DOE/BC/14991--3

PROJECT MANAGEMENT/EVALUATION PLAN

"DESIGN AND IMPLEMENTATION OF A CO_2 FLOOD UTILIZING ADVANCED RESERVOIR CHARACTERIZATION AND HORIZONTAL INJECTION WELLS IN A SHALLOW SHELF CARBONATE APPROACHING WATERFLOOD DEPLETION"

Cooperative Agreement Number: DE-FC22-94BC14991

Phillips Petroleum Company

May 3, 1995

Award Date:	June 1, 1994
Anticipated Completion Date:	01/02/01
Government Award (This Budget Period):	$880,572
Program Manager:	D. R. Wier
Principal Investigator:	L. D. Hallenbeck K. J. Harpole M. G. Gerard
Contracting Officer:	Dale A. Siciliano
Contracting Specialist:	Keith R. Miles
Contracting Officer's Representative:	Jerry F. Casteel

TABLE OF CONTENTS

INTRODUCTION

The objectives of the Management/Evaluation Plan are: 1) clarify management structure, task responsibilities and schedules, and 2) to be used as a basis for judging the Project Evaluation Report submitted as a part of the continuation application. The Table of Contents on the preceding page gives the components addressed in the report and the order in which they are presented.

MANAGEMENT STRUCTURE

This section addresses the management responsibilities and the chain of command above the project team level. The Project Team itself is discussed in detail in a later section. Members of the Project Team are located in the Permian Basin Profit Center (PBPC) in Odessa, Texas and in the Corporate Technology (CT) Group in Bartesville, Oklahoma. The PBPC is part of the North America Production Division (NAPD) headquartered in Houston, Texas. This Division is in turn a part of the Exploration and Production (E&P) Group. The ultimate responsibility of this chair of command is to approve the Authority for Expenditure (AFE) to procede from Budget Phase I into Budget Phase II and field implementation of the project. For an AFE of the monetary magnitude envisioned to be required for this project approval will be obtained through the PBPC, the NAPD, the E&P Executive V.P., the President and Chief Operating Officer, and the Chairman and Chief Executive Officer.

The responsibility of the CT personnel on the Project Team is to accomplish certain subtasks within the Statement of Work (SOW). The results from these subtasks will be utilized in the determination of the technical and economic feasibility of the project. The primary responsibility of the CT management chair of command is to insure technical quality from the CT contribution, and to advise upper management on the technical and economic feasibility of the project.

Attachment I is an organization chart showing both the E&P and CT management structure from the Project Team to the Company CEO. The E&P chain of command is shadowed to indicate the path an AFE will follow for approval.

PROJECT STAFF ORGANIZATION

There are four people on the project team classified as key personnel. D. R. Wier, Principal Reservoir

Engineer, is the project manager. His primary responsibilities are communication between the team and management, overall coordination of the tasks, and planning and budgeting. L. D. Hallenbeck, Senior Reservoir Engineering Specialist, will handle correspondence with the DOE, coordinate the technology transfer efforts, and be responsible for daily project activities, planning of long term studies and field implementation. K. J. Harpole, Principal Reservoir Engineer, will have responsibility over the reservoir engineering tasks including 3D simulation work, special PVT studies, coordination of core laboratory work, generation of production profiles and overall engineering support. M. G. Gerard, Senior Reservoir Engineer, will be responsible for coordination of the reservoir characterization work.

In addition to the people designated as key personnel there will be numerous technical personnel from Corporate Technology and the PBPC which will contribute to the accomplishment of the SOW. From Corporate Technology these include technicians, geophysicists, a sedimentologist, and research engineers and chemists. From the PBPC additional technical contributors beyond those listed as key personnel include a production engineer, a drilling engineer and a geologist.

There will be no management structure within the project team beyond the key responsibilities discussed above. The team will be empowered to assign various members as facilitators to coordinate diffferent activities during various stages of the project.

MANAGEMENT PROCEDURES

The tasks and subtasks which must be accomplished are described in the SOW (see Attachment II). The schedule by which the tasks and subtasks are to be completed are given in the Work Breakdown Schedule (WBS) (see Attachment III). The list and schedule of planned management and technical reports gives the schedule for the deliverables (see Attachment IV). Project Team members will be responsible for various subtasks or portions of subtasks. The SOW, WBS and planned deliverables will be the documents dictating the frequency and duration of coordination required between CT and PBPC personnel. Telephone conversations, electronic mail, team meetings on an as needed basis, management update meetings, unit partner meetings, review meetings with DOE personnel, preparation of quarterly reports and preparation of technical papers will all be important tools to insure coordination of effort and the sharing of data. Adherance to or slippage from the WBS and planned deliverables schedule will be used to judge successful approaches or identify needed correction areas.

QUALITY ASSURANCE PLAN

Phillips Petroleum Company is committed to continuous quality improvement. Phillips has many quality assurance programs in its businesses. Examples of such procedures in the upstream business units are well logging quality control and well stimulation quality control. All such quality assurance programs will be maintained during this project.

Specific factors which will contribute to quality assurance in the South Cowden Unit are as follows:

1.) Development and execution of a comprehensive SOW, WBS and a list and schedule of planned deliverables.

2.) Effective communication of the SOW, WBS and list and schedule of planned deliverables to all team members.

3.) Team peer, management, unit partner, industry peer and DOE review of project reports, technical paper presentations and technical and economic recommendations.

4.) Risk analysis and economic analysis of the project and review by management and the unit partners.

5.) Pre-project evaluation of technology designed to mitigate the impact of poor volumetric sweep.

6.) Periodic review of project accomplishments versus forecasted deliverables and correction where necessary.

ES&H PLAN AND ENVIRONMENTAL COMPLIANCE REPORTING

The Hazardous Substance Plan is given in Attachment V. This plan contains information which addresses the ES&H aspects of the project. Attachment VI is a Hazardous Waste Report. Hazardous Waste Reports will be made within 30 days of the end of each quarter.

TASK WBS AND LOGIC FLOW DIAGRAM

A condensed version of the SOW is given in Attachment II. Attachment III is a WBS at subtask level 2 (i.e., I.1, I.2, etc). Attachment VII is a logic flow diagram for Budget Phase I of the project. At any point in Budget Phase I an assessment can be made of the technical and economic feasibility of the project using the best information available at the time. The possible assessment outcomes are that not enough information is available to make a decision, that the results look marginal and it is doubtful Phase II should be implemented, or the results look strong and concurrent work on critical negotiations such as CO_2 contract negotiations should procede while the remainder of the Phase I work is being completed. The time required to procede into Phase II will be a function of how early in Phase I a committment can be made to concurrent work on critical negotiations.

LIST AND SCHEDULE OF PLANNED DELIVERABLES

The list and schedule for reports is given in Attachment IV. Committments for technology transfer are shown under Tasks III and VI in the Work Breakdown Schedule (Attachment III).

DIAGRAMS OF EXISTING FACILITIES

Attachment VIII shows the location of the active injectors and producers. Attachments IX and X are diagrams of the two unit tank batteries.

INDUSTRY INTERACTION

There will be two primary sources of industry interaction in this project. One source will be the South Cowden Unit working interest owners (WIO's). The WIO's were involved in the decision to pursue the project and will continue to be involved in all important decisions throughout the life of the project as dictated by their voting rights in the unit. The other source of industry interaction will be through the technology transfer portion of the project. Peer review and input during technical paper presentations, forums, core workshops and the other technology transfer efforts will provide important feedback to the project team.

EVALUATION OF TECHNICAL AND ECONOMIC FEASIBILITY

A positive vote from three or more working interest owners having 65% or more of the working interest will be required for approval of the Authority for Expenditure (AFE) to procede to Budget Phase II. Each owner will have their own criteria for approving or disproving the AFE. Phillips will base their decision on the economics of both the expected case and multiple other possible cases generated from Decision or Risk Analysis Techniques. An important economic parameter in the decision is the profitability index, which is the net present value calculated at a 13% discount rate divided by the investment plus one added to this quotient,

or $$PI = (NPV \ @ \ 13\% / Investment) + 1$$

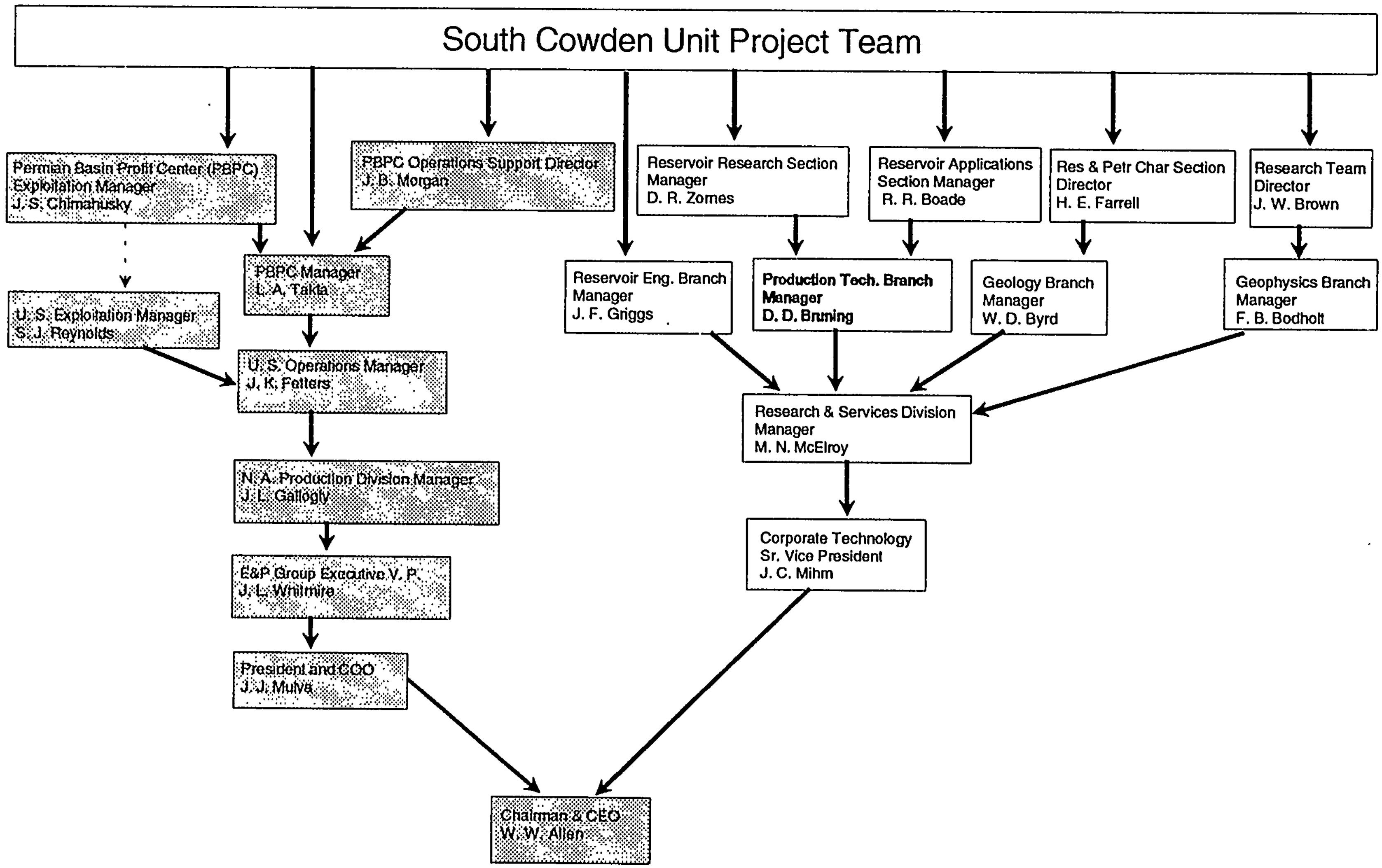
Other important economic parameters are the average annual rate of return (AARR), the payout and breakeven point in years, and net times the investment is returned at various discount rates.

The decision analysis process generally consists of identifying the alternative approaches, developing influence diagrams to determine the most important variables, calculating the economic sensitivities to these variables, assigning probabilities to various variable values, and doing a decision tree analysis to calculate the expected value and distribution of values around the expected value. In projects of the type discussed here the highest sensitivities are generally associated with oil price, the shape of the production versus time curve, as well as the total magnitude of new production, the investment costs and the operating costs.

The technical feasibility is highly intertwined with the economic feasibility through the impact that technical factors have on the highly important production forecast, investment cost and operating cost variables. Completion of Task I, Reservoir Analysis and Characterization, and Task II, Advanced Technology Definition, in the SOW will determine the technical feasibility of the project. Important factors in the technical feasibility will be the miscibility pressure for both the CO_2 source and the anticipated re-injection streams, the remaining oil in place capable of being mobilized by CO_2, the vertical and areal permeability and permeability variation, and both the injectivity and injectivity distribution of CO_2.

Attachment I

Management Structure



ATTACHMENT II

Condensed Version of the Statement of Work

I. Reservoir Analysis and Characterization

- I.1 Process and Interpret 3-D Seismic Data
  - I.1.1 Process 3-D Seismic Data
  - I.1.2 Standard Structural Interpretation
  - I.1.3 Seismic Facies Analysis
  - I.1.4 Geostatistical Evaluation of Seismic Data
- I.2 Update Injection Well Condition Database
  - I.2.1 Run Total Depth Checks on 9 Injection Wells
  - I.2.2 Run Injection Profile Surveys on 9 Injection Wells
  - I.2.3 Run Injection Falloff Tests on 3 Injection Wells
- I.3 Drill, Test and Complete First Reservoir Characterization Well (RC-1)
  - I.3.1 Drill Reservoir Characterization Well RC-1
  - I.3.2 Core Reservoir Characterization Well RC-1
  - I.3.3 Run full log suite and obtain individual zone pressures
    - I.3.3.1 Run a full suite of open-hole logs
    - I.3.3.2 Measure pressures in selected porosity zones
  - I.3.4 Perform Routine Core Analysis
  - I.3.5 Perform Micro Fracture Test
  - I.3.6 Complete Well RC-1 and Production Test Selected Zones
    - I.3.6.1 Run production casing and install equipment to production test
    - I.3.6.2 Conduct production flow tests on at least three zones
  - I.3.7 Pressure Test Analysis (buildup test on RC-1)
  - I.3.8 Install Artificial Lift Equipment on Well RC-1
- I.4 Drill, Test and Complete Second Reservoir Characterization Well (RC-2)

Condensed Version of the Statement of Work (continued)

- I.4.1 Drill Reservoir Characterization Well RC-2
- I.4.2 Core Reservoir Characterization Well RC-2
- I.4.3 Run full log suite and obtain individual zone pressures
  - I.4.3.1 Run full log suite on RC-2
  - I.4.3.2 Measure pressures in selected porosity zones
- I.4.4 Perform routine core analysis
- I.4.5 Perform micro fracture test
- I.4.6 Complete RC-2 and production test selected zones
  - I.4.6.1 Run production casing and install equipment to production test
  - I.4.6.2 Conduct production flow tests on at least three zones
- I.4.7 Conduct a pressure buildup on RC-2
- I.4.8 Install artificial lift equipment on RC-2

I.5 Evaluate unit production history and waterflood response

- I.5.1 Incorporate production and pertinent reservoir description data in a database
- I.5.2 Generate appropriate production performance maps
- I.5.3 Review well completions and individual zone production/injection allocation
- I.5.4 Evaluate unit production/injection data to validate the SCU reservoir description

I.6 Core Description and Petrographic Studies

- I.6.1 Macroscopic Core Description
- I.6.2 Microscopic Descriptions of Rock Fabric and Pore Systems
  - I.6.2.1 Prepare thin sections representing selected lithofacies
  - I.6.2.2 Conduct microscopic analysis of selected lithofacies
  - I.6.2.3 Conduct NMR and mercury porosimetry analyses
- I.6.3 X-ray Diffraction and Energy Dispersive X-ray Analyses

Condensed Version of the
Statement of Work (continued)

I.7 Geological-Petrophysical Interpretation of Stratigraphic Framework

I.7.1 Set up Geologic Project Database

I.7.2 Establish the Regional Geologic Setting

I.7.3 Establish the Stratigraphic Framework for SCU in the Project Area

I.7.3.1 Identify formation tops and other stratigraphic units, etc.

I.7.3.2 Subdivide the major stratigraphic units, etc.

I.7.4 Analyze Well Log Data

I.7.4.1 Correlate log measurements and core data

I.7.4.2 Foot by foot calculations of $\emptyset$, k and saturations

I.7.4.3 Compute net pay thickness and average porosity for each subunit

I.8 Conduct preparatory conceptual Reservoir Simulation Studies

I.8.1 Preparatory EOS fluid characterization and Grid Size Sensitivity Studies

I.8.2 Identify important reservoir description parameters influencing horizontal well design

I.8.3 Determine impact of Geologic Parameters on Design Premises and Project performance

I.9 Integrate Geological, Petrophysical and Seismic Data into 3-D Geologic Reservoir Description

I.9.1 Construct 3-D Reservoir Description

I.9.2 Modify Reservoir Description

I.9.3 Prepare Maps and Cross-sections for Reservoir Volumes Calculations

I.9.4 Calculate Reservoir Pore Volume and Oil in Place

II. Advanced Technology

II.1 Conduct Special Laboratory Studies

II.1.1 Conduct MRI Screening of Core Plugs

II.1.2 Conduct Coreflood Studies of CO_2 Trapped Gas and Residual Oil Saturations

II.1.3 Additional Slim Tube Study of MMP using Estimated Recycle Gas

Condensed Version of the
Statement of Work (continued)

II.1.4 Coreflood to Identify Foaming surfactants

II.1.4.1 Identify most promising foaming surfactants

II.1.4.2 Evaluate effect of concentration and frontal velocity on viscosity

II.1.4.3 Effect of concentration and velocity using SAG process

II.1.4.4 Evaluate surfactant retention

II.1.4.5 Evaluate the effect of residual oil on retention

II.1.5 Screening studies for low cost sacrificial agents

II.1.6 Screening studies to identify suitable gelled polymers

II.1.6.1 Conduct 24 bulk gelation tests

II.1.6.2 Conduct 12 bulk gelations tests at low pH

II.1.6.3 Conduct bulk gel stability at reservoir pressure with CO_2

II.2 Conduct Advanced Geostatistical Studies

II.2.1 Conduct Preliminary Geostatistical Data Analyses

II.2.2 Generate Kriged porosity distribution maps

II.2.3 Generate multiple realizations of the porosity distribution

II.3 Conduct Reservoir Simulation Studies for Design and Performance

II.3.1 Develop a Numerical Simulation Model

II.3.2 History Match Primary and Secondary Performance

II.3.3 Determine Optimum Horizontal Well Placement and Pattern Configuration

II.3.4 Optimize CO_2 Injection Strategy

II.3.5 Determine Optimum Volume and Estimate Rates and Pressures

II.3.6 Develop Final AFE-Quality Design Forecasts

II.4 Design Horizontal Well Scheme and Finalize Development Plan

II.4.1 Select Location and Orientation of Horizontal Wells

II.4.2 Develop Drilling, Production and Injection Safety and Environmental Plans

Condensed Version of the Statement of Work (continued)

II.4.3 Select Drilling and Completion Strategy for two Horizontal wells

II.4.4 Finalize Well Testing, Data Collection and Evaluation Program

II.5 Design Upgrades and Additions to Producing Well Equipment, etc.

II.5.1 Evaluate Current Equipment

II.5.2 Evaluate Automated Technology

II.5.3 Design Upgrades to New Production Equipment and Facilities

II.5.4 Design Corrosion Mitigation Program

II.6 Design Upgrades and Additions to Injection Well Equipment, etc.

II.6.1 Evaluate current injection well equipment, etc.

II.6.2 Evaluate Automation Technology

II.6.3 Evaluate Produced Gas Sweetening Processes

II.6.4 Design Upgrades and New CO_2 Facilities

II.6.5 Determine Design Specifications of CO_2 Pipeline Supply

II.7 Finalize AFE Cost Estimates and Forecast Operating Expenses

II.7.1 Finalize Cost Estimates to AFE Quality

II.7.2 Forecast Annual Operating Expenses

III. Technology Transfer and Project Management

III.1 Prepare and Submit Technical Papers

III.1.1 AAPG Papers

III.1.2 SEG Papers

III.1.3 SPWLA Papers

III.1.4 SPE Papers

III.1.4.1 National SPE Convention

III.1.5 Local Section Meetings of Professional Societies

III.2 Quarterly Newsletter to Selected Audience

Condensed Version of the
Statement of Work (continued)

III.3 Host Forum or Symposium on the Project

III.4 Host a Core Workshop

III.5 Press Releases to Industry Periodicals

III.5.1 Oil and Gas Journal

III.5.2 Petroleum Engineer

III.5.3 EOR Weekly

III.6 Project Management, Reporting, etc.

III.6.1 Submit Project Evaluation Plan

III.6.2 Submit Quarterly Project Reviews

III.6.3 Hold Semi-Annual Project Review Meetings

III.6.4 Provide Preliminary Dataset to DOE

III.6.5 Submit Continuation Application

III.6.5.1 Complete Project Evaluation Report

III.6.5.2 Complete detailed plan for Budget Phase II

III.6.5.3 Complete detailed budget for Budget Phase II

IV. Environmental Compliance

IV.1 NEPA Reporting

V. Field Demonstration

V.1 Drill, Test and Complete RC-3

V.1.1 Drill RC-3

V.1.2 Core RC-3

V.1.3 Run Full Log Suite and Obtain Zone Pressures

V.1.3.1 Measure pressures in selected zones

V.1.4 Perform Routine Core Analysis

V.1.5 Complete RC-3 and Production Test Selected Zones

Condensed Version of the Statement of Work (continued)

V.1.5.1 Run casing and install equipment to production test RC-3

V.1.5.2 Conduct production tests in at least three zones

V.1.6 Run buildup test on RC-3

V.1.7 Install Artificial lift on RC-3

V.2 Construct CO_2 Distribution Center

V.3 Construct CO_2 Recycle Facilities

V.4 Construct Centralized Production and Gathering Center Facilities

V.4.1 Construct Upgraded Tank Battery Facilities

V.4.2 Install Upgraded Flowlines

V.5 Drill Horizontal Injection Well H-1

V.6 Commence Water into H-1

V.6.1 Injection Profile Surveys

V.6.2 Pressure Falloff Tests

V.7 Commence CO_2 into H-1

V.7.1 Injection Profile Surveys

V.7.2 Pressure Falloff Tests

V.8 Implement Profile Control as Needed

V.9 Drill Horizontal Injection Well H-2

V.10 Commence Water into H-2

V.10.1 Injection Profile Surveys

V.10.2 Pressure Falloff Tests

V.11 Commence CO_2 into H-2

V.11.1 Injection Profile Surveys

V.11.2 Pressure Falloff Tests

V.12 Implement Mechanical Injection Profile Control as Required

**Condensed Version of the
Statement of Work (continued)**

- V.13 Project Performance Monitoring
  - V.13.1 Set up and Maintain Project Database
  - V.13.2 Collect Rate, Pressure, Temperature, Compositional Data
- V.14 Project Performance Evaluation
  - V.14.1 Periodic Updates of Performance, Design Premises, etc.
  - V.14.2 Conduct Final Post-Mortem Evaluation

VI. Technology Transfer, Reporting, Project Management

- VI.1 Prepare and Submit Technical Papers
  - VI.1.1 SPE
  - VI.1.2 National SPE Convention
  - VI.1.3 Local Section Professional Society Meetings
- VI.2 Quarterly Newsletter
- VI.3 Host a Forum or Symposium
- VI.4 Press Releases
  - VI.4.1 Oil and Gas Journal
  - VI.4.2 Petroleum Engineer
  - VI.4.3 IOR Weekly
- VI.5 Project Management and Reporting
  - VI.5.1 Submit Project Evaluation Plan
  - VI.5.2 Submit Quarterly Project Reviews
  - VI.5.3 Hold Semi-Annual Project Review Meetings
  - VI.5.4 Complete Project Evaluation Report
  - VI.5.5 Provide Final Dataset to DOE

ATTACHMENT III

Work Breakdown Schedule

South Cowden CO2 Project – CoOp #DE-FC22-94BC14991

Schedule span: 1994 (Q2) – 2002 (Q4), 2003 Q1

	◆ PROJECT APPROVAL
	>> BUDGET PHASE ONE <<
	TASK I RESERVOIR ANALYSIS AND CHARACTERIZATION
I.1	Process and Interpret 3-D Seismic Data
I.2	Update Injection Well Condition Database
I.3	Drill/Test/Complete Reservoir Characterization Well #1
I.4	Drill/Test/Complete Reservoir Characterization Well #2
I.5	Evaluate Unit Production History/Waterflood Response
I.6	Describe Core/Conduct Petrographic Studies
I.7	Interpret Stratigraphic Framework
I.8	Conduct Conceptual Reservoir Simulation Studies
I.9	Integrate Data into 3-D Geologic Description
	TASK II: ADVANCED TECHNOLOGY DEFINITION
II.1	Conduct Special Laboratory Studies
II.2	Conduct Advanced Geostatistical Studies
II.3	Conduct Reservoir Simulation Studies
II.4	Design Horizontal Well/Finalize Project Development Plan
II.5	Evaluate/Design Production Facilities
II.6	Evaluate/Design Injection Facilities
II.7	Finalize AFE
	TASK III. TECHNOLOGY TRANSFER
III.1	Prepare/Submit Technical Papers
III.2	Generate Quarterly Newsletter for Target Audience
III.3	Host Project Forum
III.4	Host Core Workshop
III.5	Submit Press Releases and Summary Articles
III.6	Continue Project Management and Reporting
	TASK IV: ENVIRONMENTAL COMPLIANCE
IV.1	Maintain Environmental Compliance Efforts
	>> BUDGET PHASE TWO <<
	(Continuation of Environmental Compliance)
	TASK V: FIELD DEMONSTRATION
V.1	Drill/Test/Complete Reservoir Characterization Well #3
V.2	Construct CO2 Distribution Facilities
V.3	Construct CO2 Recycle Facilities
V.4	Construct Production Facilities
V.5	Drill Horizontal Injection Well #1 (H-1)
V.6	Begin Water Injection into H-1 / Monitor Performance
V.7	Begin CO2 Injection into H-1 / Monitor Performance
V.8	Implement Profile Control Measures (As Needed).
V.9	Drill Horizontal Injection Well #2 (H-2)
V.10	Begin Water Injection into H-2 / Monitor Performance
V.11	Begin CO2 Injection into H-2 / Monitor Performance
V.12	Implement Profile Control Measures (As Needed)
V.13	Monitor Project Performance
V.14	Evaluate Project Performance
	TASK VI TECHNOLOGY TRANSFER
VI.1	Prepare/Submit Technical Papers
VI.2	Generate Quarterly Newsletter for Target Audience
VI.3	Host Project Forum
VI.4	Submit Press Releases and Summary Articles
VI.5	Complete Project Management and Reporting

Attachment IV

List and Schedule of Planned Deliverables

Report Title	1994				1995				1996				1997				1998				1999				2000				2001			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
PROGRAM/PROJECT MANAGEMENT REPORTING																																
DOE F 4600 3, Federal Assistance Milestone Plan		^																														
DOE F 4600.4, Federal Assistance Budget Information		^																														
DOE F 4600 5, Federal Assistance Management Summary Report				^	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^				
SF-269 or SF-269A, Financial Status Report																													^			
Project Management/Evaluation Plan		^																														
Project Evaluation Report							^																									
TECHNICAL INFORMATION REPORTING																																
DOE F 1332.15			TO BE FILED WITH ALL TECHNICAL REPORTS																													
DOE F 1430.22, Notice of Energy RD&D		^				^				^				^				^				^				^						
Quarterly Technical Report				^	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^				
Yearly Technical Report						^				^				^				^				^				^						
Topical Reports								^																				^				
Final Technical Report Draft																													^			
Final Technical Report for Approval																													^			
Software			AS NECESSARY; PROBABLY NOT APPLICABLE																													
PROPERTY REPORTING			NOT APPLICABLE																													
NEPA COMPLIANCE PLANS AND REPORTING																																
Environmental Compliance Plan			NOT REQUIRED																													
Environmental Status Report			NOT REQUIRED																													
Hazardous Substance Plan		^																														
Hazardous Waste Report				^	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^			
Notification of ES&H Violations			Telephone within 24 hours followed by written notice within 10 days after written notice of the violation is obtained.																													
Notification of Accidental Spill or Release			Same as notice of ES&H violations.																													
		← BUDGET PHASE I →						← BUDGET PHASE II →																								

ATTACHMENT V

Phillips Petroleum Company
South Cowden CO2 Project
Project #DE-FC22-94BC14991

HAZARDOUS SUBSTANCE PLAN

THIS PROJECT IS NOT ANTICIPATED TO PURCHASE, UTILIZE OR GENERATE ANY HAZARDOUS WASTE SUBSTANCES.

Substances anticipated to be purchased, utilized or generated during the course of this project will be exempt exploration and production wastes as per Subtitle C of the Resource Conservation and Recovery Act (RCRA)--see Attachment #1**.

Examples include (more detail in Section II.F.1(A) of Project Proposal--see Attachment #2):

	exempt under RCRA	comments
water-based drilling mud	YES	-
drill cuttings	YES	-
well completion and stimulation fluids	YES	unused volumes will be returned to vendor
produced water	YES	-
workover wastes	YES	-
scale/chemical treatments (well and bulk)	YES	unused volumes will be returned to vendor
pipe scale	YES	-

ATTACHMENT 1

Proposer: **Phillips Petroleum Company**

Attention: D.R. Wier

4001 Penbrook

Odessa, Texas 79762

Date: **January 15, 1993**

Pon Number: **DE-PS22-93BC14807**

SECTION II.F - EHSS ASPECTS

Information supplied in this section will be used in the preparation of the Pre-Selection Project Specific Environmental Review (See Section 3.23.2) and the Post-Selection NEPA review process (See Section 3.23.3). If the proposed project, including field work will take place at more than one location or site, provide the following information for each location or site. Where the specific information requested does not apply to the proposed project or no impact is anticipated, state this in the proposal.

SECTION II.F.1 - EXISTING ENVIRONMENT & IMPACTS OF THE PROPOSED PROJECT

(A) Waste Management

This section shall describe the provisions for managing the solid and liquid wastes (e.g., drill waste, produced water, and completion, workover or stimulation wastes) that will be generated by the proposed project and the methods to be used for storage, treatment, transportation, recycling/recovery, disposal or discharge. Estimate the volumes and composition of each waste stream. Identify any wastes that may be hazardous wastes and would not be exempt from regulation under Subtitle C of the Resource Conservation and Recovery Act.

The proposed project will include the drilling of three horizontal injection wells and three vertical production wells. The wells will be drilled with water based drilling mud. After drilling, the wells will be completed using water based completion fluids. Each of the three vertical wells will be stimulated with an estimated 4000 gallons of 15% hydrochloric acid and an estimated 30,000 gallons of water based guar gell borate crosslinked frac fluids. Each of three horizontal wells will be treated with an estimated 30,000 gallons of 15% hydrochloric acid. All acid and frac jobs will be designed such that there will be no unused fracturing fluids or acids. In the event there are unused fracturing fluids or acids, they will be disposed of in accordance with Texas Railroad Commission and Texas Department of Health

ATTACHMENT 1; pg 2

regulations by contractors certified to do so.

The primary solid wastes that will be generated by the proposed project will be Resource Conservation and Recovery Act (RCRA) exempted drill cuttings and drilling muds.

It is estimated that 3,500 cubic feet of drill cuttings will be generated from each vertical well and 5,150 cubic feet of drill cuttings will be generated from each horizontal well. After each well has been drilled, the reserve pit - which will contain all of the drill cuttings - will be dewatered, backfilled and compacted meeting Texas statewide Rule Number 8 for Oil, Gas and Geothermal Operations. Phillips standard operating procedures meets or exceeds this rule.

During the drilling of the six wells, a closed mud system will be utilized. Approximately 1000 barrels of mud will be used during the drilling of each of the horizontal wells and approximately 800 barrels of drilling mud will be used during the drilling of each of the vertical wells. However, since a closed mud system will be utilized, as much mud as possible used on the first well will be used on each of the following five wells which will minimize drilling mud waste. This RCRA exempted drilling mud will then be injected into a permitted Class II offsite disposal well by a contractor certified to do so.

Once drilling operations for these six wells is completed, the waste steams inherent with these operations will cease.

All produced water (approximately 11,000 barrels of water per day) on the property is injected for secondary recovery operations. This volume will initially remain the same and decrease throughout the life of the proposed project.

The proposed project will also include the working over of approximately six wells per year to pull and replace parted rods or leaking tubing. During the workover operations, water based completion fluids will be utilized. These fluids are primarily used for hydrostatic pressure well control and fluids circulation through downhole tubulars. The majority of these fluids will be produced water from the project area and the minority will be clean brine or 2% potassium chloride water brought in from outside the project area. These fluids are all exempt from regulation under Subtitle C of the Resource Conservation and Recovery Act and will be disposed of in accordance with Texas Railroad Commission and Texas Department of Health regulations. The estimated volume of completion fluids that will be used per well is equal to 80 barrels.

Painting products will be selected which will result in no generation of hazardous wastes. High flash point solvents (with a flash point greater than 140 degrees Fahrenheit) will be utilized to avoid generation of RCRA hazardous waste. All used oils will be recycled into the production stream and therefore exempt from the Resource Conservation and Recovery Act Subtitle C regulations.

All wastes will be disposed of in accordance with Texas Railroad Commission (TRRC) regulations by TRRC and Phillips approved contractors. Phillips has a Waste Contractors

Review Policy which sets out approved contractors to dispose of waste based on their environmental stewardship, regulatory compliance and financial rating. In addition, Phillips has a Waste Management Plan which sets out the proper procedures for the disposal of wastes. Any necessary permits will be obtained by the local operations personnel from the applicable regulatory bodies.

(B) Atmospheric Conditions and Air Emissions

This section shall describe the general local climate and existing air quality conditions in the immediate vicinity of the proposed project. Estimate the incremental air emissions, if any, that may be attributable to the proposed project. Describe any changes in the emissions of greenhouse gases and air toxics that may be attributable to the proposed project.

The general climate in the immediate vicinity of the proposed project is a semi-arid environment with average rainfall of 14.7" per year. Temperatures range from an average low in January of 43.3 to an average high in July of 81.3 degrees Fahrenheit. In accordance with the National Ambient Air Quality Standards set by the Environmental Protection Agency, this area is classified as an "attainment" area.

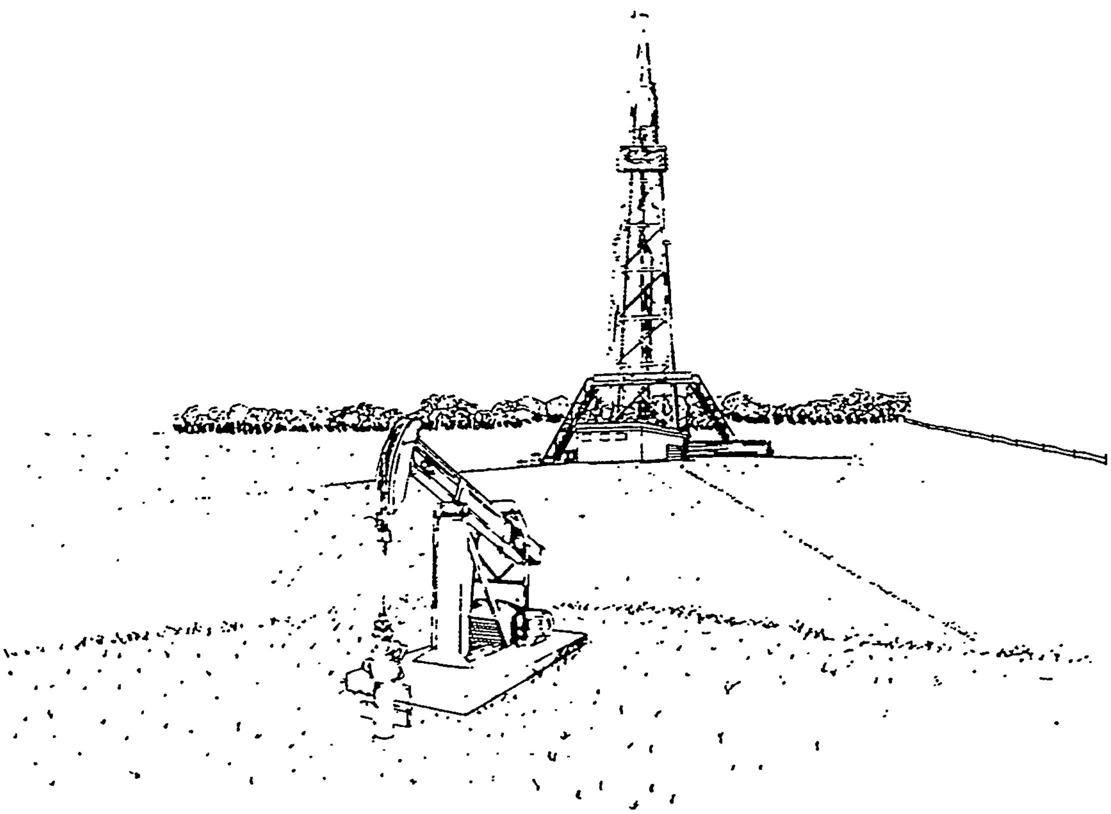
Currently the project area is continually powered by all electric equipment, however there is one standby 235 horsepower Ajax gas powered engine for a water injection pump which is only utilized in the event of the loss of electricity. This engine is utilized an average of

ATTACHMENT 1; pg5

ATTACHMENT 2

API ENVIRONMENTAL GUIDANCE DOCUMENT

ONSHORE SOLID WASTE MANAGEMENT IN EXPLORATION AND PRODUCTION OPERATIONS



FIRST EDITION, JANUARY 15, 1989

American Petroleum Institute
1220 L Street, Northwest
Washington, DC 20005

ATTACHMENT 2; p.

With respect to exploration and production wastes, operators should avoid disposing unused commercial products with oilfield wastes. All reasonable efforts should be made to completely use commercial products, return them to their vendor, or segregate them from other wastes for management and disposal.

Discarding a listed hazardous waste (e.g., a half empty container of a listed solvent) in a reserve pit would cause the otherwise exempt pit contents to become a hazardous waste and result in the expensive closing of the reserve pit under RCRA hazardous waste regulations.

2.4 EPA's List of Exempt Exploration and Production Wastes

The following wastes are listed as exempt in EPA's Regulatory Determination submitted to Congress in June 1988.

- Produced water
- Drilling Fluids
- Drill Cuttings
- Rigwash
- Drilling fluids and cuttings from offshore operations disposed of onshore
- Well completion, treatment, and stimulation fluids
- Basic sediment and water and other tank bottoms from storage facilities that hold product and exempt waste
- Accumulated materials such as hydrocarbons, solids, sand, and emulsion from production separators, fluid treating vessels, and production impoundments
- Pit sludges and contaminated bottoms from storage or disposal of exempt wastes
- Workover wastes
- Gas plant dehydration wastes, including glycol-based compounds, glycol filters, filter media, backwash, and molecular sieves

ATTACHMENT 2; pg 2

- Gas plant sweetening wastes for sulfur removal, including amine, amine filters, amine filter media, backwash, precipitated amine sludge, iron sponge, and hydrogen sulfide scrubber liquid and sludge
- Cooling tower blowdown
- Spent filters, filter media, and backwash (assuming the filter itself is not hazardous and the residue in it is from an exempt waste stream)
- Packing fluids
- Produced sand
- Pipe scale, hydrocarbon solids, hydrates, and other deposits removed from piping and equipment prior to transportation
- Hydrocarbon-bearing soil
- Pigging wastes from gathering lines
- Wastes from subsurface gas storage and retrieval, except for the listed nonexempt wastes
- Constituents removed from produced water before it is injected or otherwise disposed of
- Liquid hydrocarbons removed from the production stream but not from oil refining
- Gases removed from the production stream, such as hydrogen sulfide and carbon dioxide, and volatilized hydrocarbons
- Materials ejected from a producing well during the process known as blowdown
- Waste crude oil from primary field operations and production and
- Light organics volatilized from exempt wastes in reserve pits or impoundments or production equipment.

ATTACHMENT 2; pg 3

- Pesticide wastes
- Radioactive tracer wastes
- Drums, insulation, and miscellaneous solids.

EPA did not specifically address in the Regulatory Determination the status of hydrocarbon-bearing material that is recycled or reclaimed by reinjection into a crude stream (used oils, hydraulic fluids, and solvents).

However, under existing EPA regulations, recycled oil, even if it were otherwise hazardous, could be reintroduced into the crude stream, if it is from normal operations and is to be refined along with normal process streams at a petroleum refinery facility [see 40 CFR §261.6 (a)(3)(vi)].

2.6 Additional Exempt Wastes

It should be noted that EPA's lists of exempt and nonexempt wastes are not all-inclusive and that determinations will need to be made on a number of other incidental wastes. In deciding which wastes were exempt, it appears that EPA focused on wastes necessary to conduct so-called "primary field operations" (including centralized facilities and gas plants). Using this approach, the following wastes, although not specifically listed as exempt, appear clearly exempt.

- Excess cement slurries and cement cuttings
- Sulfur contaminated soil or sulfur waste from sulfur recovery units
- Gas plant sweetening unit catalyst
- Produced water contaminated soil
- Wastes from the reclamation of tank bottoms and emulsions when generated at a production location
- Production facility sweetening and dehydration wastes
- Pigging wastes from producer operated gathering lines
- Production line hydrotest/preserving fluids utilizing produced water
- Iron sulfide.

ATTACHMENT 2; pg 4

ATTACHMENT VI

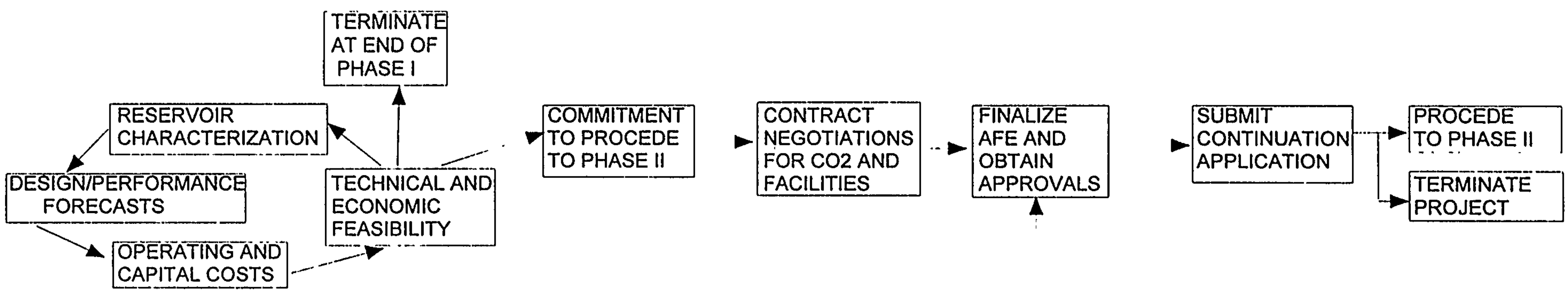
HAZARDOUS WASTE REPORT
3rd and 4th Quarters 1994
1st Quarter 1995

Phillips Petroleum Company
South Cowden CO2 Project
Project #DE-FC22-94BC14991

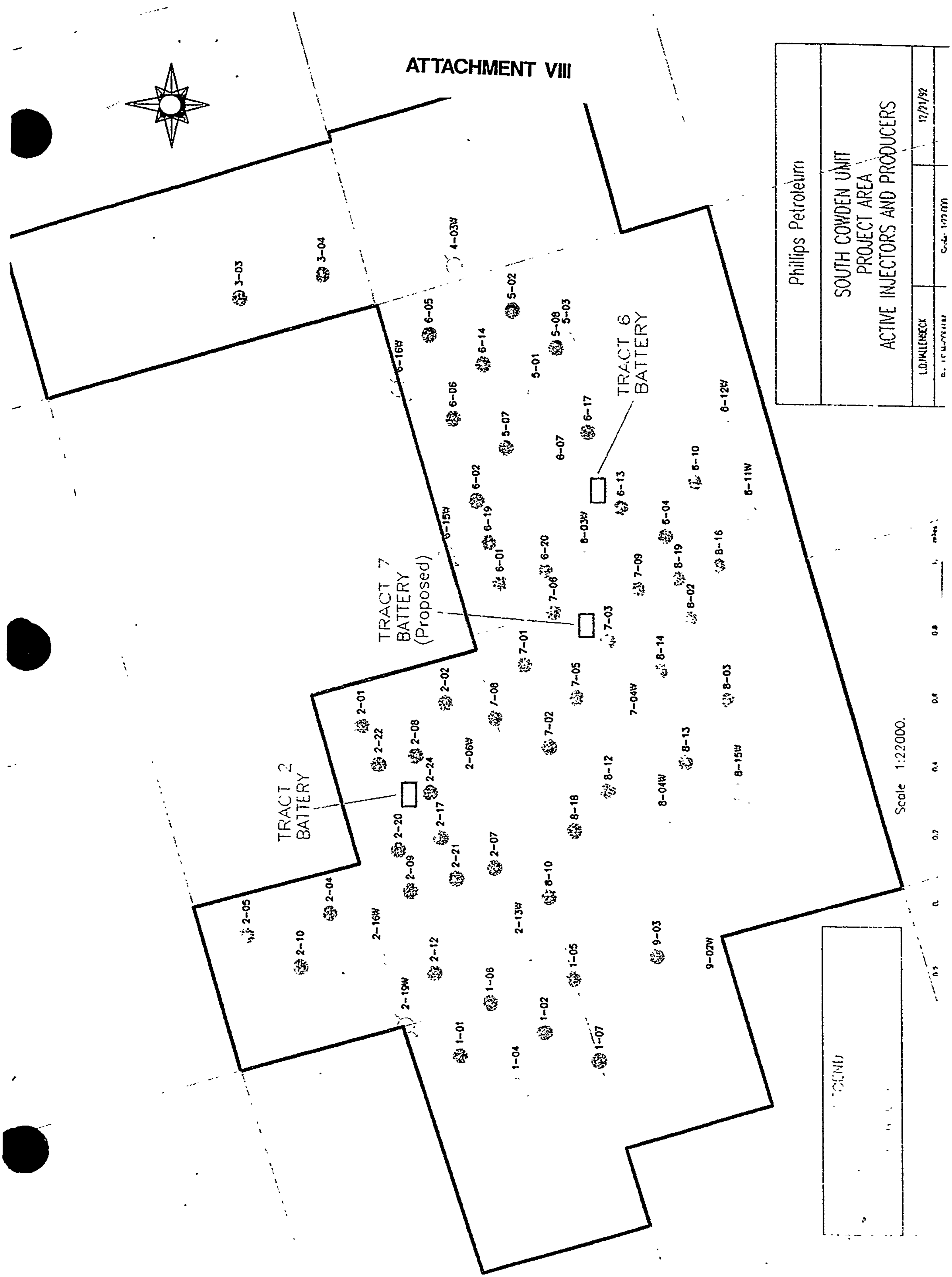
No hazardous wastes were actually utilized or generated during the 3rd/4th Quarters 1994 or during the 1st Quarter 1995. All substances were exempt exploration and production wastes under Subtitle C of the Resource Conservation and Recovery Act.

ATTACHMENT VII

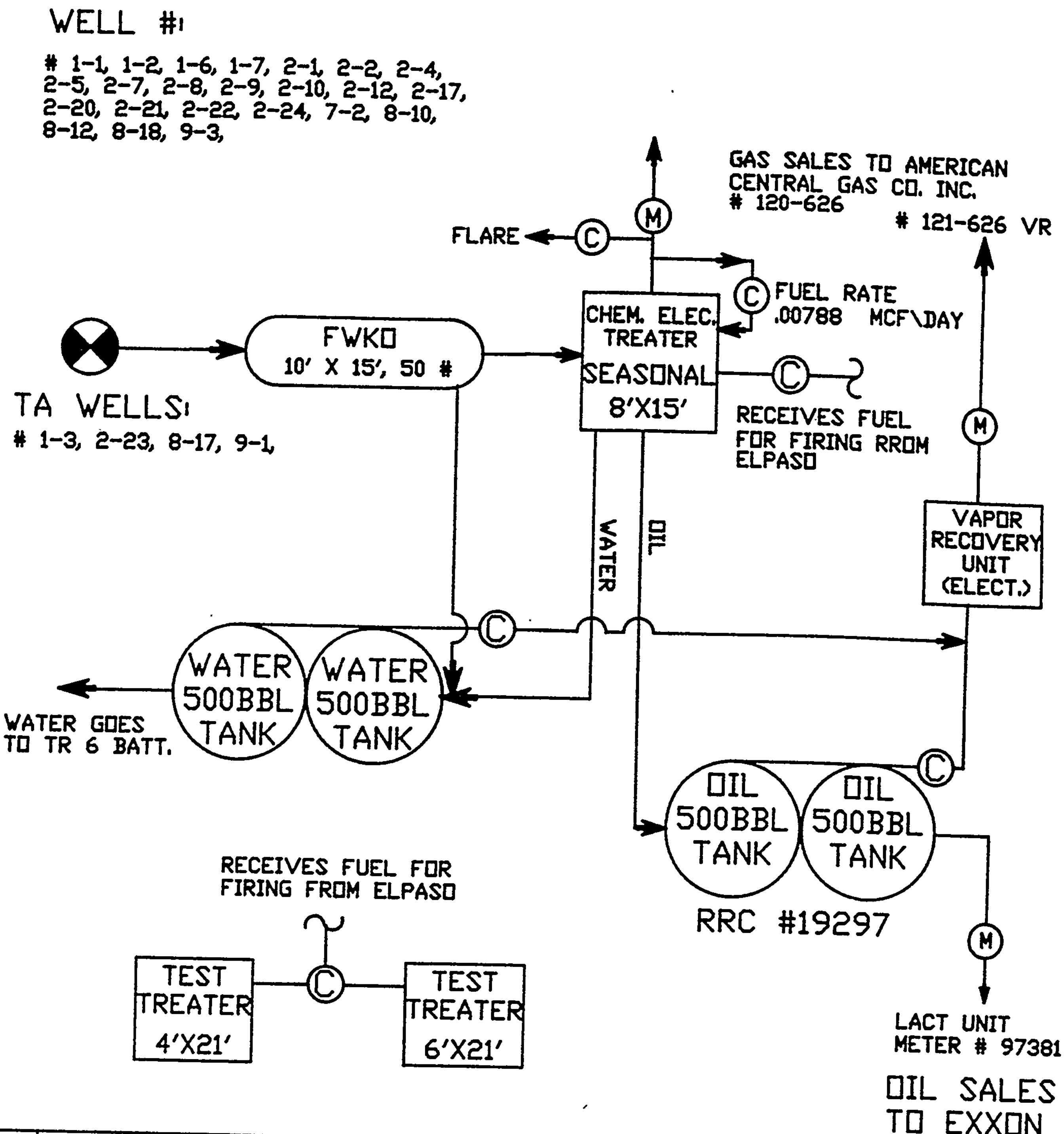
LOGIC FLOW DIAGRAM



ATTACHMENT VIII



ATTACHMENT IX



NO.	REVISION	BY	DATE	CHKD	APP'D

FOR BIDS
FOR APPR
FOR CONST

PHILLIPS PETROLUEM COMPANY
BARTLESVILLE, OKLAHOMA

LEASE NAME: SOUTH COWDEN UNIT 2 BATTERY
LEASE CODE: 245463
NETWORK:

JA NO. | FILE CODE
AFE NO. | SCALE NO
DWG NO.
SH NO.

DRAWN 5/6/91 LWS
CHECKED 6-4-91 [initials]
APP'D 6-5 [initials]

RC-ORIGINAL

FORM 1779-S 7-84

ATTACHMENT X