plans.

From research conducted a summary document titled *Technical Summary of Oil & Gas Produced Water Treatment Technologies* was produced in draft form as a working document. This draft document was sent out for comments in May, 2006. The deadline for comments ended in July, 2006 and a final report will be published by the end of October, 2006. The

produced water analysis tool will be completed by December 31, 2006.

Research continues on Phase II tasks and a project Website has been developed as part of the technology transfer and communication phase of the project. Presentations have also been provided at a Ground Water Protection Council (GWPC) meeting, at a DOE project meeting for the BLM, DOE and GWPC and at an IOGCC meeting.

EXPERIMENTAL

There have been no experimental methods used to date in this project.

RESULTS AND DISCUSSION

Project Status Report: March-August, 2006

*IDENTIFICATION, VERIFICATION AND COMPILATION OF PRODUCED
WATER MANAGEMENT PRACTICES FOR CONVENTIONAL OIL AND GAS PRODUCTION
OPERATIONS*

This memorandum details progress for the months of **March 2006** through **August 2006** completed by the ALL Consulting (ALL) team for the project. The report details tasks completed, tasks in progress, problems encountered, problems resolved, miscellaneous project activities, and tasks to be conducted over the next quarter.

TASKS COMPLETED

The research team does not anticipate additional work for Tasks 1.0 , 2.0, 3.0, and 4.0 therefore these tasks are considered complete. However, through the course of additional peer review, additional findings may become apparent and some additional research may be required to substantiate the findings.

Task 1.0 involves research relevant to produced water management regulations. General research has been conducted on existing and planned changes to regulations and identifying regulatory barriers. In addition, various state and federal regulations have been reviewed and team members have also attended meetings in Wyoming and Montana relative to issues such as watershed assimilative capacity, surface discharge, and water management regulatory and planning oriented meetings (e.g., Montana Board of Environmental Review (BER) meetings concerning water management planning and requirements for coal bed natural gas development). In addition, researchers have attended federal public meetings concerning water management activities and have also met with a variety of state and federal regulatory officials in several states. For instance, research team members have attended meetings of the Montana HB790 subcommittee relative to issues pertaining to water management and the subcommittee's view on various water management practices. Research team members have compiled into the Guidebook titled *A Guide to Practical Management of Produced Water from Onshore Oil and Gas Operations in the United States* a discussion of relevant produced water regulatory issues identified from field reconnaissance, interviews, and research.

Task 2.0 involves Identifying Current and Emerging Produced Water Management Practices. From the research conducted, a summary document titled TECHNICAL SUMMARY OF OIL & GAS PRODUCED WATER TREATMENT TECHNOLOGIES was produced in draft form and the content has been assimilated into the Guidebook. This document describes and summarizes various produced water treatment systems developed by oil and gas

producers, research organizations, water treatment service companies, and universities. Produced water treatment technologies are a growing concern with very large investments by industry and manufacturers as well as DOE and is a critical aspect to be addressed in the project. Research staff have visited a number of water treatment systems currently used as well as those that are under development (largely in the Powder River Basin of Montana and Wyoming). Research team members have also compiled into the Guidebook a broad array of water management practices identified from field reconnaissance, interviews, and research.

Task 3.0 involves performing Field Reconnaissance on various sites to get a rounded impression of produced water management practices under varying regional conditions. Numerous sites have been visited in Alabama, Alaska, Kansas, Montana, North Dakota, Oklahoma, Texas, and Wyoming. Site visit summaries have been prepared for most of the sites and vary in detail. Each site visit summary includes general information about the site (State, County, Basin, etc), a description of the produced water management practice in use, any environmental impacts and/or benefits, relevant cost information, regulatory issues or concerns, and a photo log depicted what was noted at the site. The findings of Task 3.0 have been incorporated into the Guidebook as examples of successful produced water management practices in various regions. **The research team does not anticipate the need to conduct additional site visits.**

Task 4.0 involves assessing and evaluating the data collected during the research performed in Tasks 1.0 and 2.0, and the field reconnaissance performed in Task 3.0. **The findings of Task 4.0 have been incorporated into the Guidebook to provide a framework for produced water management technology transfer between various regions of the United States.**

TASKS-IN-PROGRESS

The Project Advisory Council (PAC) held a meeting in **May of 2006 at the IOGCC Midyear Issues Summit in Billings, MT** to discuss the Guidebook (Draft Version) and the functionality of the Watershed Analysis Tool.

Task 5.0 involves the development of a Watershed Analysis Tool. The research team has conducted discussions with the PAC members and completed the preliminary conceptual design

of the Watershed Analysis Tool. **Development of the Watershed Analysis Tool is moving forward.**

Task 6.0 involves the development of the Guidebook discussed above. **The comments received on the draft version of the Guidebook are being incorporated into the final version of the Guidebook.** In addition to the Guidebook, a project web-site was developed as part of the technology transfer and communication phase of the project and put on-line (www.all-llc.com/iogcc/prodwtr). The web site includes basic information on the project. Relevant project documents such as presentations and draft reports can be downloaded from the site. The site is evolving.

Also as part of the technology transfer aspects of the project, ALL staff presented information on produced water management practices at a Ground Water Protection Council Meeting and at a meeting DOE project meeting for federal land access held by BLM, DOE and the GWPC. **Additional presentations on the final Guidebook and the Watershed Analysis Tool are planned for conferences around the country.**

Problems Encountered

No problems this period

Problems Resolved

N/A

Miscellaneous Project Activities

Research team members have held several discussions with industry and regulatory officials since the start of the project. Interest by industry has exceeded expectations and the researchers are considering the addition of sites to be considering in the project at the request of industry.

In addition, the researchers have identified additional potential case studies and will be working with the PAC and industry on the appropriateness of each project.

Tasks for Next Quarter

Work will continue on Tasks 5 and 6. Project team members will be **attending the IOGCC Annual Meeting in Austin, TX for a PAC meeting** and to meet with cooperators to discuss activities that have been performed to date, and to present and discuss path forward on the Watershed Analysis Tool.

The comments received on the draft Guidebook will be incorporated into the final Guidebook. **The final Guidebook will be posted on the project website once it is complete.**

CONCLUSIONS

Thus far PAC meetings were held on November 1, 2004 at the Tulsa, Oklahoma offices of the DOE-NETL and on May 13, 2005 in conjunction with the IOGCC 2004 Mid-Year Issues Summit held in Anchorage, Alaska. General research has been conducted on existing and planned changes to regulations and identifying regulatory barriers. A Website has been constructed to allow PAC members and other key constituents to up-date themselves on the progress of the project.

It has been identified that produced water treatment technologies are a growing concern with very large investments by industry and manufacturers as well as DOE and is a critical aspect to be addressed in the project. A third PAC meeting is scheduled for September 16, 2005 in

Jackson Hole, Wyoming, which will be held in conjunction with the IOGCC 2005 Annual Meeting. It is anticipated that we will have at least one new PAC member from the public sector participate at this meeting.

REFERENCES

None

BIBLIOGRAPHY

None

LISTS OF ACRONYMS AND ABBREVIATIONS

AOGCC	Alaska Oil and Gas Conservation Commission
BLM	Bureau of Land Management
DOE	Department of Energy

GIS	Geographic Information System
IOGCC	Interstate Oil and Gas Compact Commission
MBOGC	Montana Board of Oil and Gas Conservation
NETL	National Energy Technology Laboratory
PAC	Project Advisory Committee
WOGCC	Wyoming Oil and Gas Conservation Commission

APPENDICES

None

