

1 of 1

QUARTERLY TECHNICAL PROGRESS REPORT

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**TITLE: IDENTIFICATION AND EVALUATION OF FLUVIAL-DOMINATED
DELTAIC (CLASS I OIL) RESERVOIRS IN OKLAHOMA**

Cooperative Agreement No. DE-FC22-93BC14956
Oklahoma Geological Survey (OGS), University of Oklahoma (OU)
Norman, Oklahoma 73019

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Program Manager:
Martin J. Byrnes,
Pittsburgh Energy Technology Center

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Principal Investigators:
Charles J. Mankin, OGS
Mary K. Banken, OU

OSTI

Technical Project Officer (TPO):
Rhonda Lindsey,
Bartlesville Project Office

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OBJECTIVES

The Oklahoma Geological Survey (OGS), the Geological Information Systems department, and the School of Petroleum and Geological Engineering at the University of Oklahoma are engaging in a program to identify and address Oklahoma's oil recovery opportunities in fluvial-dominated deltaic (FDD) reservoirs. This program includes the systematic and comprehensive collection and evaluation of information on all of Oklahoma's FDD reservoirs and the recovery technologies that have been (or could be) applied to those reservoirs with commercial success. This data collection and evaluation effort will be the foundation for an aggressive, multifaceted technology transfer program that is designed to support all of Oklahoma's oil industry, with particular emphasis on smaller companies and independent operators in their attempts to maximize the economic producibility of FDD reservoirs.

Specifically, this project will identify all FDD oil reservoirs in the State; group those reservoirs into plays that have similar depositional and subsequent geologic histories; collect, organize and analyze all available data; conduct characterization and simulation studies on selected reservoirs in each play; and

14
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implement a technology transfer program targeted to the operators of FDD reservoirs to sustain the life expectancy of existing wells with the ultimate objective of increasing oil recovery.

The elements of the technology transfer program include developing and publishing play portfolios, holding workshops to release play analyses and identify opportunities in each of the plays, and establishing a user lab called the OGS Geosystems Extension Laboratory. The laboratory will contain all the play data files, as well as other oil and gas data files, together with the necessary hardware and software to analyze the information. Technical support staff will be available to assist interested operators in the evaluation of their producing properties, and professional geological and engineering outreach staff will be available to assist operators in determining appropriate recovery technologies for those properties.

SUMMARY OF TECHNICAL PROGRESS

The execution of this project is being approached in three phases. The current Phase 1: Planning and Analysis will last eighteen months, and includes system design, play definition, and database development activities. Data from the Natural Resources Information System (NRIS), an Oklahoma data system which has been developed through the support of the Department of Energy's Bartlesville Project Office, will provide the foundation for this data collection effort. Phases 2 and 3 will include implementation and technology transfer activities in which the collected information is organized and made available to the industry through the various methods. The milestone schedule and log for Phase 1 is included as Exhibit 1. Activities for Phase 1 have been divided into five primary tasks.

Task 1.1 Design/Develop Database Systems: System design and development activities continued during this quarter for the primary databases of the project. A reconsideration of the most efficient approach to database development and maintenance activities led to a decision to modify the overall approach to this task. In the original project design, it was expected that mainframe-level databases would be developed initially, with a conversion to pc-level systems as part of the overall user lab configuration. Once project staff had received training in the Advanced Revelations pc-level database software, it became clear that a more efficient approach would be to develop the Advanced Revelations system as quickly as possible, and use informal data storage until that system was operational.

This decision has slightly different implications for the different subtasks. The reservoir (subtask 1.1.1) and bibliographic/recovery technologies (subtask 1.1.2) databases are under development in Advanced Revelations. The operator database (subtask 1.1.3) has already been developed at the mainframe level, but by next year it will be converted to a pc-level system to facilitate contact-tracking activities.

Task 1.2 Data Research: Primary efforts for this quarter were devoted to data research activities.

One fundamental precursor to the analysis of FDD reservoirs is the appropriate delineation of the oil field boundaries in which these reservoirs occur (subtask 1.2.1). Project staff are working closely with the Oklahoma Nomenclature Committee (ONC) of the Midcontinent Oil and Gas Association to

identify necessary updates to the official field boundaries. ONC review areas are prioritized based on their volumes of oil production from "unassigned" leases (i.e., leases outside of field boundaries). For each review area, project staff are generating maps and print listings of fields, leases, and wells that the ONC uses to determine appropriate field updates. During this quarter, the ONC completed its review efforts for Beaver County, reducing that county's unassigned oil production from 40% (which was over a million barrels per year being produced outside of the official field boundaries) to 12%; much of the oil in that area is included in the Morrow play. Project staff have now turned their efforts to the north central region of Oklahoma, where considerable volumes of Red Fork and Bartlesville production are unassigned.

Public domain data research (subtask 1.2.2) continued as a primary emphasis during this quarter. Initial reservoir identification activities have been completed; these reservoir delineations will be further refined as additional data are collected. Data research efforts for the operator database were minimal this quarter, as greater emphasis was placed on the intensive research of literature and theses that are relevant to FDD reservoirs. Photocopies have been produced of several hundred literature sources which will be referenced in the compilation of the reservoir data items and in the production of the published play summaries, and will be available in the public-access files of the project.

One of the baseline illustrations for the play analyses and publications is a map of the geologic provinces of Oklahoma. Available versions of such a map are outdated and lack some of the structural/stratigraphic details that have been identified in the literature of recent years. Data collection efforts this quarter included an assessment of that literature to develop a draft of a revised geologic province map for the state. A peer review process will be conducted for that revised map, with a final product that will be used and distributed by the Oklahoma Geological Survey for numerous applications in addition to this project.

Progress in the collection of private domain data (subtask 1.2.3) has developed more slowly. Several contacts have been made with operators who have expressed interest in working with the project team, however the actual data collection process has yet to begin.

Reservoir and bibliography/recovery technology data elements (subtasks 1.2.4 and 1.2.5) are being captured as they are identified in various sources, even though the user lab input formats are still under development.

Task 1.3 Play ID/Folio Plans: None of the Play ID/Folio planning sessions were scheduled for this quarter. Primary plays are still:(1) the Skiatook-Kansas City Play which includes Layton, Marchand and Cleveland sandstones; (2) the Upper Cherokee Play including the Prue and Skinner sandstones; (3) the Middle Cherokee Play for the Red Fork sandstone; and (4) the Lower Cherokee Play including the Bartlesville and Booch sandstones.

Other identified plays include (5) the Shawnee Play (Hoover, Carmichael, and Endicott sandstones), (6) the Douglas Play (Wade & Tonkawa sandstones), (7) the Ochelata-Lansing Play (Cottage Grove sandstone), (8) the Marmaton Play (Peru sandstone), (9) the Atoka Play (Gilcrease and Dutcher sandstones), and (10) the Morrow Play (Upper and Lower Morrow sandstones).

1.4 Computer Applications: The Analysis/Exhibit Preparation activities (subtask 1.4.1) include the development of computerized mapping and report programs to support the analysis of reservoir and play information. The programs will also be used to generate exhibits for the play folio publications and workshops in later phases of the project. To facilitate the process of generating these applications,

the state has been divided into standard rectangular panels which can be mapped at a 1:250,000 scale to produce area maps of reservoirs and fields at a workable size. The panel delineations are shown in Exhibit 2.

User lab development activities (subtask 1.4.2) include both the acquisition of hardware and software, and the development of user interfaces for the data and applications that will be available through the user lab. Research is being continued on the most valuable and cost-effective hardware and software selections for the user lab, and some acquisitions have already been completed. Design efforts for the Advanced Revelations user interfaces are coinciding with the database development efforts in Task 1.1.

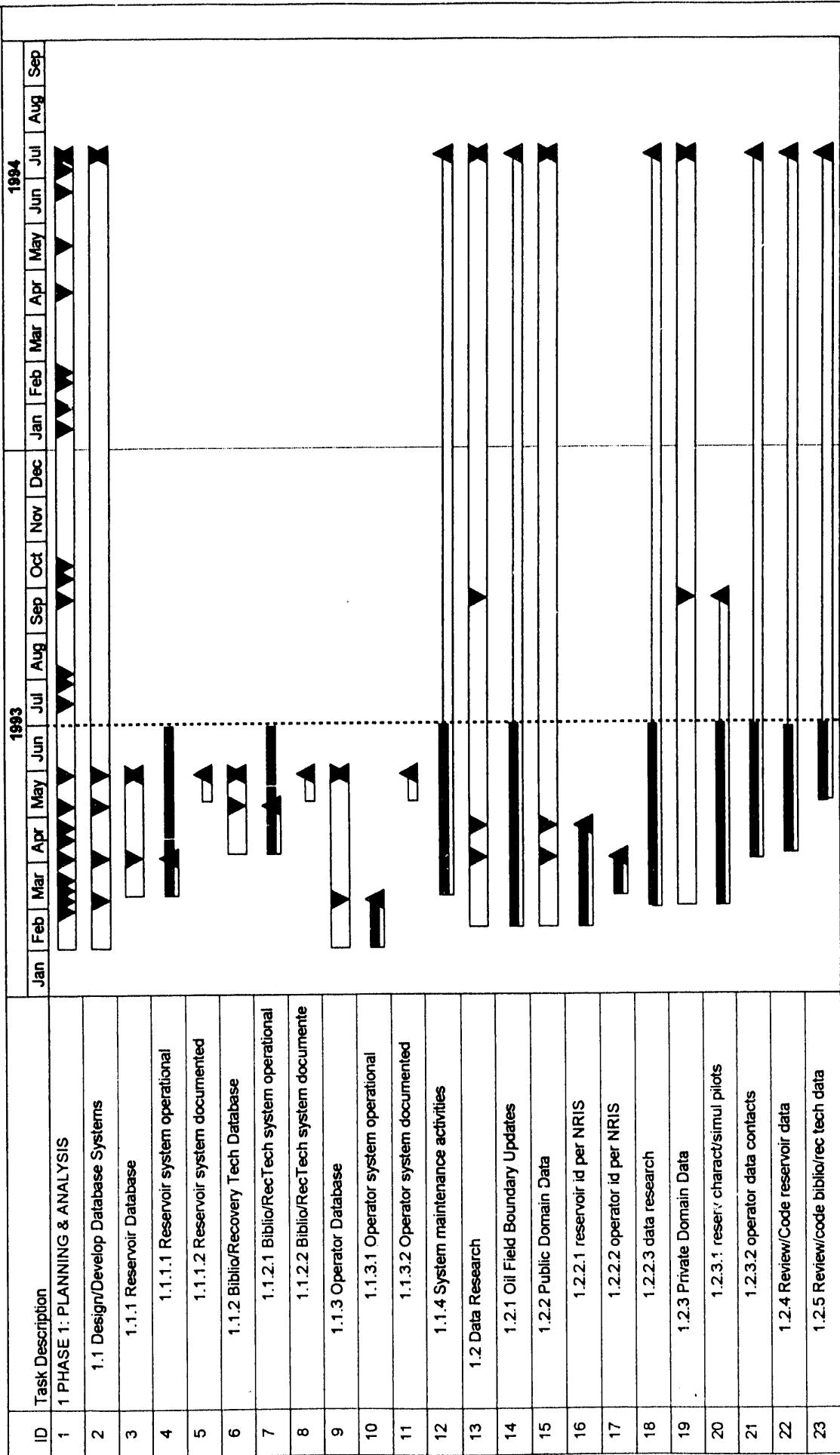
1.5 Management/Reporting: Primary management activities during this quarter included the hiring of a petroleum geologist to serve as the third Play Leader for the project. That individual will begin work during the third quarter of the project.

The only contract deliverable report completed during this quarter was the quarterly technical progress report for last quarter.

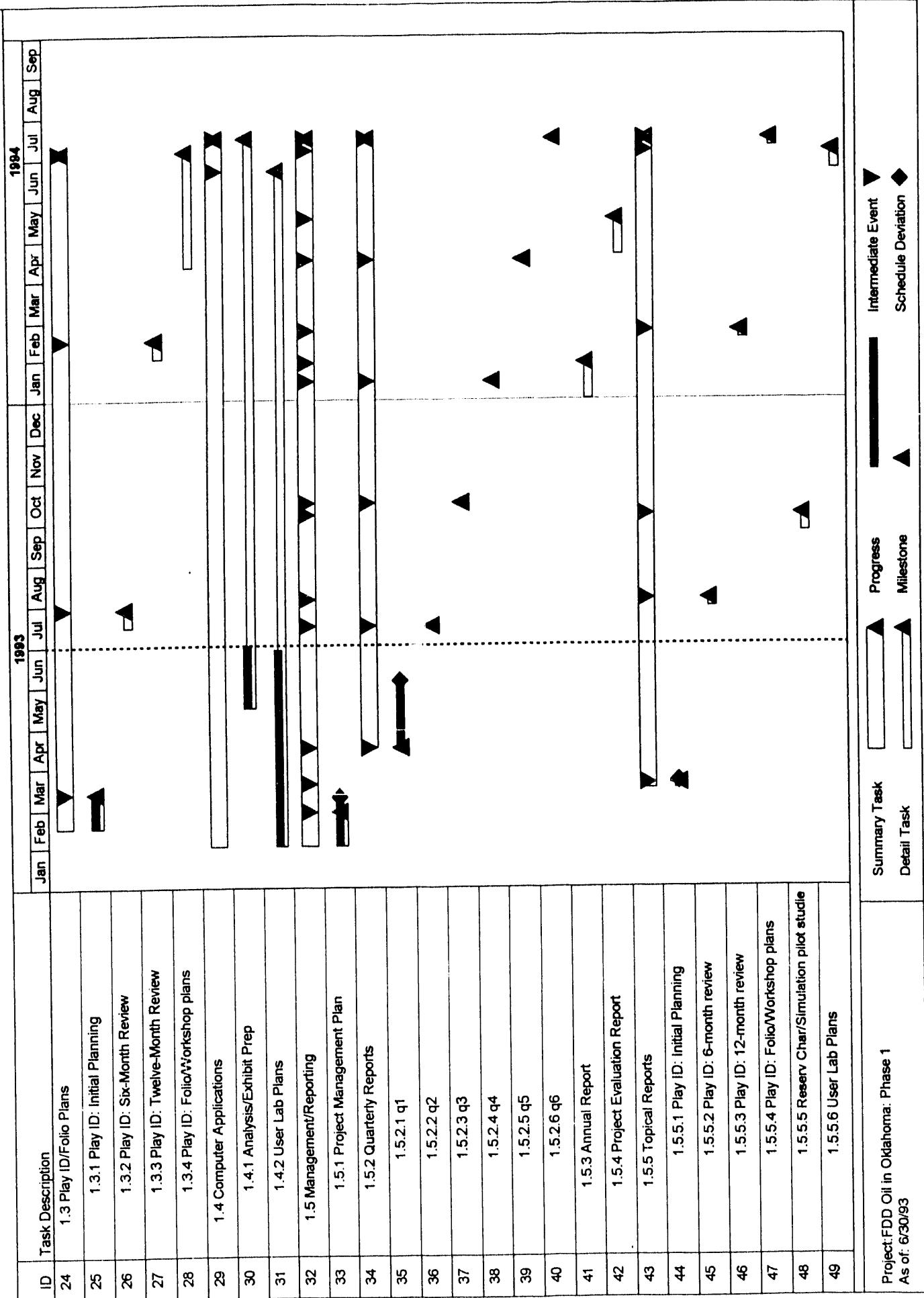
REFERENCES/PUBLICATIONS

Since the project is in its early stages of planning and analysis, no publications have resulted from the project work thus far. However, other efforts are underway to publicize the project to relevant audiences. During this quarter, a project overview was presented to a meeting of the Board of Directors of the Oklahoma Independent Producers Association that was held at OU's Sarkeys Energy Center.

OKLAHOMA FDD OIL RESERVOIRS



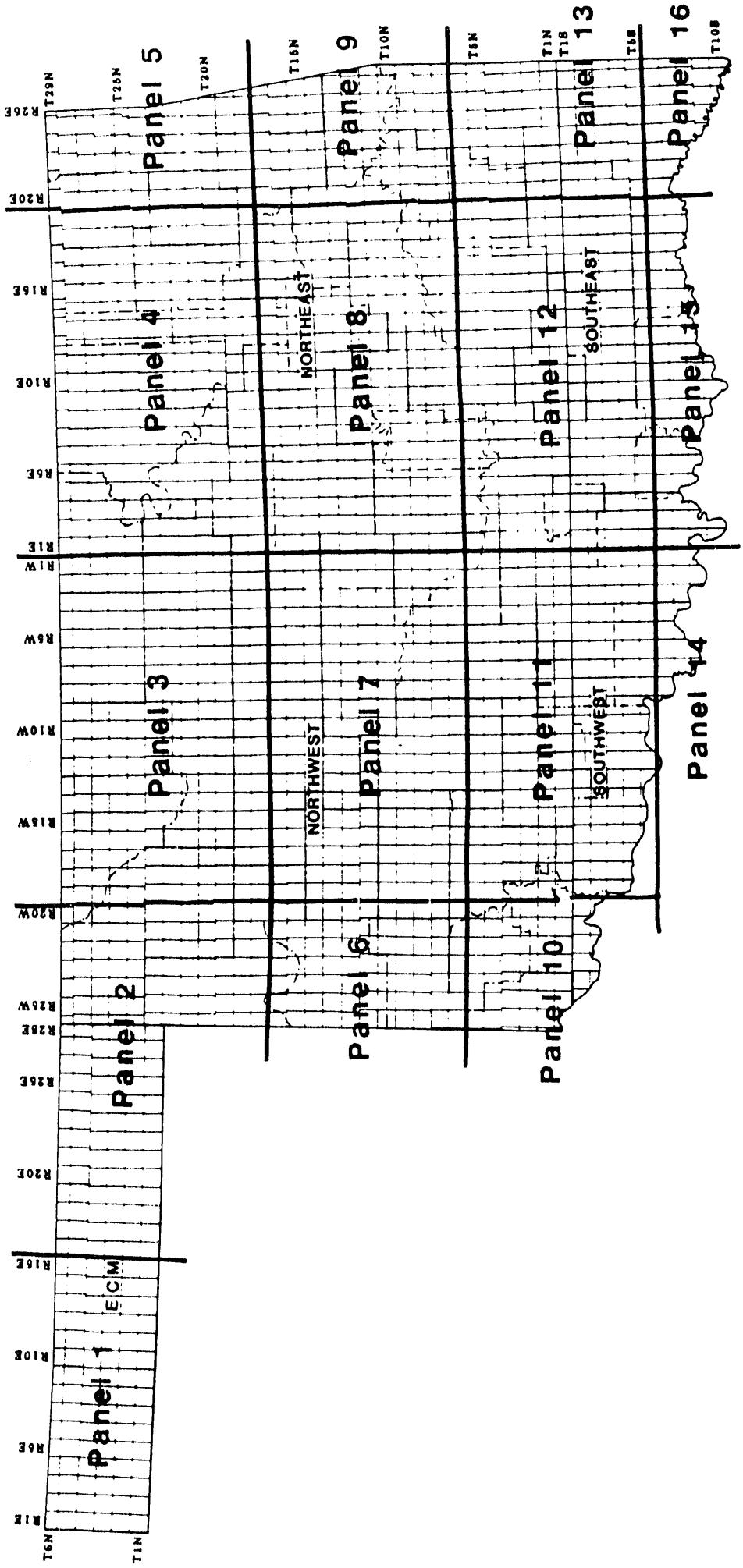
OKLAHOMA FDD OIL RESERVOIRS



FDD Oil in Oklahoma: Phase 1

Exhibit 1.3
Milestone Log

ID	Task Description	Planned Date	Actual Date	Comments
1	1 PHASE 1: PLANNING & ANALYSIS	7/15/94	NA	
2	1.1 Design/Develop Database Systems	7/15/94	NA	
3	1.1.1 Reservoir Database	5/28/93	NA	Delay due to change in approach
4	1.1.1.1 Reservoir system operational	4/2/93	NA	
5	1.1.1.2 Reservoir system documented	5/28/93	NA	
6	1.1.2 Biblio/Recovery Tech Database	5/28/93	NA	Delay due to change in approach
7	1.1.2.1 Biblio/RecTech system operational	5/7/93	NA	
8	1.1.2.2 Biblio/RecTech system documented	5/28/93	NA	
9	1.1.3 Operator Database	5/28/93	NA	Delay due to change in approach
10	1.1.3.1 Operator system operational	3/5/93	3/5/93	
11	1.1.3.2 Operator system documented	5/28/93	NA	
12	1.1.4 System maintenance activities	7/15/94	NA	
13	1.2 Data Research	7/15/94	NA	
14	1.2.1 Oil Field Boundary Updates	7/15/94	NA	
15	1.2.2 Public Domain Data	7/15/94	NA	
16	1.2.2.1 reservoir id per NRIS	4/23/93	4/23/93	
17	1.2.2.2 operator id per NRIS	4/2/93	4/2/93	
18	1.2.2.3 data research	7/15/94	NA	
19	1.2.3 Private Domain Data	7/15/94	NA	
20	1.2.3.1 reserv charact/simul pilots	9/22/93	NA	
21	1.2.3.2 operator data contacts	7/15/94	NA	
22	1.2.4 Review/Code reservoir data	7/15/94	NA	
23	1.2.5 Review/code biblio/rec tech data	7/15/94	NA	
24	1.3 Play ID/Folio Plans	7/5/94	NA	
25	1.3.1 Play ID: Initial Planning	3/12/93	3/12/93	
26	1.3.2 Play ID: Six-Month Review	7/28/93	NA	
27	1.3.3 Play ID: Twelve-Month Review	2/14/94	NA	
28	1.3.4 Play ID: Folio/Workshop plans	7/5/94	NA	
29	1.4 Computer Applications	7/15/94	NA	
30	1.4.1 Analysis/Exhibit Prep	7/15/94	NA	
31	1.4.2 User Lab Plans	6/21/94	NA	
32	1.5 Management/Reporting	7/15/94	NA	
33	1.5.1 Project Management Plan	2/28/93	3/9/93	
34	1.5.2 Quarterly Reports	7/15/94	NA	
35	1.5.2.1 q1	4/15/93	6/4/93	
36	1.5.2.2 q2	7/15/93	NA	
37	1.5.2.3 q3	10/15/93	NA	
38	1.5.2.4 q4	1/14/94	NA	
39	1.5.2.5 q5	4/15/94	NA	
40	1.5.2.6 q6	7/15/94	NA	
41	1.5.3 Annual Report	1/28/94	NA	
42	1.5.4 Project Evaluation Report	5/16/94	NA	
43	1.5.5 Topical Reports	7/15/94	NA	
44	1.5.5.1 Play ID: Initial Planning	3/19/93	3/20/93	
45	1.5.5.2 Play ID: 6-month review	8/4/93	NA	
46	1.5.5.3 Play ID: 12-month review	2/21/94	NA	
47	1.5.5.4 Play ID: Folio/Workshop plans	7/15/94	NA	
48	1.5.5.5 Reserv Char/Simulation pilot studie	10/6/93	NA	
49	1.5.5.6 User Lab Plans	7/6/94	NA	



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12/10/93

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