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Methane Recovery from Coalbeds Project

Monthly Progress Report

Contract Number DE-AC21-78MC08089

NOVEMBER 1980

PREPARED FOR
UNITED STATES DEPARTMENT OF ENERGY
MORGANTOWN ENERGY TECHNOLOGY CENTER
MORGANTOWN, WEST VIRGINIA

BY

TRW
ENERGY SYSTEMS PLANNING DIVISION

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1. SUMMARY OF PROGRESS - NOVEMBER 1980

This section of the report highlights progress made by TRW Energy Systems Group during November 1980 on the Methane Recovery from Coalbeds Project (MRCP) under DOE Morgantown Energy Technology Center Contract No. DE-AC21-MC08089. A discussion of progress accomplished during this period is contained in Section 3.

1.1 PROGRESS DURING THE MONTH

Planning and Support

- Submitted a draft FY 1981 UGR Drilling Technology Project Plan Document (PPD) to METC for review and incorporated comments received from the Project Manager.
- Delivered camera-ready mats of the MRCP section of the UGR Semi-Annual Report for the period 1 April through 30 September 1980.
- Attended a meeting at the USGS to discuss the National Coal Resource Data System and the Methane Recovery from Coalbeds Project Resource Data Base.

Resource Engineering

- Distributed the Raton Mesa Coal Region Report to METC.
- The Uinta and Warrior basin reports have been reviewed and will be published and delivered in early December.
- Negotiated a cooperative core test with R&P Coal Company on a well in Indiana County, Pennsylvania.
- Cooperated with the USGS Coal Branch on three wells in the Wind River Basin. Desorption of coal samples showed little or no gas.
- Completed field testing at the Dugan Petroleum well in the San Juan Basin. Coal samples showed minimal gas.
- Initial desorption of coal samples suggests that at least a moderate amount of gas was obtained from the Coors well test in the Piceance Basin.
- Completed field work for the Piceance Basin Detailed Site Investigation.

Technology Test Projects

- Occidental Research Corporation

- A higher capacity vacuum pump to increase CH₄ venting operations has been installed
 - Drilling of Oxy #12 experienced delays caused by mine gas-offs and was eventually terminated at 460 feet after an attempt to drill through a "roll" which produced a severe dog leg and severely damaged the drill pipe
-
- ORC moved the second drill rig and equipment to a new location in the same panel as Oxy #12 and set the stand pipe for Oxy #13
 - Drill rig #1 has been moved east of the longwall mining area in anticipation of drilling cross-panel on 500 foot intervals.

- Waynesburg College Project

- Equitable Gas Company has received the contract from Waynesburg College and has applied to the Pennsylvania Public Utilities Commission for a new tariff rate
 - Waynesburg College has identified a contractor to make the piping connections to the gas line after Equitable establishes their meter and valve requirements.
-

1.2 PROGRESS TO DATE

The following is a summary of the significant progress made by TRW Energy Systems Group under this contract since its inception:

ENGINEERING SUPPORT

Planning and Analysis

- Assisted in preparation and publication of FY 1979, FY 1980, and FY 1981 MRCP Project Plan Documents
- Assisted in preparation of the MRCP Technical Implementation Plan (TIP)
- Assisted in preparation of the Unconventional Gas Recovery RD&D Plan
- Assisted in preparation of the UGR Advanced Drilling PPD for FY 1980.

Technical Review of Proposals

- Supplied formal review and evaluation of four R&D proposals, three technology test project proposals, and twelve resource engineering proposals.

Technology Transfer and Information Management

- Assisted in planning and conducting the 1978 and 1979 Methane Recovery from Coalbeds Symposia and in compilation of the Symposia Proceedings
- Provided MRCP inputs used in the preparation of exhibits for the International Petroleum Exposition and other meetings
- Provided inputs and assistance for preparation and publication of Unconventional Gas Recovery Semi-Annual Reports for the periods ending September 1978, March 1979, September 1979, March 1980, and September 1980.
- Prepared draft MRCP Technology Transfer Plan
- Prepared draft Information Management Plan
- Prepared and published specifications for first phase of the MRCP resource data base
- Authored or co-authored the following papers on Methane Recovery from Coalbeds:

Technology Transfer and Information Management (Continued)

1. A. A. Lee, "The Delineation of Methane Resources in Unminable Coalbeds," presented at the Methane Recovery from Coalbeds Wymposium, April 18-20, 1979, in Pittsburgh, Pennsylvania.
2. H. H. Rieke, C. R. Skillern, C. T. Rightmire, and W. Overbey, "A Systems Approach to Large Scale Exploratory Drilling Ventures," presented at the Society of Professional Log Analysts' 20th Annual Logging Symposium, June 3-6, 1979, in Tulsa, Oklahoma.
3. H. D. Shoemaker, A. Gillies, and C. L. Sturgill, "Generation of Mine Power from Methane Drainage," presented at the Coal Gasification Conference, July 31-August 3, 1979, in Pittsburgh, Pennsylvania.
4. R. L. Wise and C. T. Rightmire, "Methane Recovery and Utilization from Coalbeds," presented at the 1979 Society of Petroleum Engineers Annual Technical Conference and Symposium, September 23-26, 1979, in Las Vegas, Nevada.
5. H. H. Rieke, C. T. Rightmire, and W. H. Fertl, "Evaluation of Gas-Bearing Coal Seams," presented at the 1979 Society of Petroleum Engineers Annual Technical Conference and Symposium, September 23-26, 1979, in Las Vegas, Nevada.
6. W. H. Fertl and H. H. Rieke, "Gamma Ray Spectral Evaluation Techniques Identify Fractured Shale Reservoirs and Source Rock Characteristics," presented at the 1979 Society of Petroleum Engineers Annual Technical Conference and Symposium, September 23-26, 1979, in Las Vegas, Nevada.
7. D. R. Watkins and H. D. Shoemaker, "Testing for Methane in Coal Seams," presented at the Energy Sources Technology Conference and Exhibition in New Orleans, Louisiana, February 3-7, 1980.
8. H. H. Rieke, F. G. Galliers, and S. A. Friedman, "Stratigraphic Relationship of Desmoinesian Coals in the Kiowa Syncline, Pittsburg County, Oklahoma," presented at the South-Central Section Meeting of the Geological Society of America, Wichita, Kansas, March 3-4, 1980.
9. J. P. McCord, "Potential for Coalbed Methane Production from the Greater Green River Coal Region," presented at the 1980 Symposium on the Geology of Rocky Mountain Coal in Golden, Colorado, April 28-29, 1980.
10. H. H. Rieke, "Preliminary Methane Resource Assessment of Coalbeds in the Arkoma Basin," presented at the Unconventional Gas Recovery Symposium in Pittsburgh, Pennsylvania, May 18-20, 1980.

Technology Transfer and Information Management (Continued)

11. P. L. Archer, D. D. Carr, and D. Harper, "The Coalbed Methane Resource of the Illinois Basin," presented at the Unconventional Gas Recovery Symposium in Pittsburgh, Pennsylvania, May 18-20, 1980.
12. A. Gillies, A. J. Snygg, D. A. Dickehuth, and S. M. Howarth, "Utilization and Recovery Economics for Vertical Wells in Coalbed Methane," presented at the Unconventional Gas Recovery Symposium in Pittsburgh, Pennsylvania, May 18-20, 1980.
13. J. N. Kirr, G. E. Eddy, R. Rahsman, and N. F. McGinnis, "Waynesburg College Multiple Coal Seam Methane Extraction Well," presented at the Unconventional Gas Recovery Symposium in Pittsburgh, Pennsylvania, May 18-20, 1980.*
14. H. A. von Schonfeldt, B. R. Pothini, and G. N. Aul, "Advance Methane Control and Its Impact on Gas Emissions in the Pocahontas #3 Coal Seam," presented at the Unconventional Gas Recovery Symposium in Pittsburgh, Pennsylvania, May 18-20, 1980.*
15. C. T. Rightmire, H. H. Rieke, and W. H. Fertl, "Resource Evaluation of Gas-Bearing Coalbeds," presented at the AAPG/SEPM/EMD Annual Convention, Denver, Colorado, June 9-11, 1980.
16. H. H. Rieke, D. W. Oliver, W. H. Fertl, and J. P. McCord, "Successful Application of Carbon/Oxygen Logging to Coalbed Exploration," presented at the 55th Annual SPE Technical Conference and Exhibition in Dallas, Texas, September 21-24, 1980.

R&D Surveillance

- Developed test plans for Phase I and II testing of the Maurer turbodrill
- Completed Phase I testing of the Maurer turbodrill
- Completed interim Phase II turbodrill testing in January 1980
- Prepared and published Phase I Turbodrill Test Report in August 1980
- Prepared and published Phase II Turbodrill Test Report in November 1980.

*Prepared as a result of Technology Test Projects subcontracted by TRW.

RESOURCE ENGINEERING

Planning and Analysis

- Assisted in preparation and publication of the following:
 - Unminable Coal Drilling Project Plan
 - Resource Delineation Plan
- Prepared and published the following basin reports:
 - Illinois Basin Report
 - Powder River Basin Report
 - San Juan Basin Report
 - Greater Green River Basin Report
 - Western Washington Coal Region
 - Arkoma Basin Report
 - Raton Mesa Coal Region Report
- Participated in industry coordination meetings as follows:
 - Unmined Coal Project Organization
 - Resource Delineation Workshops
 - Desorption Methods and Standards
- Prepared specifications for MRCP Resource Data Base
- Developed contractual agreements with companies for cooperative participation in 44 wells of the 49 planned for the 1978-1980 program.

<u>Basin</u>	<u>Tests Completed (to date)</u>	<u>Additional Projected (1980 Program)</u>
Arkoma	4	0
Green River	4	0
Illinois	5	0
Northern Appalachian	2	0
Piceance/Uinta	11	0
Powder River	8	0
San Juan	4	3
Southern Appalachian/ Warrior	2	1
Western Washington	1	2
Wind River	3	0
TOTAL	44	6

University Subcontracts

- Negotiated and signed subcontracts with Pennsylvania State University, Virginia Polytechnic Institute, Colorado School of Mines, and University of New Mexico to support the resource delineation effort.
- Colorado School of Mines has provided a compendium of published information on rock mechanics, properties of coal, and coal-measure rocks. Additional reports completed to date under this contract include:
 - o Hydraulic Fracture Propagation-Direction as Related to Preliminary Methane Drainage
 - o Basic Theories and Mechanisms of Hydrofracturing--State-of-the-Art
 - o Design and Construction of the New Triaxial Testing Machine in the Edgar Mine, CSM /
 - o Potential Methane Drainage Using Hydro-Fracturing, Carbondale Coal Field, Pitkin County, Colorado.
 - The University of New Mexico has initiated field verification of a desorption technique employing drilling cuttings. Samples will be collected from multiple wells in the San Juan Basin in cooperation with Northwest Pipeline. Physical characterization of natural coal samples has begun with the laboratory determination of surface area and sorption isotherms.
 - Penn State is involved in mapping a mine through of a hydraulic stimulation in a Cumberland coal mine. Mine ventilation air methane monitoring system lacks one component for completion and will be tested as soon as possible.
 - VPI & SU is completing the work on a report on the geologic framework and methane potential for the Richmond Basin and other Triassic Basins in the southeastern United States. Evidence of methane presence has been gleaned from historical records of mine accidents and reports of gas shows during drilling in this area.

Field Activities

- Reservoir assessment efforts have been directed to target areas in the following states:

Alabama	New Mexico
Fayette County	Rio Arriba County
Walker County	San Juan County
Colorado	Oklahoma
Mesa County	Haskell County
Moffat County	LeFlore County
Rio Blanco County	Pennsylvania
Illinois	Greene County
Clay County	Washington
Marion County	Thurston County
Indiana	Wyoming
Posey County	Campbell County
Kentucky	Carbon County
Webster County	Fremont County
Montana	Johnson County
Big Horn County	Sheridan County
Powder River County	Sublette County

- Ten geological coal areas have been sampled by conventional and sidewall coring operations. Approximately 4,738 feet of conventional core and 92 sidewall cores were recovered since field operations began in April 1978. The total thickness is approximately 842 feet; 207 coal samples have been collected for desorption analysis as have 30 samples of roof and floor rock. In addition, 20 samples of cuttings were collected for chip desorption from three wells (1 in the Green River and 2 in the Powder River Basins).
- The ranges of gas contents of coalbeds tested to date, by basin, are:

<u>Basin</u>	<u>Gas Content (cf/ton)</u>
Arkoma	72 - 301
Green River	90 - 540
Illinois	23 - 83
Northern Appalachian	70 - 195
Piceance	0 - 339
Powder River	1 - 30
San Juan	16 - 73
Warrior	17 - 104
Western Washington	20 - 75
Wind River	Testing in Progress

TECHNOLOGY TEST PROJECTS

- Completed conceptual system designs for three candidate sites:

<u>Company</u>	<u>Types of Systems</u>	
	<u>Recovery</u>	<u>Utilization</u>
Ranger Fuels	Vertical wells	Pipeline injection
Eastern Associated	Gob gas	Mine shaft heating
Bethlehem Mines	Vertical wells	Pipeline injection

- Prepared and published the Technology Test Project Evaluation Report which ranked 12 major proposed activities
 - Occidental Research Corporation Project
 - After finalizing a subcontract with Occidental Research Corporation (ORC) in cooperation with Island Creek Coal Company for developing a long horizontal borehole technique within an operating mine for methane recovery, Phase I, Concept Development, was initiated. A drilling concept was developed for drilling three 500 foot wells in Coalbed #3.
 - Following validation of the techniques, Phase II was begun, and three wells (#4, #5, and #6) varying in length from 500 to 1700 feet were drilled, completing the design and verification phase. Gas production approximated 200 Scfd per foot of horizontal hole with occluded methane at 400 to 500 cf/ton.
 - During this phase, implementation, Phase III, was begun. The following wells have been drilled:

#7	383 feet	No. 4 Coalbed
#8	675 feet	No. 4 Coalbed
#9	1,020 feet	No. 3 Coalbed
#10	abandoned	No. 3 Coalbed
#11	1,400 feet	No. 3 Coalbed
- Nominal gas flow rates have been 19,000 Scfd, 32,000 Scfd, and 160,000 Scfd, with Oxy #11 producing 600,000 Scfd.
- Concurrent with the drilling activity, a J-Tec Safety Warning System has been installed. This system is oriented towards gas leakage detection.
 - In addition, a second specialized Acker drill rig has been procured and moved into the mine to augment the existing Acker rig. (The Acker rigs were purchased using ORC capital funds and are, therefore, not charged to this contract.)
 - A larger vacuum pump has been installed to increase the CH₄ vent to surface rate.

TECHNOLOGY TEST PROJECTS (Continued)

- Planning for a second vent hole has been completed and a drilling contract awarded.
- Waynesburg College Project
 - Entered into a subcontract with Waynesburg College to develop and demonstrate a multiple completion technique system for methane recovery from bituminous coal and utilizing the gas by injection into a private pipeline.
 - Completion of the Environmental Assessment and coring program was followed by preparation of Drilling, Completion, and Stimulation Plans.
 - Because of Pennsylvania State regulations, a variance to standard completion techniques was necessary to satisfy future mining and mine safety requirements.
 - Casing was set and cemented after completion of drilling and logging of the well borehole. Based on coring and logging information, three zones containing coal seams with methane potential were perforated and incrementally stimulated with nitrogen foam and 20/40 sand proppant.
 - This fracturing activity was followed by bailing frac sand and swabbing the well preliminary to setting production tubing and a sucker rod pump. Dewatering operation has begun and surface gas processing equipment procured.
 - Dewatering operations have dropped the wellbore water level to 950 feet. Concurrent with dewatering activity, drawdown and gas flow measurements were made in preparation for installation of surface process equipment.
 - Surface processing equipment has been installed.
 - A contract between Equitable Gas Company and the College for gas transport has been signed.
- Pennsylvania Energy Resources, Inc. Project
 - Completed negotiations with Pennsylvania Energy Resources (PERI) to develop and demonstrate a system for the recovery of methane from anthracite coal using stimulated multiple completion wells and utilizing the gas by injection into a local pipeline. This project is being held in abeyance due to the current MRCP funding limitation.

2. INTRODUCTION

2.1 BACKGROUND

During the natural process of coal formation, methane, the principal constituent of natural gas, is generated and trapped in the coal seam as well as in the adjacent rock area. All coal deposits contain methane. The concentration of methane varies from seam to seam, and within the seam. Recent estimates of the methane reserves in coalbeds are reported to approximate 700 trillion cubic feet. Given current and conservatively projected economic and technological factors, the recovery of an estimated 300 trillion cubic feet of the resource appears feasible. Based on present consumption rate, this is equal to a 10- to 12-year supply of the commodity.

Because of its volatility, methane has been considered a menace and hazardous to mining operations. The U. S. Bureau of Mines and many mining companies, in the interest of safety, have developed techniques for draining methane from the coalbeds prior to the start of underground coal mining, and for diluting the methane with fresh air during underground coal mining operations to reduce the concentration of coal dust and methane in the mines, and thereby reduce the probability of mine explosions and fires. Presently, all drainage techniques conclude by venting the coal gas into the atmosphere. Approximately 250 million cubic feet of methane are vented daily in U. S. mining operations. The content of the methane in gas vented from virgin coal is comparable to the quality of natural gas recovered from gas reservoirs. The content of methane in gas vented from gob (working mine) areas varies from 25 to 90 percent, depending on the venting techniques used.

In order to curb the waste of methane contained in coalbeds, and to provide for its recovery and utilization, the Department of Energy has initiated the Methane Recovery from Coal Project (MRCP) and assigned lead responsibility to the Morgantown Energy Technology Center. Major project objectives include:

- Location and characterization of methane resources
- Development of improved, cost-effective methane recovery and utilization technology

- Development of methane conservation techniques and systems
- Development of methane recovery prediction and projection techniques (models for well productivity)
- Development of field tests for pilot systems
- Investigation of legal and institutional constraints
- Transfer of applicable technologies to private industry.

On March 24, 1978, TRW was awarded Contract No. DE-AC21-78MC08089 to implement the engineering and integration necessary to achieve these objectives.

2.2 SCOPE OF WORK

Objectives and Approaches

The primary objective of the TRW effort is to develop and demonstrate a set of conditions in which recovery and utilization of coalbed methane is clearly to the economic advantage of the relevant private sector interests and which minimizes the necessity for Federal involvement over an extended time period. The TRW approach is established to meet this objective and encompasses:

- Resource characterization to identify target sites with greatest potential
- Identification of R&D to improve recovery and utilization techniques
- Definition, selection, and implementation of systems application projects to verify technical and economic viability under a variety of field conditions
- Technology transfer sufficient to support extensive commercialization of coalbed methane
- Overall program integration to assure a coordinated effort.

Statement of Work

Work under the TRW Methane Recovery from Coalbeds Project (MRCP) is defined by three discrete tasks. For Calendar Year 1980, work under each task is delineated as follows:

Task 1 - Engineering Assistance to METC

Task Objective

Provide technical assistance to the Methane Recovery from Coalbeds Project.

Subtask Objectives

Subtask 1 - Project coordination and preparation and updating of MRCP planning inputs for Project Planning Documents, Project Technical Implementation Plans, and Project Strategy Plans.

Subtask 2 - Review and analyze MRCP-related technical proposals which are submitted to DOE/METC for resource delineation, technology development, and Technology Test Projects as directed by METC.

Subtask 3 - Project documentation including preparation of project reports and technology transfer activities.

Subtask 4 - Review and evaluate R&D and related activities associated with the Methane Recovery from Coalbeds Project, as directed by METC.

Task 2 - Resource Engineering

Task Objective

Provide technical assistance and subcontracting support for the resource delineation activities. The task objectives are threefold:

- To estimate more reliably the methane resources contained in the nation's coalbeds
- To estimate the recoverable resource
- To determine exploration and production technologies that allow extrapolation from test sites to larger resource areas.

Subtask Objectives

Subtask 1 - Provide overall resource delineation planning, field support, evaluation and analysis, and administration/monitoring support.

Subtask 2 - Provide subcontracting and administration/monitoring of selected university activities.

Subtask 3 - Provide subcontracting and administration/monitoring of data derived from field activities involving geological investigations, drilling, well testing, logging, fracturing, laboratory analysis, and evaluation of data.

Task 3 - Technology Test Projects

Task Objective

Provide to METC detailed design, development, analysis, initial implementation, evaluation, and reporting of technology test projects.

Subtask Objectives

Subtask 1 - Provide for the definition and implementation, analysis, and reporting of the technology test projects defined in the discussions of Task 3, Subtasks 2 and 4 of the basic proposal.

Subtask 2 - Continue implementation of the test to demonstrate the recovery of methane from multiple horizontal wells in an active mine and the utilization of the gas for the production of LNG or other purposes.

Subtask 3 - Deleted.

Subtask 4 - Continue implementation of the test to demonstrate the feasibility of recovering methane from multiple production zones in a single well and utilizing the gas in a local distribution system pipeline.

Subtask 5 - Reserved.

Figure 2-1. TRW MRCP Work Breakdown Structure
(Revised 6/30/79)

3. DISCUSSIONS OF PROGRESS DURING NOVEMBER 1980

The following items are brief discussions of progress during the month of October. Additional data and descriptions of field projects in progress and in firm planning are contained in Section 4; Appendix A contains data and descriptions of completed field projects.

3.1 ENGINEERING SUPPORT

- A draft FY 1981 PPD for the UGR Drilling Technology Project was submitted for review. Comments of the METC Project Manager and various in-house personnel were received and incorporated. Another draft incorporating a revised Technical Implementation Plan, a WBS Dictionary, and an Executive Summary is now in progress and should be ready by 10 December.
- The camera-ready mats for the MRCP section of the UGR Semi-Annual Report for the Period Ended 30 September 1980 have been delivered to METC. In addition, a copy of the MRCP section was published for internal distribution.
- At the request of METC, MRCP personnel attended a meeting at the USGS in Reston to discuss the National Coal Resource Data System (NCRDS) which has been in existence for approximately five years (developed and administered by the USGS Coal Branch) and the MRCP Resource Data Base which is currently being developed. It was concluded that there is little in common between the data bases, but each can provide data of use to the other. Access to the NCRDS is available by execution of an agreement with the Coal Branch at a cost which appears to be nominal.

3.2 RESOURCE ENGINEERING

- The Raton Mesa Coal Region Report has been published and distributed to DOE/METC.
- The Uinta and Warrior basin reports have been reviewed by METC. Comments received have been incorporated into the reports, and both will be published and distributed in early December.
- Western field test activities have been completed. Work is now being concentrated on finishing the desorption analyses and completing the well test data packages.

RESOURCE ENGINEERING (Continued)

- The current status of the CY 1980 well testing program is:

Originally Planned: 14

Tested:	Green River Basin	- 2
	Piceance Basin	- 3
	Powder River Basin	- 5
	San Juan Basin	- 3
	Warrior Basin	- 1
	Wind River Basin	- 3
	Total	17

- Contacts are being maintained with El Paso Natural Gas, Southland Royalty, and Energy Reserves for cooperative testing early next year, contract coverage permitting.
- A cooperative agreement has been negotiated with R&P Coal Company for coring and desorption of coal from a well in a new coal mine area in Indiana County, Pennsylvania. A sample taken by USBM in the same coalbed, but deeper and farther south, showed 358 cf/ton. Previously, this area had been considered "not gassy".
- Testing at the Dugan Petroleum well in the San Juan Basin was completed. Although a significant amount of coal core was recovered, gas appeared to be minimal.
- A significant amount of gas was found in core from the Coors Nichols #1-23CM well test in the Piceance Basin. Also evident was a permeable sand above the coalbed. Two drill stem tests in the coal indicated very low permeability.
- Cores recovered from three USGS wells (1200 feet, maximum) in the Wind River Basin showed significant amounts of coal with little or no gas.
- Production testing in cooperation with Belco Petroleum is being critically reviewed because of a potential cement bond problem adjacent to a coal zone of interest.
- Field work for the Piceance Basin Detailed Site Investigation has been completed, including in mine fracture orientation studies. Report preparation is in progress.

3.3 TECHNOLOGY TEST PROJECTS

- Occidental Research Corporation Project

- Mine gas-off conditions continued, causing delays in drilling progress.
- Plans for the drilling of a second vertical vent shaft to relieve the load on the vent shaft have been completed. A drilling contract has been let with operations scheduled to begin in early December.
- Drilling of Oxy #12 was interrupted after encountering a severe "roll" in the coalbed. This encounter necessitated a 136 foot plug back, a directional drilling change, and changing from a drag bit to a STRATAPAX bit. The use of this type bit was a first for this project.
- Drilling of Oxy #12 was terminated at 460 feet because of drill string failure caused by the severe stress reversals occurring at the dog leg which resulted from the plug back and well bore directional change. This well was then connected to the vent system with methane production measuring at approximately 150,000 CFD.
- The No. 2 drill rig was moved 400 feet up panel where Oxy #13 was spudded and stand pipe cemented in.
- The original Acker drill rig was moved into position for drilling cross-panel holes on 500 foot centers in a long-term mining area east of the next big block for longwall operations.

- Waynesburg College Project

- The College has signed the contract for gas transportation with Equitable Gas Company after resolution of several items raised by the Counsel for Waynesburg College.
- Prior to the hookup to the gas line, Equitable must file an application with the Pennsylvania Public Utilities Commission for a new Tariff Rate. The application has been filed and approval is expected shortly.
- A gas production data collection plan has been prepared for use after the methane well is on line.

ENGINEERING SUPPORT

R&D Projects

4. FIELD ACTIVITIES

A summary sheet for each project in the Engineering Support, Resource Engineering, and Technology Test areas giving substantial field activity, planning for field activity, or analysis activity immediately following field activity is contained in this section.

Summary sheets are included for the following projects:

Engineering Support

R&D Projects

Maurer Turbodrill Testing

Resource Engineering

Field Operations in Progress

None at this time.

Field Operations in Planning

Cooperator

Basin

USGS/Conservation Division
USGS/Conservation Division
Kemmerer Coal
R&P Coal
El Paso Natural Gas
Energy Reserves
Northwest Fuel
USGS/Coal Branch

Warrior
Green River
Green River
Northern Appalachian
San Juan
San Juan
Western Washington
Wind River Basin

Field Operations Complete

Summary sheets for projects with completed field activities are contained in Attachment A of this report. Projects with completed field activities include the following:

Basin

No. of Sites

Northern Appalachian	1
Southern Appalachian/ Warrior	2
Illinois	5
Arkoma	4
Piceance	11
Green River	4
San Juan	4
Powder River	8
Western Washington	1
Wind River	3

Technology Test Projects

Occidental Research Corporation
Waynesburg College
Pennsylvania Energy Resources

TURBODRILL TESTING PROJECT
HOUSTON AND FORT WORTH, TEXAS

July 1980

STATUS

Phase II Performance Tests are completed and testing program terminated

CO-OPERATING COMPANY

Maurer Engineering Inc.
Houston, Texas
TRW Mission Manufacturing
Houston, Texas
Gearhart-Owen Indus., Inc.
Fort Worth, Texas

CONTRACT(S)

DE-AC21-78MC08089

FIELD TEST PERIOD(S)

Performance
Phase I - February 1979
Field Tests
Phase II - December 1979
Directional Drilling Test
Phase III - Not Scheduled

OBJECTIVE

Determine performance and wear characteristics along with operational procedures required to apply the turbodrill to placing methane drainage boreholes in horizontal and/or steeply dipping coal seams.

FIELD ACTIVITY PROGRESS

- Maurer Engineering completed in-house development testing in December 1978 after which they made some design changes, and the prescribed Phase I testing began in early February 1979.
- Because of premature bearing failure, Phase I testing was terminated in late February 1979.
- After bearing pack modifications, Phase II testing was begun in March 1979 and completed in April 1979. This portion of the testing program was conducted in Salt Lake City, Utah, and Los Alamos Fenton Hill site.

OTHER TESTING

Prior to beginning the Phase I testing, Maurer conducted shakedown testing at their facility consisting of no-load bench tests.

ANALYSIS STATUS

Phase I and Phase II test data has been analyzed.

Maurer Turbodrill Testing

DISCUSSION OF TEST ACTIVITIES

Maurer Engineering performed during December 1978 five short-duration shakedown tests of the turbodrill in which baseline performance data were obtained. Teardown and inspection of the drill motor components revealed design problems. Maurer instituted design modifications to the floating-piston seal assembly in preparation for subsequent Phase I testing at Mission Manufacturing facility. DOE/METC exercised an option to proceed into a modified testing project using the flow-through version of the bearing pack.

After unit modifications, Maurer decided to run the turbodrill in actual drilling operations at a TerraTek site in Utah. Here, sophisticated instrumentation would be utilized while running the unit under actual downhole conditions. Twenty-three holes were drilled before the unit locked up. Upon disassembly and examination, it was apparent that sand and mud had damaged the lower thrust bearing.

Phase II testing resumed the week of 21-25 January 1980. Bearing failures resulted in both turbodrill versions locking up. The tachometer did not produce discernible signals to indicate rotary speed downhole in the first test but indicated rotary speeds of 2400 to 2600 rpm in the second.

Preliminary indications of drilling rates to be expected at Gearhart-Owen site were determined from the TerraTek data to aid in planning activities for Phase II testing.

RESULTS

- Preliminary baseline performance curves (at zero imposed bit-end pressure drops), have been determined from the shakedown tests and Phase I testing.
- Redesign of the floating-piston assembly on the oil reservoir of the sealed bearing pack model.
- Elimination of the pressure seal assembly and use of the seal leak-sleeve in the flow-through version of the bearing pack.
- Analyses of the preliminary shakedown test data and Phase I data show characteristic torque, power, efficiency, and rotary speed relationships as expected. However, pressure drops through the drill bit appear to be considerably higher than expected.
- Results of turbodrill teardown following resumed Phase II testing are:
 - The lowest and uppermost radial roller bearings failed in the first motor: the outer races were cracked in both cases. The roller cage in the lowest radial bearing was bent and extruded in part between two rollers. Two rollers in that bearing were broken. Other parts of the uppermost radial bearing were intact.
 - In the second motor, the lower thrust bearing failed because of excessive loading due to hydraulic downthrust of the turbine.

RESOURCE ENGINEERING
Field Operations in Progress

RESOURCE ENGINEERING

Firm Planning

WARRIOR BASIN
TUSCALOOSA COUNTY, ALABAMA

STATUS

Firm Planning

CO-OPERATING COMPANY

USGS/Eastern Region
Washington, D. C.

Alabama Geological Survey
Tuscaloosa, Alabama

Location: Well #32 (depth 1650') SE/4, Sec. 31, T18S, R9W
Well #42 (depth 1640') SW/4, Sec. 20, T17S, R9W

CONTRACT(S)

FIELD TEST PERIOD(S)

November 1980

OBJECTIVE

To determine the quantity and quality of the coal, the methane content of the coal, and some reservoir properties of several coal seams in the Pottsville Formation. This effort will help determine the potential productivity of coalbed methane from this resource area.

FIELD ACTIVITY PROGRESS

Planned Tests

- Conventional Coring - Entire well cored by USGS
- Geophysical Logging

OTHER TESTING

- Desorption of coal samples
- Lab analyses of coal samples

ANALYSIS STATUS

FIELD ACTIVITIES

ANALYSIS ACTIVITIES

RESULTS

GREEN RIVER BASIN
CARBON COUNTY, WYOMING

STATUS

Firm Planning

CO-OPERATING COMPANY

USGS/Conservation Division
Denver, Colorado

Location: Drill Hole DM-D72, Sec. 13, T15N, R91W or D72 (alt)
Sec. 18, T15N, R90W; B-D26, Sec. 3, T14N, 90W or
B-D26 (alt) Sec. 34, T15N, R90W

CONTRACT(S)

FIELD TEST PERIOD(S)

Postponed until 1981

OBJECTIVE

To determine the quantity and quality of the coal, the methane content of the coal, and some reservoir properties of the coal seams within the Almond Formation in the Green River Basin. This effort will help determine the potential producibility of coalbed methane from this resource area.

FIELD ACTIVITY PROGRESS

Planned Tests

- Conventional Coring - Parts to be cored will be determined in field
- Geophysical Logging

OTHER TESTING

- Desorption of coal samples
- Lab analyses of coal samples

ANALYSIS STATUS

FIELD ACTIVITIES

ANALYSIS ACTIVITIES

RESULTS

GREEN RIVER BASIN
CARBON COUNTY, WYOMING

STATUS

Firm Planning

CO-OPERATING COMPANY

Kemmerer Coal Company
Denver, Colorado

CONTRACT(S)

FIELD TEST PERIOD(S)

Postponed until 1981

Location: Barrel Springs Unit 32-2, Sec. 32, T16N, R93W

OBJECTIVE

To determine the methane content and reservoir properties of three coal zones within the Fort Union Formation in the Green River Basin as part of an effort to delineate the potential for production from this resource area.

FIELD ACTIVITY PROGRESS

Planned Tests

- Conventional Coring - Up to 160 feet in three coal zones
- Drill Stem Testing - Conduct tests of two zones
- Geophysical Logging - formation compensated borehole density (neutron), caliper, dual induction, natural gamma ray

OTHER TESTING

- Desorption of coal samples
- Lab analyses of coal samples

ANALYSIS STATUS

Kemmerer Coal Company - Barrel Springs Unit 32-2

FIELD ACTIVITIES

ANALYSIS ACTIVITIES

RESULTS

SAN JUAN BASIN
SAN JUAN COUNTY, NEW MEXICO

STATUS

Firm Planning

CO-OPERATING COMPANY

El Paso Natural Gas
Farmington, New Mexico

CONTRACT(S)

FIELD TEST PERIOD(S)

1 November 1980

Location: Russell No. 12, NE/4, Sec. 24, T28N, R8W

OBJECTIVE

To determine the quantity and quality of the coal, the methane content of the coal, and some reservoir properties of the coal seams within the Fruitland Formation in the San Juan Basin. This effort will help determine the potential producibility of coalbed methane from this resource area.

FIELD ACTIVITY PROGRESS

Planned Tests

- Conventional Coring - Up to 120 feet at a depth of 2570 to 2790 feet
- Geophysical Logging - Dual induction laterolog, gamma ray, formation compensated density, compensated neutron log
- Drill Stem Testing - Up to 2 tests with agreement of El Paso on-site personnel
- The Fruitland Formation is 220 feet thick; the total coal thickness is about 75 feet.

OTHER TESTING

- Desorption of coal samples
- Lab analyses of coal samples

ANALYSIS STATUS

El Paso Natural Gas - Russell No. 12

FIELD ACTIVITIES

ANALYSIS ACTIVITIES

RESULTS

WESTERN WASHINGTON
WHATCOM COUNTY, WASHINGTON

STATUS

Firm Planning

CO-OPERATING COMPANY

Northwest Fuel Development,
Inc.
Portland, Oregon

Location: Whatcom County, Washington
T38N, R2E

CONTRACT(S)

FIELD TEST PERIOD(S)

Postponed until 1981

OBJECTIVE

To determine the quantity and quality of the coal, the methane content of the coal, and some reservoir properties of the coal seams in the N.W. Washington Basin. This effort will help determine the potential producibility of coalbed methane from this resource area.

FIELD ACTIVITY PROGRESS

Planned Tests

- Conventional Coring - Bellingham coalbed in the Chuckanut Formation. Core up to 30 feet at about 1400 feet deep.
- Geophysical Logging - Resistance, spontaneous potential, natural gamma ray, neutron density, caliper, dip meter, and formation density
- Drill Stem Testing - One test of about 20 feet interval, unless the Northwest Fuel's on-site representative determines such testing will endanger the hole.

OTHER TESTING

- Desorption of coal samples
- Lab analyses of coal samples

ANALYSIS STATUS

Northwest Fuel Development, Inc.

FIELD ACTIVITIES

ANALYSIS ACTIVITIES

RESULTS

TECHNOLOGY TEST PROJECTS

LONG HORIZONTAL HOLES, ACTIVE MINE TEST PROJECT
BUCHANAN COUNTY, VIRGINIA

STATUS

Implementation Phase in Progress - Contracts Approved.

November 1980

CONTRACT(S)

DE-AC21-78MC08089
Subcontract: H15730JJ96

Location: Island Creek Coal, Virginia Pocahontas Mine No. 5

CO-OPERATING COMPANY

Occidental Research Corp. (ORC)
Irvine, California with Island
Creek Coal Co., Lexington, KY

GENERAL SCHEDULE

Concept Phase - March 1978 to
August 1979
Design and - Sept. 1978 to
Verification October 1979
Phase
Implementation Nov. 1979 to
Phase - July 1981

OBJECTIVE

To develop a technique for recovery of methane from long horizontal holes drilled from within the mine and using the gas to produce LNG or in a similar application.

PROGRESS TO DATE

- Basic drilling techniques proven (multiple short- and long-holes), utilities emplaced and surface vent hole installed
- In-mine piping for test site complete and extended
- Technique for drilling through roof and along overriding seam for degasification demonstrated
- Concept and Design and Verification Phases completed; Implementation Phase begun

<u>Wells Completed to Date:</u>	<u>Well No.</u>	<u>Length, ft.</u>	<u>Coalbed</u>
Concept Development - Phase I	1	500	No. 3
	2	502	No. 3
	3	502	No. 3
Design & Verification - Phase II	4	505	No. 3
	5	1,550	No. 3
	6	1,720	No. 3
	7	383	No. 4
	8	675	No. 4
	9	700	No. 3
	10	400	No. 3
	11	1,200	No. 3
	12	460	No. 3

RECOVERY SYSTEM SUMMARY

(5) 2000 ft horizontal holes drilled into longwall panel from mine. Use of a drill bit guidance system. Development of fail-safe piping system for in-mine use.

UTILIZATION SYSTEM SUMMARY

Pipeline to nearby mine site to small capacity developmental LNG or similar application if LNG not viable use. Alternate uses - Pipeline injection, minehead uses.

Long Horizontal Active Mine Test Project

DESIGN AND ANALYSIS ACTIVITIES

- Patent rights variation request by ORC still under consideration by ORO. Contract was signed 17 September. Go-ahead given by METC August 1979.
- Formal project review was held 1 November 1979 and 21 May 1980 by TRW and DOE representatives.
- Preliminary utilization analyses show that at least two options are viable: coal drying and ventilation fan power. Other options, e.g., LNG, are still under study.
- Received DOE Implementation Phase approval. Executed contract modification.
- CY 1980 contract was negotiated and approved.
- Implementing coal drying system as Oxy funded project. Other pipeline uses are in study.
- Conducted an evaluation of J-Tec in-mine safety warning system; based on the results, ORC has ordered the complete system for installation.
- Consideration being given to increasing the capacity of the surface vacuum pump in order to accommodate high flow rate of Oxy #11.
- Because of current venting limitations, thought is being given to a second vertical vent shaft.

FIELD ACTIVITIES

- Stopped drilling of first long-hole at 1550 feet due to high pressure and flow.
- Completed drilling on the second long-hole at 1730 feet. This part of the effort was for validation of techniques and to provide drilling baseline data. The hole will also be the first of five production holes. Gas production approximates 800 Mcfd from the two long-holes and one 400 foot hole.
- Drilled exploratory holes (#7 and #8) into the #4 overriding seam. This unmined seam occasionally vents significant amounts of gas into the mining area (#3 seam); some predrainage is desirable.
- Completed communication tests on Nos. 4, 5, and 6 holes with #6 in full operation.
- Initiated drilling on #9 hole.
- Installed vent to surface and added 5000 feet of vent lines.
- Experiencing directional control problems with drill string in #9 hole. String became stuck due to formation shift in adjacent shaft; however, fishing operations have recovered all steel.
- First Acker drill rig was moved and set up to drill Oxy #10. Drilling terminated at 780 feet due to unstable conditions similar to that experienced in Oxy #9.
- Second Acker drill rig on site has been moved underground and is positioned to begin drilling Oxy #11.
- An inspection visit of the drilling and in-mine pipeline systems was conducted by TRW, DOE, and other Government personnel.
- Permanent piping was installed for Oxy #11; the J-Tec system installation is completed and operational.
- A higher capacity vent shaft vacuum pump has been delivered for venting the methane to the surface.
- A decision was made to drill a second vent shaft and negotiations with a driller initiated.
- Oxy #12 was spudded in down panel from Oxy #11.
- Oxy #12 was terminated at 460 feet due to well bore/string difficulties and put on line.
- Oxy #13 was spudded in; stand pipe cemented in.

SCHEDULE

	1980												1981											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J					
Drainage Parameters																								
Steering System																								
Methane Venting (Phase II)																								
Drainage Test Holes																								
Methane Venting (Phase III)																								
Production Tests																								
Reservoir Characterization																								
Availability Analysis																								
Utilization Options																								
Utilization Testing																								
Final Report																								

MULTIPLE COMPLETION DEVELOPMENT TEST PROJECT
GREENE COUNTY, PENNSYLVANIA

STATUS

Implementation Phase in Progress

November 1980

CONTRACT(S)

DE-AC21-78MC08089

Subcontract: H12719JJ9S

CO-OPERATING COMPANY

Waynesburg College
Waynesburg, Pennsylvania

GENERAL SCHEDULE

Concept Phase	Mar 1978
	Aug 1978
Design and Veri-	Aug 1979
fication Phase	Oct 1979
Implementation	Nov 1979
Phase	Nov 1980

Location: Purman Run Tract on college campus North of Waynesburg

OBJECTIVE

To develop and demonstrate a multiple completion technique system considering a variable need for dewatering each zone and utilizing the recovered methane in a local distribution pipeline.

PROGRESS TO DATE

- Basic site and target coal seams and pipeline route and tie-in point identified
- Cost and potential benefits estimated
- Subcontract negotiated and signed and the Environmental Assessment completed
- Drilling plan, preliminary geological work-up and permitting tasks completed
- Core drilling and core analysis activities completed, and well completion options evaluated
- Production well drilled, cased, cemented, and logged
- Perforated casing and nitrogen/foam fractured target seams
- Installed down hole water pump, rods, tubing after bailing and swabbing
- Begin dewatering operations
- Surface gas process equipment procured, and 90% of the items delivered
- Conducted special drawdown, flow back, and gas production tests
- Surface equipment has been installed less gas company gauge and meter requirements.
- Equitable Gas Company contract with the college has been drawn up.
- Dewatering of the well is complete.

RECOVERY SYSTEM SUMMARY

Single well drilled into three seams overlain by the college facilities. Isolation and stimulation of individual zones planned. Multiple dewatering pumps considered in design.

UTILIZATION SYSTEM SUMMARY

Recovered gas to be utilized in college's distribution system. Estimates of production will satisfy 70 percent of peak demand.

Multiple Completion Development Test Project

DESIGN AND ANALYSIS ACTIVITIES

- Design and verification and implementation phase completed; production phase in progress
- Environmental Assessment, drilling and completion techniques completed
- Technique for coal stimulation evaluated in light of recent frac job conducted in Pennsylvania and other states
- Results of coal core analyses are indicated below:

Sample No.	Coal	Depth (ft)	Lost Gas cc/gm	Desorbed Gas cc/gm	Residual Gas cc/gm	Total Gas cc/gm	cf/ton
41	Waynesburg	149	0.06	1.58	1.15	2.8	90
42	"	153	0.02	1.07	1.06	2.2	70
43	Sewickley	371	0.07	2.66	2.01	4.7	150
44	"	486	0.05	1.88	2.63	4.6	147
45	Pittsburgh	489	0.08	2.15	1.89	4.1	131
46	"	491	0.15	2.82	2.60	5.6	180
J-L-1	(Rider)	483	0.10	2.75	1.33	4.2	134
155	Bakerstown	888	0.04	2.53	1.78	4.4	141
J-L-2	Upper Freeport	1085	?	1.48	2.12	3.6	115
47	Upper Kittanning	1187	0.12	3.07	1.64	4.8	154
156	(Predom. Shale)	1188	0.35	3.75	2.00	6.1	195
48	Middle Kittanning	1238	?	2.41	0.67	3.1	99
142	Clarion	1292	0.10	2.93	1.39	4.4	141

- Analysis of pre-production test data is complete
- Equitable Gas Company has analyzed gas samples and accepted the gas for their pipeline.

FIELD ACTIVITIES

- Site survey and mud pit and access road constructed
- Coring contractor initiated coring on October 23 and completed on December 18
- Production well drilled to TD January 29 and required geophysical logs run
- Well completed and stimulated. Down hole pump, tubing, and electric power service installed
- Completed abandonment operations on old well discovered during well #1 frac job
- Pump jack installed; dewatering operations begun
- Pulled pump and tubing to correct erratic pumping problem
- Replaced pump motor due to pumping imbalance overload problem
- Began water level measurements with an Echometer
- Coal seam dewatering operations continuing
- Conducted well site pre-production water and gas tests
- Manufacturer replaced pump jack and motor with a heavier duty version of same size unit
- Surface equipment had been installed less gas company connecting components
- Well has been dewatered and production of CH₄ begun for evaluation by the Equitable Gas Company.

SCHEDULE

MILESTONE/ACTIVITY	1979											
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Phase I Report												
Begin Coring										▲		
Complete Coring											▲	
Complete Well Design												▲
Complete Drilling Operations		▲										▲
Complete Multiple Fracturing		▲										
Start Pipeline Hookup Tests									▲			
Phase II Design Report										▲		

ANTHRACITE COAL DRAINAGE TEST PROJECT
LUZERNE COUNTY, PENNSYLVANIA

STATUS

Concept Phase Complete - Project deferred due to lack of DOE funding. As of 11/79

CONTRACT(S)

DE-AC21-78MC08089

Location Southwest of Wilkes-Barre on the Susquehanna

CO-OPERATING COMPANY

Pennsylvania Energy
Resources, Inc. (PERI)
Wilkes-Barre, Pennsylvania

GENERAL SCHEDULE

Concept Phase - June 1976
to Aug 1978

Design and
Verification

Implementation
Phase

Indefinitely
Deferred

OBJECTIVE

To develop and demonstrate a system for the recovery of methane from anthracite coal using stimulated multiple, multiple completion wells and utilizing the gas by injection into a local pipeline.

PROGRESS TO DATE

- Experimental well drilled in 1976. Initial production was 85 MCFD before well was killed during hydraulic fracturing.
- Detail plan established for design and verification activities.
- Cost estimates completed for next phases.
- First draft of EA completed.

RECOVERY SYSTEM SUMMARY

- (3) Multiple completion wells in Red Ash veins of Northern anthracite fields. Stimulation by gas, explosive or hydraulic fracturing.

UTILIZATION SYSTEM SUMMARY

Recovered gas to be utilized by injection into pipeline serving local area.

ANTHRACITE COAL DRAINAGE TEST PROJECT

DESIGN AND ANALYSIS ACTIVITIES

- Statement of Work has been structured to provide for one well to be drilled and tested during CY 1979. Completion will be delayed until CY 1980.

NOTE: The 1979 and 1980 work has been temporarily suspended at the direction of METC.

FIELD ACTIVITIES

- Site inspection conducted in mid-July, 1979
- Field trip for environmental planning conducted in August, 1979.

SCHEDULE

MILESTONE/ACTIVITY	1979											
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Drilling Preparation					▲		▲					
- complete site selection												
- complete legal arrangements												
- complete well design												
Complete Initial Utilization												
System Design												
Prepare Maps												
Update Design												
Develop Procurement specifications												
Drill First Well												
Phase II Design Report												

5. SCHEDULES

Three types of schedules are shown in this section: the Master Schedule showing major project milestones, critical milestones for the next month, and major events scheduled for the following quarter.

5.1 MASTER SCHEDULE

The major milestones for the TRW MRCP for portions of CY 1979 and CY 1980 are shown in Figure 5-1.

5.2 PLANS FOR DECEMBER 1980

Engineering Support

- 10 December - Deliver coordination draft of FY 1981 UGR Drilling Technology PPD to METC
- 10 December - Conduct year-end project review at Morgantown, West Virginia
- 10 December - Review forms for computerized data base with METC
- 16 December - Publish and deliver FY 1981 UGR Drilling Technology PPD to METC.

Resource Engineering

- 1 December - Deliver Uinta Basin Report to METC
- 4 December - Deliver Warrior Basin Report to METC
- 10-15 December - Participate on a coring and logging test with R&P Coal Company in Indiana County, Pennsylvania
- 30 December - Deliver draft Piceance Basin Detailed Site Investigation to METC for review

Technology Test Projects

- 1 December - Begin drilling second vent hole at ORC/Island Creek site
- 4 December - Conduct review of Occidental Research Corporation Project at McLean

MASTER PROJECT SCHEDULE

Modified June 1980
Updated June 1980

[illegible]

*Denotes number of test reports or investigations to be completed.

- ☐ Incomplete
- ☐ Deferred
- ☒ Complete

Technology Test Projects (Continued)

- 19 December - Complete hookup of Waynesburg College methane well to pipeline
- 30 December - Complete drilling of second vent hole at ORC/ Island Creek site
- 30 December - Complete drilling of Oxy #13

5.3 PLANS FOR POST-DECEMBER 1980

All work elements will be directed toward the preparation and completion of the MRCP Final Report in accordance with December 1980 contract modification.

6. DELIVERABLE STATUS

The deliverables for the TRW effort are specified in Article III of the Contract. The status of each of the deliverables follows:

Reference: Article III, 1 Reports

<u>Paragraphs and Description</u>	<u>Delivery Date</u>	<u>Completion Status</u>
a. Monthly Progress Reports	Within 15 days after each month of contract performance.	Periodic
b. Monthly Financial Reports	Within 15 days after calendar month of performance.	Periodic
c. Contractor's Reports on Government-owned Capital Equipment	With each voucher.	As Applicable
d. Annual Reports	Within 20 days after annual period of contract.	CY 1978 - Completed CY 1979 - Completed
e. Draft Final Report	June 21, 1981	When Applicable
f. Final Report	Within 30 days of DOE approval or recommended change of Draft.	When Applicable
g. Post Contract Reports	Semiannually after completion of the contract, if work continues at contractor's expense.	When Applicable

Reference: Appendix A, 1.2 Deliverables, 1.2.1 Phase I.

<u>Paragraphs and Description</u>	<u>Delivery Date</u>	<u>Completion Status</u>
a. Plan for Readily Available Central Data Base Information System	A Phase I deliverable. Exact due date not specified.	Completed - November 1979
b. Plan for Delineation of the Coal-bed Methane Resource	A Phase I deliverable. Exact due date not specified.	Completed - February 1979
c. A preliminary & System Design d. for site developed for the first project	A Phase I deliverable. Exact due date not specified.	Completed - November 1978
e. A Program Plan	A Phase I deliverable.	FY 1980 Annual Update Completed December 1979 FY 1981 Annual Update Completed September 1980
f. A List and Ranking of Potential Resource Contractors	A Phase I deliverable. Exact due date not specified.	Completed - March 1979
g. A complete Technology Transfer Plan	A Phase I deliverable. Exact due date not specified.	Completed - November 1979
h. An updated Cost Estimate for Phase I Options	A Phase I deliverable. Exact due date not specified.	Completed - July 1978
i. An updated Cost Estimate for Phase II Options	A Phase I deliverable. Exact due date not specified.	Completed - December 1978
j. Oral Presentation to TPO MERC at completion Phase I	A Phase I deliverable.	Completed - November 1978

Reference: Contract Modifications Covering CY 1979/1980 Effort (TBS)

<u>Paragraphs and Description</u>	<u>Delivery Date</u>	<u>Completion Status</u>
a. Well Test Reports	90 days after tests.	Required: 32 Delivered: 28 Past Due: 0
b. Basin Reports	Approximately 6 week intervals starting in June.	Required: 11 Delivered: 7 Past Due: 0
c. Detailed Site Investigation Report	November 1980	Required: 3 Delivered: 1 In Work: 1 Deferred: 1
d. Phase II Design Report	30 days after completion of design.	Required: 2 Delivered: 0 In Work: 2
e. Maurer Turbodrill	Phase I Phase II	Delivered: 9/2/80 Delivered: 11/17/80

7. EXPENDITURE STATUS

The expenditure plan and actual costs through the current reporting month are shown in Figure 7-1.

CONTRACT SUMMARY REPORT			CONTRACT TITLE Methane Recovery From Coalbeds			CUSTOMER DOE		PERIOD ENDING 11/21/80	
		SALES NUMBER 97141	CONTRACT NUMBER DE-AC21- 78MC08089	CONTRACT TYPE CPFF	CONTRACT PERIOD FROM: 12-12-77 TO: 12-31-80	CONTRACT VALUE (\$ 000) COST FEE % TOTAL 9354 712 7.6 10066

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC				
PLAN	5166	5645	6145	6465	6600	7032	7186	7609	8155	8400	8937	9354				
ACTUAL	4601	5137	5575	5895	6168	6680	7008	7216	7646	7895	8231					
VARIANCE	565	508	570	570	432	352	178	393	509	505	706					
COMMIT.	959	610	701	564	763	861	822	796	644	605	789					

DEVELOPMENTS/PROBLEMS THIS REVIEW PERIOD:

*Commitments reflected include invoices pending to book against subcontracts.

PROJECT MANAGER

A. Gillies

OPERATIONS MANAGER

R.L. Robertson

--- PLAN
— ACTUAL
..... FUNDING
-.- COMMIT.

Figure 7-1. Expenditure Schedule

ATTACHMENT A

RESOURCE ENGINEERING
Field Operations Complete

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SAN JUAN	H-1
POWDER RIVER	I-1
WESTERN WASHINGTON	L-1
WIND RIVER	N-1

NORTHERN APPALACHIAN BASIN

NORTHERN APPALACHIAN BASIN
GREENE COUNTY, PENNSYLVANIA

Site AAA

STATUS

Complete

July 1979

CO-OPERATING COMPANY

Kinloch Development Co.
Waynesburg, Pennsylvania

Location: #1 Murdock Well; Whiteley Township, Greene County,
Pennsylvania ~1 mi. No. of Fordyce along Frosty Run

CONTRACT(S)

FIELD TEST PERIOD(S)

3 April - 23 June 1978

OBJECTIVE

To test the effect of stimulation on the producibility of methane from
Pennsylvanian coalbeds.

FIELD ACTIVITY PROGRESS

- Drilling completed.
- Borehole geophysical logging - Neutron, compensated, density, induction - Completed.
- Sidewall coring - Completed.
- Perforation and pre-frac flow testing - Completed.
- Stimulation - Kiel process hydraulic fracturing - Completed.
- Post-frac injection testing - Completed.
- Gas and water production testing - Recommended but not carried out.

OTHER TESTING

- Desorption of sidewall core samples - Completed.

ANALYSIS STATUS

- All testing and analysis of tests completed.

FIELD ACTIVITIES

- April 3-7 - Drill to TD 1608 feet.
- April 8 - Log and sidewall core well.
- May 5 - Cement in 5-1/2 inch casing to TD.
- May 25 - Perforate 4 selected coalbeds.
- May 25-26 - Run casing-collar log and perforating record and cement bond logs.
- June 7 - Complete pre-frac injection tests.
- June 7 - Stimulate well - Kiel frac process.
- June 23 - Final injection test.

ANALYSIS ACTIVITIES

- Desorption of sidewall core samples show that gas in content of coal seams ranges from 33 to 426 cf/ton with the higher values from samples of the lower perforated coals.
- Pre-frac water injection test through acidized perfs indicated permeabilities of 0.5 to 1.0 md depending on tested zone.
- Three stage frac at 3800 - 3900 psi (well above design) introduced 1533 bbl containing 18,480 lb 80-100 mesh and 15,750 lb 20-40 mesh sand.

RESULTS

- After frac, well flowed ~80 bbl water per day with show of gas.
- Sucker rod pump installed and produced water and gas. No water or gas monitoring equipment was installed so no quantitative measure of fluid production could be made.

WARRIOR BASIN

STATUS

Testing Complete - Analysis Complete

May 1980

CO-OPERATING COMPANY

Grace Petroleum Corp.
Jackson, Mississippi

Location: Davis Chapel Field, Sec. 34, T14S, R11W
Well No. 1 - Grimsley 35-15

CONTRACT(S)

FIELD TEST PERIOD(S)

6-23 July 1979

OBJECTIVE To determine the quantity and quality of the coal, the methane content of the coal, and some reservoir properties of several coal seams in the Pottsville Formation. This effort will help determine the potential productivity of coalbed methane from this resource area.

FIELD ACTIVITY PROGRESS

- Testing was performed during the original drilling at 551 feet.

Tests Performed

Conventional Coring

- 80 feet of core. Coal at 593-597, 1100-1102, 1675-1676, 1879-1882.

Logging

- Geophysical borehole logs - dual induction (DISF), formation density, compensated neutron, microlog and borehole compensated sonic log.

OTHER TESTING

- Desorption of coal samples.
- Laboratory analyses of coal samples.

ANALYSIS STATUS

- Desorption complete
- Laboratory analysis complete.

FIELD ACTIVITIES

July 6 - Spud date
July 9 - Core point reached
July 11 - Cored Blue Creek seam, logged hole
July 13 - Cored unnamed "H" seam
July 15 - Logged hole
July 16 - Cored Roosa seam
July 17 - Cored Tidemore "B" seam
July 23 - Final logging
July 23 - Cemented production casing.

ANALYSIS ACTIVITIES

- Coal core desorption complete
- Laboratory analyses of coal samples complete
- Ultimate and proximate analyses complete.

RESULTS

Desorption data from conventional cores:

Sample Depth (ft)	Lithology	Sample Weight (gm)	Desorbed Gas (cc/gm)	Residual Gas (cc/gm)	Lost Gas (cc/gm)	Total Gas (cc/gm)	Per Unit (cf/ton)
593	Coal	1789	2.2	0.2	0.4	2.8	90
1102	Coal	657	2.3	0.3	0.6	3.2	102
1675	Coal	1198	0.2	0.2	0.2	0.6	19
1880	Coal	1113	1.2	0.9	0.1	2.2	70

WARRIOR BASIN
WALKER COUNTY, ALABAMA

Site CAB

STATUS

Field Operations Complete

October 1980

CO-OPERATING COMPANY

USGS/Eastern Region
Washington, D. C.

Alabama Geological Survey
Tuscaloosa, Alabama

Location: Well #57 (depth 1000') SW/4, Sec. 19, T14S, R9W

CONTRACT(S)

FIELD TEST PERIOD(S)

16-21 October 1980

OBJECTIVE

To determine the quantity and quality of the coal, the methane content of the coal, and some reservoir properties of several coal seams in the Pottsville Formation. This effort will help determine the potential productivity of coalbed methane from this resource area.

FIELD ACTIVITY PROGRESS

Tests Performed

- Conventional Coring - Entire well cored by USGS
- Geophysical Logging

OTHER TESTING

- Desorption of coal samples
- Lab analyses of coal samples

ANALYSIS STATUS

FIELD ACTIVITIES

October 16-21 - Cored through the Mary Lee coal zone and encountered 14 inches of coal
By prior agreement with USGS this was insufficient coal to permit
sampling for coalbed methane desorption.

ANALYSIS ACTIVITIES

RESULTS

ILLINOIS BASIN

ILLINOIS BASIN
CLAY COUNTY, ILLINOIS

Site DAA

STATUS

Testing Complete/Analysis Complete

May 1980

CO-OPERATING COMPANY

Hagen Oil Company
Clay City, Illinois

Location: Henderson #2 Well, Elevation 451 feet,
Section 19, Township 3N Range 8E

CONTRACT(S)

DE-AC21-78MC08089

FIELD TEST PERIOD(S)

25-28 October 1978

OBJECTIVE To determine the methane content and reservoir properties of numerous coal horizons within the Illinois Basin as part of an effort to delineate the potential for production from this resource area.

FIELD ACTIVITY PROGRESS

- Testing was performed during the original drilling at 990 feet.
- Tests Performed
 - Conventional coring
 - 194 feet of core. Coal at 994-997, 1035-1037, 1077-1078, 1089-1091, and 1352-1352.5 feet.
 - Drill stem tests
 - Tests at 1342-1354, 1071-1083, and 1026-1038 feet.
 - Logging
 - Induction-laterolog, porosity, density, sonic, fracture identification.
 - Sidewall cores
 - Very little coal recovered.

OTHER TESTING

- Desorption of coal
- Laboratory analyses

ANALYSIS STATUS

- Laboratory analysis complete
- Desorption complete.

FIELD ACTIVITIES

- October 25 - Coring with 30 foot barrel. Rates of 10 to 30 feet/hour.
- Intervals 990-1020, 1023-1053, 1053-1067, 1067-1097, 1330-1360, 1400-1430, and 1480-1510 feet (TD).
 - Coal samples collected and placed in desorption canisters.
- October 27 - Start drill stem tests in Seelyville coal - 1342-1354 feet.
- October 28 - DST in Briar Hill (No. 5A), 1071-1083 feet.
- DST in Herrin (No. 6) - misrun due to plugged tool.
 - Ran logs (induction, porosity, density, sonic, and fracture identification).
 - Attempts at sidewall coring aborted due to zero return - no charge for attempts.

Service Contractors: Christensen - Conventional coring
 Lynes - DST
 Schlumberger - Logging sidewall cores

ANALYSIS ACTIVITIES

- Desorption complete
- DST analysis completed, shut in pressures in Seelyville 479 to 466 psig; in Briar Hill 239 to 176 psig. No significant flows.
- Sidewall core desorption preliminary data - the gas content of the Danville (No. 7) coal was estimated by this technique to be 27.7 cf/ton.
- Proximate/Ulimate Analysis complete.
- Porosity/Permeability of coal analyses complete; porosity is estimated to be between 3 and 7 percent; permeability is less than 0.1 md.

RESULTS

Desorption data from conventional cores:

Sample Depth (ft)	Lithology	Sample Weight (gm)	Desorbed Gas (cc/gm)	Residual Gas (cc/gm)	Lost Gas (cc/gm)	Total Gas (cc/gm)	Per Unit (cf/ton)
994	Coal	1700	0.8	0.5	0.1	1.4	45
995	Coal	1640	0.9	0.3	0.1	1.3	42
1035	Coal	2080	0.6	0.3	0.1	1.0	32
1036	Coal	1890	0.5	0.5	0.1	1.1	35
1034	Shale	3050	0.3	0.0	0.0	0.3	10
1077	Coal	1780	0.4	0.5	0.1	1.0	32
1090	Coal	1350	0.7	0.3	0.1	1.1	35
1352	Coal	860	0.9	0.4	0.3	1.6	51

ILLINOIS BASIN
MARION COUNTY, ILLINOIS

Site DAB

STATUS

Field and Laboratory Activities Completed/Evaluation Complete

June 1980

CO-OPERATING COMPANY

GeoWest Inc.
Billings, Montana
(406) 252-0070

Location: Sec. 7, T2N, R2E

CONTRACT(S)

FIELD TEST PERIOD(S)

12-17 May 1979

OBJECTIVE To determine coal thickness, gas content and some reservoir characteristics of these coals.

FIELD ACTIVITY PROGRESS

- Drilling and coring completed
- Borehole geophysical logging - electric, gamma-ray, gamma-gamma density, and caliper - completed.
- Drill stem test aborted because of hole sloughing

OTHER TESTING

- Desorption of coal samples
- Laboratory analyses of coal samples

ANALYSIS STATUS

- Desorption complete
- Laboratory analysis complete

FIELD ACTIVITIES

May 12 - Location selection

May 13 - Site preparation

May 14-16 - Drill and core coal seams encountered:

<u>Seam</u>	<u>Depth (feet)</u>	<u>Thickness (feet)</u>
Illinois No. 7	663.7	2.8
No. 6	698.0	5.1 (Upper part of seam drilled through)
No. 4	727.0	0.9
No. 5	732.4	4.0

May 16 - Borehole geophysical logs run - Electric, gamma-ray, gamma-gamma density, and caliper

May 17 - Plug hole

ANALYSIS ACTIVITIES

- Coal desorption complete
- Porosity/Permeability and bulk density determination of roof and floor rock samples complete
- Proximate/Ulimate analyses complete

RESULTS

Desorption data from conventional cores:

<u>Sample Depth (ft)</u>	<u>Lithology</u>	<u>Sample Weight (gm)</u>	<u>Desorbed Gas (cc/gm)</u>	<u>Residual Gas (cc/gm)</u>	<u>Lost Gas (cc/gm)</u>	<u>Total Gas (cc/gm)</u>	<u>Per Unit (cf/ton)</u>
665	Coal	1776	0.7	0.1	0.0	0.8	25
698	Coal	1748	0.8	0.3	0.0	1.1	35
727	Coal	1349	0.4	0.3	0.0	0.7	23
736	Coal	1544	0.8	0.1	0.0	0.9	29
733	Coal	1441	0.9	0.0	0.0	0.9	29
732	Coal	1349	0.5	0.3	0.0	0.8	26

ILLINOIS BASIN
POSEY COUNTY, INDIANA

Site DAC

STATUS

Field Activities Complete/Analyses in Progress

July 1980

CO-OPERATING COMPANY

Indiana Geological Survey
Bloomington, Indiana
(812) 337-2862

Location: Sec. 33, T6S, R13W

CONTRACT(S)

FIELD TEST PERIOD(S)

3 October -
16 November 1979

OBJECTIVE

Provide gas content and desorption data from coals in the southeast part of the Illinois Basin in areas previously untested by MRCP. Two wells in Posey County, Indiana, will be cored and logged.

FIELD ACTIVITY PROGRESS

- Field operations complete
- Desorption samples taken from the following coals:

<u>Depth (ft)</u>	<u>Coal</u>	<u>Thickness (ft)</u>
467.7	VII	2.0
517.5	Herrin	3.7
614.9	V	3.5
728.5	IVa	2.2
786.7	IV	1.3
879.0	III (Upper Split)	1.7
889.0	III (Lower Split)	5.0

- Borehole geophysical logs run: gamma-ray, SP, resistivity

OTHER TESTING

- Desorption of coal samples
- Laboratory analyses of coal samples

ANALYSIS STATUS

- Desorption complete

FIELD ACTIVITIES

October 16 - At initial core point
October 18 - Coal VII cored, sampled for desorption test
October 23 - Herrin Coal member cored, sampled for desorption test
October 25 - Coal V cored, sampled for desorption test
October 31 - Coal IVa cored, sampled for desorption test
November 1 - Coal IV cored, sampled for desorption test
November 14 - Coal III (Upper Split) cored, sampled for desorption test
November 14 - Coal III (Lower Split) cored, sampled for desorption test
November 14 - Geophysical logs run
November 15 - Hole plugged

ANALYSIS ACTIVITIES

- Coal core desorption complete
- Residual gas determination complete
- Proximate/ultimate analyses in progress planned for completion in July

RESULTS

Desorption data from conventional cores:

Sample Depth (ft)	Lithology	Sample Weight (gm)	Desorbed Gas (cc/gm)	Residual Gas (cc/gm)	Lost Gas (cc/gm)	Total Gas (cc/gm)	Per Unit (cf/ton)
467	Coal	1980	1.0	0.1	0.0	1.1	35
518	Coal	1660	0.0*	0.5	0.0	?	?
616	Coal	2059	0.3	0.4	0.1	0.8	26
728	Coal	1154	1.4	0.4	0.0	1.8	58
787	Coal	1009	1.5	0.5	0.1	2.1	67
879	Coal	937	0.3	0.5	0.0	0.8	26
889	Coal	1207	2.1	0.4	0.1	2.6	83

*Canister leaked

ILLINOIS BASIN
POSEY COUNTY, INDIANA

Site DAD

STATUS

Field Operations Complete

August 1980

CO-OPERATING COMPANY

Indiana Geological Survey
Bloomington, Indiana

Location: Sec. 26, T4S, R13W

CONTRACT(S)

FIELD TEST PERIOD(S)

26 November 1979 -
22 May 1980

OBJECTIVE

Provide gas content and desorption data from coals in the southeast part of the Illinois Basin in areas previously untested by MRCP.

FIELD ACTIVITY PROGRESS

- Drilling initiated; coring of initial hole complete
- The following coals were intercepted:

Depth (ft)	Coal	Thickness (ft)
506.0	VII	3.0
562.0	Herrin	4.9
665.4	V	4.1
772.0	IVa	2.2
827.0	IV	2.5
906.5	IIIa	0.7
933.1	III	11.5

- Borehole geophysical logs run include: gamma ray, SP, and resistivity
- Twin hole to recore Coal V complete

OTHER TESTING

- Desorption of coal samples
- Laboratory analyses of coal samples upon completion of desorption

ANALYSIS STATUS

- Desorption in progress

FIELD ACTIVITIES

December 20 - At initial core point
 December 21 - Coal VII cored; sampled for desorption test
 Break for Holidays
 January 8 - Herrin coal cored; sampled for desorption test
 January 24 - Coal V cored; sampled for desorption test
 January 28 - Mechanical and hole problems delayed progress
 February 19 - Coal IVa cored; sampled for desorption test
 February 22 - Coal IV cored; sampled for desorption test
 February 26 - Mechanical difficulties delayed progress
 April 2 - Coal IIIa cored; sampled for desorption
 Mechanical difficulties delayed progress
 April 16 - Coal III cored, thickest coal seam ever recovered
 in Posey County; sampled for desorption
 April 17 - Hole logged; hole sloughing precluded complete
 suite being run
 April 21 - Hole plugged
 April 29 - Rig skidded over to drill to Coal V in twin hole
 May 21 - Coal V cored; sampled for desorption test
 May 22 - Hole logged and plugged

ANALYSIS ACTIVITIES

- Coal core desorption in progress
- Coal quality - ultimate/proximate analyses begun
- Gas composition - including isotopic analyses, complete

RESULTS

Preliminary desorption from conventional cores:

Sample Depth (ft)	Lithology	Sample Weight (gm)	Desorbed Gas (cc/gm)	Residual Gas (cc/gm)	Lost Gas (cc/gm)	Total Gas (cc/gm)	Per Unit (cf/ton)
505	Coal (VII)	1196	1.9	0.2	0.1	2.2	70
562	Coal (Herrin)	1358	2.4	+	0.1		
665	Coal (V)	1445	1.1*	0.3	-	1.4	45
772	Coal (IVa)	1491	1.8	0.5	0.1	2.4	77
827	Coal (IV)	961	2.7	+	0.1		
993	Coal (IIIa)	1348	2.7	+	0.1		
995	Coal (III)	1413	3.4	+	0.2		
667	Coal (III)	1243	2.1	+	0.1		
669	Coal (V)	1550	2.0	+	0.2		

*Canister leaked

+Samples sent to USBM Laboratory for Residual Gas determination and Proximate/Ulimate analysis

ILLINOIS BASIN
WEBSTER COUNTY, KENTUCKY
STATUS

Site DAE

Field Operations Complete

May 1980

CO-OPERATING COMPANY
R. W. Beeson Oil Producer
Evansville, Indiana

Location: 1475' FSL, 925' FWL, 4 L 24

CONTRACT(S)

FIELD TEST PERIOD(S)

18-22 January 1980

OBJECTIVE

To test the methane content of coals in the deep part of the Illinois Basin from which no specific gas content data is available.

FIELD ACTIVITY PROGRESS

- Field activity complete
- Coal cored as follows:

<u>Depth (ft)</u>	<u>Coal</u>	<u>Thickness (ft)</u>
1200.0	No. 13	5.7
1304.7	No. 9	5.0

- Geophysical logs run: resistivity, gamma ray, density, neutron, SP, sonic, and caliper
- DST performed in each coal horizon: Formations were very tight -- permeability very low

OTHER TESTING

- Desorption of coal samples
- Lab analysis of coal, roof, and floor rocks

ANALYSIS STATUS

- Desorption complete
- Mechanical properties analysis complete

FIELD ACTIVITIES

- January 18 - Site preparation, rig up, spud well
- January 19 - Core #1 - No. 14 coal not encountered
- January 20 - Core #2 - No. 13 coal sampled for desorption testing
- Cores #3 and #4 - No. 11 coal missing from section
- January 21 - Core #5 - No. 9 coal sampled for desorption testing
- TD @ 1324 feet
- Geophysical logs run
- DST initiated
- January 22 - DST completed
- Hole plugged

ANALYSIS ACTIVITIES

- Desorption complete
- Roof and floor rock property testing complete
- Coal log computer analysis complete
- Coal quality - ultimate/proximate analyses complete
- Gas quality - including isotopic composition in progress

RESULTS

Desorption data from conventional cores:

Sample Depth (ft)	Lithology	Sample Weight (gm)	Desorbed Gas (cc/gm)	Residual Gas (cc/gm)	Lost Gas (cc/gm)	Total Gas (cc/gm)	Per Unit (cf/ton)
1200	Coal	1908	0.6	0.8	0.0	1.4	45
1204	Coal	2074	0.8	0.6	0.0	1.4	45
1305	Coal	1650	0.6	0.8	0.0	1.4	45
1308	Coal	1732	0.5	0.9	0.0	1.4	45

ARKOMA BASIN

ARKOMA BASIN
PITTSBURG COUNTY, OKLAHOMA

Site EAA

STATUS

Testing Complete - Analysis complete

May 1980

CO-OPERATING COMPANY
Arkla Exploration Co.
Shreveport, Louisiana

Locations: Brown Well #1-2, Elevation 755 feet
Section 2, Township 6N, Range 13E

CONTRACT(S)

DE-AC21-78MC08089

FIELD TEST PERIOD(S)

9-11 October 1978

OBJECTIVE

To determine the methane content and reservoir properties of the Lower Hartshorne Seam in the Arkoma Basin as part of the effort to delineate the potential for production from this resource area.

FIELD ACTIVITY PROGRESS

- Testing on this well was done during original drilling to 3150 feet.
- Tests Performed
 - Sidewall coring
 - 36 cores obtained from 48 shots, 1820.0 to 2715.5 feet
 - Drill stem tests
 - Tested interval 2700 to 2740 feet. Pressure 716 psig, final flow 9.6 bbls/day
 - Test interval 2127-2130 cancelled to eliminate risk of sticking pipe
 - Logging
 - Logging by Arkla - Induction Later log, neutron density, and sonic

OTHER TESTING

- Desorption of core samples

ANALYSIS STATUS

- Desorption completed

FIELD ACTIVITIES

- October 8 - Drilling reached 3150 feet, logging completed
 - Sidewall cores taken

<u>Interval</u>	<u>Shots</u>	<u>Cores Recovered</u>
1833.0 - 1834.0	2	2
1903.0 - 1906.0	4	3
2124.0 - 2131.0	20	17
2703.0 - 2732.0	22	18

- October 10 - Circulated preparatory to drill stem tests at 2700 to 2740 feet
 - After reaching bottom with DST tools, pipe tally showed improper test depth

- October 11 - DST tools repositioned and test conducted

- October 12 - Preparing for DST at 2127 to 2130 feet

- October 13 - DST cancelled by Arkla due to risk of sticking pipe below packer to bottom of the hole
 - Testing completed

Service

- Contractors - Geochem - Sidewall cores, desorption
 Johnston - DST
 Schlumberger - Arkla logs

ANALYSIS ACTIVITIES

- Coal indicated on logs at depths shown above
- DST results as calculated by Johnston using Horner method
 - Flow 9.0 bbl/day, water
 - Pressure Initial shut-in 716 psig, Final shut-in 710 psig
 - Permeability 4.5 md, average
 - Well Bore Damage None
 - Radius of Investigation - 206 feet
- Desorption complete

RESULTS

Results from sidewall cores:

<u>Sample Depth (ft)</u>	<u>Lithology</u>	<u>Sample Weight (gm)</u>	<u>Desorbed Gas (cc/gm)</u>	<u>Residual Gas (cc/gm)</u>	<u>Lost Gas (cc/gm)</u>	<u>Total Gas (cc/gm)</u>	<u>Per Unit (cf/ton)</u>
1904	Coal					4.1	131
2128	Coal					6.6	211
2730	Coal					2.3	73

ARKOMA BASIN
PITTSBURG COUNTY, OKLAHOMA

Site EAB

STATUS

Field Operations Complete

May 1980

CO-OPERATING COMPANY

Mustang Production Co.
1100 East First National
Center
Oklahoma City, OK

Location: Barringer No. 1-11, Pittsburg County, OK
Sec. 11, T4N, R15E

CONTRACT(S)

FIELD TEST PERIOD(S)

4-26 July 1979

OBJECTIVE

To determine coal thickness and gas content and selected reservoir characteristics of these coals

FIELD ACTIVITY PROGRESS

- Drilling and coring completed
- Borehole geophysical logging - electric, gamma-ray, spectralog, compensated density, and caliper

OTHER TESTING

- Computer analysis of the coal seams for relative rank, thickness, moisture, mineral content, and ash content
- Desorption of coal samples
- Laboratory analyses of coal samples

ANALYSIS STATUS

- Desorption complete
- Computer analysis complete
- Laboratory analysis complete

FIELD ACTIVITIES

- July 11 - Coal horizon - Middle Booch, projected to be within the interval 3650 to 3662 ft.
 Core size - 3" core, using PVC plastic liner for the inner barrel
 Interval cored - 3650' to 3662' - 12 feet, "air" coring
 Core recovered - 10.45' of core; 11" of which was coal
 Core loss - 1.55', attributed to core lifter slippage
 Percent recovery - 87.1 percent
- July 16 - Coal horizon - Upper Hartshorne, projected within the interval 4435 to 4458 ft
 Core size - 3" core, using PVC plastic liner for the inner barrel
 Interval cored - 4435' to 4458' = 23 feet, "air" coring
 Core recovered - 0 feet
 Core loss - 23.00', attributed to the failure of the core lifter to react
 Percent recovery - 0 percent
- July 17 - Coal horizon - Lower Hartshorne, projected to be within the interval 4500 to 4593 feet.
 Core size - 3" core, using PVC plastic liner for the inner barrel
 Interval cored - 4580' to 4593' = 13.0 feet, "air" coring
 Core recovered - 5.5' of core; shale w/sandstone partings
 Core loss - 7.5' of core attributed to failure of the core lifter
 Percent recovery - 41.3 percent

ANALYSIS ACTIVITIES

- Design of fracture treatment was prepared.
- Pre-frac and post-frac testing programs were prepared.
- Field operations were begun on February 11 and were terminated on February 13. Several attempts were made to swage out the collapsed casing at 1710 feet and 1744 feet downhole. The casing could not be repaired to accept the required packer unit for subsequent well completion operations. As a result, the Barringer well was abandoned as a viable prospect for type III testing.

RESULTS

Desorption data from conventional cores:

Sample Depth (ft)	Lithology	Sample Weight (gm)	Desorbed Gas (cc/gm)	Residual Gas (cc/gm)	Lost Gas (cc/gm)	Total Gas (cc/gm)	Per Unit (cf/ton)
3651	Coal	1257	5.6	1.2	0.8	7.6	243

ARKOMA BASIN
HASKELL COUNTY, OKLAHOMA

Site EAC

STATUS

Field Operations Complete

August 1980

CO-OPERATING COMPANY

Mustang Production Company
Oklahoma City, OK

Location: Day Well 1-14, Haskell County, Oklahoma
Sec. 14, T7N, R20E

CONTRACT(S)

FIELD TEST PERIOD(S)

4-26 July 1979

OBJECTIVE

To determine coal thickness and gas content and some reservoir characteristics of these coals

FIELD ACTIVITY PROGRESS

- Drilling and coring completed
- Borehole geophysical logging - electric, gamma-ray, spectralog, compensated density, neutron, and caliper

OTHER TESTING

- Computer analysis of the coal seams for relative rank, thickness, moisture, mineral content, gas content, and ash content

ANALYSIS STATUS

- Computer analysis of coals completed

FIELD ACTIVITIES

- July 7 - Coal horizon - Upper Booch, projected to be within the interval 1615 to 1643 ft.
Core size - 3 1/2" core, using the standard steel inner barrel liner
Interval cored - 1615 to 1643 feet - 28 feet, "air-mist"
Core recovered - 25.30" of core
Core loss - 2.70 feet of core caused by slippage of the core lifter
Percent recovery - 90.4 percent, all shale
- July 21 - Core horizon - Hartshorne Undivided, projected within the interval 2585 to 2613 ft.
Core size - 3" core, using PVC plastic liner for the inner barrel
Interval cored - 2585 to 2613 feet - 28 feet, "air-mist"
Core recovered - 18.45 feet of core, shale with sandstone partings
Core loss - 9.55 feet of core; 6 feet of which is believed to be coal and
3.55 feet of which is believed to be bottom rock. Coal core
loss attributed to air jetting of a soft and friable material.
Loss of bottom rock attributed to core lifter failure.
Percent recovery - 65 percent

ANALYSIS ACTIVITIES

- Computer analyses of the well logs completed

RESULTS

ARKOMA BASIN
LE FLORE COUNTY, OKLAHOMA

Site EAD

STATUS

Field Operations Complete

June 1980

CO-OPERATING COMPANY

U.S. Bureau of Reclamation
Amarillo, Texas

Location: Well #DH-A17. Section 14, T8N, R26E
SW $\frac{1}{4}$ of NW $\frac{1}{4}$

CONTRACT(S)

FIELD TEST PERIOD(S)

6-14 September 1979

OBJECTIVE

To determine the quantity and quality of the coal, the methane content of the coal, and some reservoir properties of the Hartshorne Formation. This effort will help determine the potential productivity of coalbed methane from the eastern Arkoma Basin.

FIELD ACTIVITY PROGRESS

- Testing was performed during the original drilling at 460 feet.
- Tests Performed
 - Conventional Coring
 - 10 ft of core. Coal at 191.6 - 194.5 feet.
 - Logging
 - Borehole geophysical logs run - gamma-ray, caliper, and electric

OTHER TESTING

- Desorption of coal sample
- Laboratory analysis of coal sample complete

ANALYSIS STATUS

- Desorption complete

FIELD ACTIVITIES

- September 6 - Spud date, began coring from surface to TD
- September 11 - Recovered 2.9 feet of coal (Lower Hartshorne seam)
- September 13 - Reached TD, USGS logged hole

ANALYSIS ACTIVITIES

- Coal desorption complete

RESULTS

Desorption data from conventional cores:

Sample Depth (ft)	Lithology	Sample Weight (gm)	Desorbed Gas (cc/gm)	Residual Gas (cc/gm)	Lost Gas (cc/gm)	Total Gas (cc/gm)	Per Unit (cf/ton)
192	Coal	1363	8.4	0.9	0.1	9.4	300

PICEANCE BASIN

PICEANCE BASIN
RIO BLANCO COUNTY, COLORADO

Site FAA

STATUS

Testing Complete/Analysis Complete

July 1980

CO-OPERATING COMPANY

Fuel Resources Development
Company
Denver, Colorado

Location: Cathedral 0-28-3-101-S - Sec. 28, T3S, R101W

CONTRACT(S)

FIELD TEST PERIOD(S)

9-10 September 1978

OBJECTIVE

To determine the methane content and reservoir properties of coal seams within the Lower Mesaverde Formation sediments in the Piceance Basin as part of an effort to delineate the potential for production from this resource area.

FIELD ACTIVITY PROGRESS

- Testing was performed during the original drilling at 7894 feet.
- Tests Performed
 - Conventional coring
 - 142 feet of core, coal samples taken at 1584-1586 and 1603-1604 feet.
 - Logging
 - Compensated neutron-formation density, dual induction-laterolog.

OTHER TESTING

- Coal core desorption
- Proximate/ultimate analysis

ANALYSIS STATUS

- Desorption of cores completed

FIELD ACTIVITIES

- September 7 - Spudded in bedrock
- September 9 - Began coring, cored 90 feet
- September 10 - Cored 52 feet
- September 11 - Began logging by Schlumberger
- September 12 - Rigged down Schlumberger and rigged up casing crew
- September 13 - Released rig

ANALYSIS ACTIVITIES

- Desorption of coal samples complete
- Laboratory analysis (proximate/ultimate, heating value, sulfur forms) completed

RESULTS

Desorption data from conventional cores:

Sample Depth (ft)	Lithology	Sample Weight (gm)	Desorbed Gas (cc/gm)	Residual Gas (cc/gm)	Lost Gas (cc/gm)	Total Gas (cc/gm)	Per Unit (cf/ton)
1585	Coal	1584	0.5	-	0.1	.6	18
1603	Coal	144	1.5	-	1.0	2.5	81

PICEANCE BASIN
RIO BLANCO COUNTY, COLORADO

Site FAB

STATUS

Testing Complete
No Further Activity

July 1979

CO-OPERATING COMPANY

Twin Arrow Drilling Co.
Rangely, Colorado

Location: C&K Well #1-13, Elevation 6910 feet.
Section 13, Township 3S, Range 101W

CONTRACT(S)

DE-AC21-78MC08089

FIELD TEST PERIOD(S)

3-7 October 1978

OBJECTIVE

To determine the gas permeability, flow rate and producibility of several coal seams of the Mesaverde Formation in the Piceance Basin as part of an effort to delineate the potential for production from this resource area.

FIELD ACTIVITY PROGRESS

- Well in process of being abandoned by Twin Arrow. Plug set at about 1050 feet to isolate coal seams prior to initial testing.
- Zones tested, 573-581, 627-665, 726-736, 801-810.
Testing Sequence, all zones	Results/Comments
Pressure and flow tests	No pressure, no flow
Squeeze cemented	320 to 1050 feet
Cement Bond Log	100 - 883 feet
Perforated	1 shot per foot
Acid treated	7.5% HF
Swabbed	Dry
Pressure and flow tests	No pressure, no flow
Fracture and flow tests	Not performed due to no gas shows

OTHER TESTING

- Logs available from original drilling effort
- Induction, electric compensated density

ANALYSIS STATUS

- No further site specific analysis activity

FIELD ACTIVITIES

- October 3 - Swabbing attempted while awaiting bridge plug, unable to swab dry. Shut in.
- October 4 - Bridge plug set at 1050 feet and hole swabbed dry. Hole continues to make water at 2.5 bbl/hr. Pressure and flow are negligible.
- October 5 - Hole cemented from top of existing cement (-1050 feet) to 320 feet.
- October 6 - Cement Bond log run. Perforated 5 zones at 1 shot/ft.
- October 7 - Treated all zones with 7.5% MF. Total acid - 500 gal. Swabbed dry and pressure tested. Shut-in pressure zero. No flow observed through 1/8 inch orifice. Operations terminated.

Service

Contractors- Halliburton - Bridge plug, cementing, acidizing
Schlumberger - Bond log, perforating
Wellex - Original logs

ANALYSIS ACTIVITIES

- In this area the Mesaverde is divided into upper and lower. Upper is brown and yellowish gray massive sandstone and gray shale with principal coalbeds near base. Lower is light gray and brown massive sandstone, gray shale and some coal. Based on Twin Arrow logs coal is present at 573-581, 627-633, 661-665, 726-736, 801-810. Other coal in thinner, deeper seams and in washed out hole areas at 1278-1282, 1494-1496, 1864-1870, 2116-2119, and 2148-2154. These zones to be tested in another well.
- While no shows are now evident, original well tool pusher recalls show at 320 feet. It is possible that a bridge sealed off small sand from perforations.

RESULTS

- No gas show in coals. Drilling site is on mesa with valley floor lower than intervals tested. It is possible any original gas in place was lost to the atmosphere.

See site AC in same locale.

PICEANCE BASIN
RIO BLANCO COUNTY, COLORADO

Site FAC

STATUS

Testing Complete/Analysis Complete

August 1980

CO-OPERATING COMPANY

Twin Arrow Drilling Company
Rangely, Colorado

Location: C&K Well #4-14 - Sec. 14, T3S, R101W

CONTRACT(S)

FIELD TEST PERIOD(S)

November - December 1978

OBJECTIVE

To determine the content and reservoir properties of multiple coal seams of the Mesaverde Formation in the Piceance Basin as part of an effort to delineate the potential from this resource area.

FIELD ACTIVITY PROGRESS

- Testing was performed during original drilling at 6931 feet.

• Tests Performed

Conventional coring

- 150 feet of core. Coal desorption samples at 685.2-685.6, 698.1-698.45, 770.9-771.6, 772.5-773.8, 759.2-760.0, 801.9-802.6, 804.4-805.0, 809.4-809.7, 986.5-987.3

OTHER TESTING

- Desorption complete
- No logs run due to lost hole; logs run on #4-14X at same location

ANALYSIS STATUS

- Desorption of cores complete

FIELD ACTIVITIES

November 18 - First truck loads of rig equipment moved to site
 November 20-24 - Rigging up
 November 25 - Spud date, shaft pilot bearing froze
 November 26 - Repairs
 November 27 - Repair Kelly bushings, drill surface
 November 30 - Trip in for core #1
 December 1 - Trip in for core #2, core #3, core #4
 December 2 - Trip out for core #4, reaming, drilling
 December 3 - Repairs
 December 4 - Coring for CER
 December 5 - Coring for CER
 December 8 - Fish in hole
 December 11 - Fishing completed
 December 14-28 - Tried to whipstock out of plugged hole
 Hole abandoned on December 28, 1979

ANALYSIS ACTIVITIES

- Desorption complete
- No well testing was performed because the hole was lost

RESULTS

Desorption data from conventional cores:

Sample Depth (ft)	Lithology	Sample Weight (gm)	Desorbed Gas (cc/gm)	Residual Gas (cc/gm)	Lost Gas (cc/gm)	Total Gas (cc/gm)	Per Unit (cf/ton)
685	Coal	355	1.0	0.1	2.5	3.6	115
698	Carb. shale/coal	353	0.7	0.8	5.2	6.7	214
772	Carb. siltstone	393	0.8	0.0	0.6	1.4	46
771	Carb. shale w/coal	593	0.5	0.0	0.3	0.8	24
759	Coal	397	0.9	0.8	1.0	2.7	86
809	Coal	119	2.8	2.5	2.9	7.6	243
802	Coal	306	0.8	0.6	1.3	2.7	88
804	Carb. Shale	643	0.5	0.2	0.7	1.4	46
986	Coal	653	0.9	1.2	1.4	3.5	111

PICEANCE BASIN
RIO BLANCO COUNTY, COLORADO

Site FAD

STATUS

Field Operation complete

July 1980

CO-OPERATING COMPANY

Western Fuels Assoc.
Lakewood, Colorado

Location: Well No. 310136-2 Sec. 36, T3N, R101W

CONTRACT(S)

FIELD TEST PERIOD(S)

11-20 June 1979

OBJECTIVE

To determine the quantity and quality of the coal, the methane content of the coal, and some reservoir properties of three coal seams. This effort will help determine the potential productivity of coalbed methane from this resource area.

FIELD ACTIVITY PROGRESS

- Testing was performed during the original drilling at 5463 feet.
- Tests Performed
 - Conventional Coring
 - 43 feet of core. Coal at 1324.7 - 1325.9, 1325.9 - 1327.1, 1330.65 - 1338.8, 1351.2 - 1352.1
 - Logging
 - Borehole geophysical logs run - electric, gamma-ray, gamma-gamma density, and caliper

OTHER TESTING

- Desorption of coal samples
- Laboratory analysis of coal samples

ANALYSIS STATUS

- Desorption in progress
- Laboratory analysis of coal samples in progress

FIELD ACTIVITIES

- June 16 - Pilot hole logged
June 17 - Spud date for core hole
June 19 - Core point reached

<u>Seam</u>	<u>Depth (ft)</u>	<u>Thickness (ft)</u>
"E"	1324.7	2.4
"D"	1330.6	8.2
"C"	1351.2	0.9

- June 20 - Borehole geophysical logs run - electric, gamma-ray, gamma-gamma density and caliper
- Demobilization

ANALYSIS ACTIVITIES

- Coal core desorption in progress
- Laboratory analysis of coal samples in progress

RESULTS

Desorption data from conventional cores:

<u>Sample Depth (ft)</u>	<u>Lithology</u>	<u>Sample Weight (gm)</u>	<u>Desorbed Gas (cc/gm)</u>	<u>Residual Gas (cc/gm)</u>	<u>Lost Gas (cc/gm)</u>	<u>Total Gas (cc/gm)</u>	<u>Per Unit (cf/ton)</u>
1325	Coal	1558	1.9	-	0.0	1.9	61
1331	Coal	1599	1.9	-	0.0	1.9	61
1333	Coal	1614	1.7	-	0.0	1.7	54
1336	Coal	1651	1.5	-	0.0	1.5	48
1351	Coal	1453	1.5	-	0.0	1.5	48

PICEANCE BASIN
RIO BLANCO, COLORADO

Site FAE

STATUS

Field Operations Complete

July 1980

CO-OPERATING COMPANY

Western Fuels Assoc.
Lakewood, Colorado

Location: Well No. 21011-5, Sec. 1, T2N, R101W

CONTRACT(S)

FIELD TEST PERIOD(S)

26 June - 1 July 1979

OBJECTIVE

To determine the quantity and quality of the coal, the methane content of the coal, and some reservoir properties of six coal seams. This effort will help determine the potential productivity of coalbed methane from this resource area.

FIELD ACTIVITY PROGRESS

- Testing was performed during the original drilling at 5344 feet.
- Tests Performed
 - Conventional Coring
 - 79 feet of core. Coal at 741.75-748.18, 758.71-761.01, 764.92-770.0, 770.0-772.5, 794.65-796.8, 797.5-801.5, 805.6-810.97. Eight samples placed in canisters for desorption.
 - Logging
 - Borehole geophysical logs run - electric, gamma-ray, gamma-gamma, and caliper

OTHER TESTING

- Desorption of coal samples
- Laboratory analysis of coal samples

ANALYSIS STATUS

- Desorption in progress
- Laboratory analysis of coal samples in progress

FIELD ACTIVITIES

- June 29 - Spud date, surface casing set
 June 30 - Core point reached (depth 740.0 feet)
 June 30-July 1 - Cored six coal seams

Seam	Depth (ft)	Thickness (ft)
"F"	741.75-748.18	6.43
"E"	758.71-761.01	2.30
"D"	764.92-772.5	7.58
"C"	794.65-796.8	2.15
"B"	797.5 -801.5	4.0
"A"	805.6 -810.97	5.37

- July 2 - Borehole geophysical logs run - electric, gamma-ray, gamma-gamma density and caliper

ANALYSIS ACTIVITIES

- Coal core desorption in progress
- Laboratory analysis of coal samples (proximate/ultimate, equilibrium moisture) in progress

RESULTS

Desorption data from conventional cores:

Sample Depth (ft)	Lithology	Sample Weight (gm)	Desorbed Gas (cc/gm)	Residual Gas (cc/gm)	Lost Gas (cc/gm)	Total Gas (cc/gm)	Per Unit (cf/ton)
741	Coal	1703	0.2	0.1	0.2	0.5	16*
744	Coal	1820	1.9	-	0.2	2.1	69
759	Coal	1596	1.6	-	0.1	1.7	54
765	Coal	1731	2.1	-	0.1	2.2	70
772	Coal	1622	2.3	-	0.5	2.8	90
795	Coal	1646	1.8	-	0.1	1.9	64
797	Coal	1620	1.8	-	0.1	1.9	61
809	Coal	1665	1.1	-	0.0	1.1	35

*Possible canister leak

PICEANCE BASIN
RIO BLANCO COUNTY, COLORADO

Site FAF

STATUS

Field Operation complete

July 1980

CO-OPERATING COMPANY

Western Fuels Assoc.
Lakewood, Colorado

Location: Well No. 310129-4; Sec. 29, T3N, R101W

CONTRACT(S)

FIELD TEST PERIOD(S)

23-31 August 1979

OBJECTIVE

To determine the quantity and quality of the coal, the methane content of the coal, and some reservoir properties of two coal seams. This effort will help determine the potential productivity of coalbed methane from this resource area.

FIELD ACTIVITY PROGRESS

- Testing was performed during the original drilling at 5877 feet.
- Tests Performed
 - Conventional coring
 - 45 feet of core. Coal at 879.15 - 882.48 ft., 904.3 - 912.0
 - Logging
 - Borehole geophysical logs run - electric, gamma-ray, gamma-gamma density, and caliper

OTHER TESTING

- Desorption of coal samples
- Laboratory analysis of coal samples to be completed in future

ANALYSIS STATUS

- Desorption in progress
- Laboratory analysis of coal samples in progress

FIELD ACTIVITIES

August 26 - Pilot hole logged, twin core hole spudded

August 28 - Core point reached (depth 870 feet), began coring two coal seams

<u>Seam</u>	<u>Depth (ft)</u>	<u>Thickness (ft)</u>
"C"	879.15 - 882.48	3.3
"B"	904.3 - 912.0	7.7

August 28 - Completed coring, demobilization

ANALYSIS ACTIVITIES

- Coal desorption in progress
- Laboratory analysis of coal in progress

RESULTS

Desorption data from conventional cores:

<u>Sample Depth (ft)</u>	<u>Lithology</u>	<u>Sample Weight (gm)</u>	<u>Desorbed Gas (cc/gm)</u>	<u>Residual Gas (cc/gm)</u>	<u>Lost Gas (cc/gm)</u>	<u>Total Gas (cc/gm)</u>	<u>Per Unit (cf/ton)</u>
880	Coal	1512	0.1	0.0	0.1	0.2	6
905	Interburden						
	Siltstone	1785	0.1	0.0	?	0.1	3
911	Coal	1527	0.01	0.0	?	0.01	0.3*

*Does not include lost gas

PICEANCE BASIN
RIO BLANCO COUNTY, COLORADO

Site FAG

STATUS

Field Operations complete

July 1980

CO-OPERATING COMPANY

Western Fuels Assoc.
Lakewood, Colorado

Location: Well No. 310135-4; Sec. 35, T3N, R101W

CONTRACT(S)

FIELD TEST PERIOD(S)

23-31 August 1979

OBJECTIVE

To determine the quantity and quality of the coal, the methane content of the coal, and some reservoir properties of two coal seams. This effort will help determine the potential productivity of coalbed methane from this resource area.

FIELD ACTIVITY PROGRESS

- Testing was performed during the original drilling at 5562.2 feet.
- Tests Performed
 - Conventional coring
 - 28.9 feet of core. Coal at 1187.46 - 1190.96 ft., 1198.35 - 1206.75 ft.
 - Logging
 - Borehole geophysical logs run - electric, gamma ray, gamma-gamma density, and caliper

OTHER TESTING

- Desorption of coal samples
- Laboratory analysis of coal samples in progress

ANALYSIS STATUS

- Desorption in progress
- Laboratory analysis of coal in progress

FIELD ACTIVITIES

August 25 - Pilot hole logged, twin core hole spudded

August 29 - Core point reached (depth 1180 feet), began coring two coal seams

<u>Seam</u>	<u>Depth (ft)</u>	<u>Thickness (ft)</u>
"E"	1187.46 - 1190.96	3.5
"D"	1198.35 - 1206.75	8.4

August 30 - Completed coring, demobilization

ANALYSIS ACTIVITIES

- Coal desorption in progress
- Laboratory analysis of coal in progress

RESULTS

Desorption data from conventional cores:

<u>Sample Depth (ft)</u>	<u>Lithology</u>	<u>Sample Weight (gm)</u>	<u>Desorbed Gas (cc/gm)</u>	<u>Residual Gas (cc/gm)</u>	<u>Lost Gas (cc/gm)</u>	<u>Total Gas Per Unit (cc/gm) (cf/ton)</u>
1191	S1 Floor Rock	2783	0.04	-	0.0	0.04 1.0*
1206	Coal	2018	0.9	-	0.1	1.0 32

*Does not include lost gas

PICEANCE BASIN
RIO BLANCO COUNTY, COLORADO

Site FAH

STATUS

Field Operations complete

May 1980

CO-OPERATING COMPANY

Fuel Resources Development
Co. (Fuelco)
Denver, Colorado
(303) 571-7707

Location: D-26-3-101-S Section 26, T3S, R101W

CONTRACT(S)

FIELD TEST PERIOD(S)

12-17 August 1979

OBJECTIVE

To determine the quantity and quality of coal and the methane content of the coal in the Mesaverde Formation on the west side of the Piceance Basin

FIELD ACTIVITY PROGRESS

- Testing was performed during the original drilling at 7387 feet.
- Tests Performed
 - Conventional coring
 - 96 feet of core. Coal at 1148.9 - 1151.9, 1154.0 - 1159.0, 1183.2 - 1185.7, 1205.7 - 1206.5, 1209.1 - 1217.8, 1223.0 - 1225.0
 - Logging
 - Borehole geophysical logs run - electric, gamma-ray, compensated density, and caliper

OTHER TESTING

- Desorption of coal samples
- Laboratory analyses of coal samples, roof rock and floor rock

ANALYSIS STATUS

- Desorption in progress
- Laboratory analyses of roof and floor rock complete

FIELD ACTIVITIES

August 13 - Spud date for core hole

August 14 - Core point reached, began coring operations

<u>Seam</u>	<u>Depth (ft)</u>	<u>Thickness (ft)</u>
"C"	1148.9 - 1151.9	3.0
"C"	1154.0 - 1159.0	5.0
"B"	1183.2 - 1185.7	2.5
"A"	1205.7 - 1206.5	0.8
"A"	1209.1 - 1217.8	8.7
Unnamed	1223.0 - 1225.0	2.0

August 15 - Completed coring, demobilization

ANALYSIS ACTIVITIES

- Coal desorption in progress
- Laboratory analysis of coal (proximate/ultimate, heating value, sulfur form) complete
- Laboratory analysis of roof rock (triaxial compressive strength w/elastic properties, permeability, porosity and natural bulk density) complete
- Laboratory analysis of floor rock (uniaxial compressive strength, permeability, porosity and natural bulk density) complete

RESULTS

Desorption data from conventional cores:

<u>Sample Depth (ft)</u>	<u>Lithology</u>	<u>Sample Weight (gm)</u>	<u>Desorbed Gas (cc/gm)</u>	<u>Residual Gas (cc/gm)</u>	<u>Lost Gas (cc/gm)</u>	<u>Total Gas (cc/gm)</u>	<u>Per Unit (cf/ton)</u>
1210	Coal	1498				0.5	16
1211	Coal	1312				0.8	26
1223	Coal	1249				0.6	19

PICEANCE BASIN
SPECIFIC LOCATION CONFIDENTIAL

Site FAI

STATUS

Field Operations complete; desorption in progress

November 1980

CO-OPERATING COMPANY

Confidential Well No. 6

Location: Piceance Basin
Specific Location Confidential

CONTRACT(S)

FIELD TEST PERIOD(S)

18-30 April 1980

OBJECTIVE

Provide gas content and desorption information on the Cameo coal zone in southeastern part of the Piceance Basin.

FIELD ACTIVITY PROGRESS

- Completed coring of 68 feet
- A total of about 42 feet of coal was encountered at the following depths:

Core Intervals (ft)

Core Composition

4682-4696 (14')

41.5 ft. of coal

4726-4759 (33')

5.0 ft. of carbonaceous shale

4798-4819 (21')

21.5 ft. of sandstone

Core recovery of shale + sandstone 100%

Core recovery of coal 25%

- Borehole geophysical logs run

OTHER TESTING

- Desorption of coal core and some cuttings is in progress (16 samples)
- Lab analysis of coal samples to be conducted on completion of desorption

ANALYSIS STATUS

FIELD ACTIVITIES

ANALYSIS ACTIVITIES

RESULTS

Desorption data from conventional cores:

Sample Depth (ft)	Lithology	Sample Weight (gm)	Desorbed Gas (cc/gm)	Residual Gas (cc/gm)	Lost Gas (cc/gm)	Total Gas (cc/gm)	Per Unit* (cf/ton)
4682-4696	Coal	2255	1.2	**	0.1	1.4	44
4682-4696	Non-Carb. shale	1046	0.1	**	-	0.1	4
4724-4731	Coal/shale shaker	486	3.9	0.8	0.2	5.0	160
4724-4731	Coal/shale shaker	2278	4.7	**	0.4	5.1	164
4756	Coal	2009	5.3	**	0.5	5.8	185
4731	Coal	3003	3.2	**	0.2	2.5	112
4735	Carb. shale	3864	0.2	**	0.01	0.3	8
4726	Coal	3804	1.1	**	0.1	1.2	37
4755	Coal	1486	7.8	**	0.7	8.6	274
4753	Coal	2313	5.3	**	0.6	5.9	189
4796-4808	Coal/shale shaker	397	4.4	1.0	0.3	5.9	188
4804	Coal	1829	7.9	**	1.1	9.1	290
4801	Coal	1733	7.4	**	1.1	8.5	272
4799	Coal	1621	7.4	**	1.5	9.0	288
4808	Coal	631	4.6	0.3	1.2	6.3	201
4816	Rollins sandstone	2805	1.8	-	0.7	2.5	80

*Does not include residual gas

**Sample still undergoing desorption

PICEANCE BASIN
MESA COUNTY, COLORADO

Site FAJ

STATUS

Field Operations Complete

July 1980

CO-OPERATING COMPANY

Adolph Coors
Golden, Colorado

Location: Nichols #1-24 - NW/4, NW/4,
Sec. 24, T105W, R97W

CONTRACT(S)

FIELD TEST PERIOD(S)

28 April - 25 June 1980

OBJECTIVE

Complete well in one coal interval of the Cameo zone, frac, and test to determine water and producibility of the part of the Mount Garfield Formation.

FIELD ACTIVITY PROGRESS

- The well was fractured during the stimulation treatment performed in May 1980.
- A subsequent injectivity test was performed on June 24 and 25 to evaluate the results of the fracture.

OTHER TESTING

- Water samples taken during swabbing operations prior to the injectivity test are being analyzed by Dowell and a water testing laboratory.

ANALYSIS STATUS

Flow pressure response measured at wellhead during injectivity test calculated flowing bottom-hole pressure during injectivity test.

FIELD ACTIVITIES

- Well was initially drilled in 1978 to a depth of 3600 feet and cased with 5-1/2" casing to 3323 feet. Well was plugged back to 2720 feet and 2-3/8" tubing set as 2400 feet.
- Casing was perforated with four holes per foot over an eight-foot interval from 2625 to 2633 feet and fractured with 52,500 gallons of 75 percent quality foam and nitrogen. The frac fluid consisted of
 - 13,230 gal water
 - 26 gal F75 (foaming agent)
 - 39 gal F78 (foaming agent)
 - 430,000 SCF nitrogen
 - 48,992 lbs 20/40 mesh sand
- Injectivity testing was performed on June 25, 1980

ANALYSIS ACTIVITIES

- The average effective post-frac permeability to water was estimated from injectivity test data to be approximately 19 md in the fractured formation.
- The initial reservoir pressure in the perforated interval (2625-2633 feet) was calculated to be 1079 psia based upon liquid level measurements made on June 24, prior to the start of the injectivity testing.

RESULTS

- Hydraulic Stimulation:
 - After flowing back well and swabbing frac fluid and nitrogen, well failed to produce methane in any production size rate. Small quantities of gas were observed, but flow fell off to zero in 5 to 10 minutes.
- Injectivity Test:
 - Data obtained in the injectivity test cannot be used to verify that the Cameo coal seam itself was fractured. The only conclusion that can be drawn from the test is that a formation previously stimulated accepted fluids during the injectivity test. Additional testing in the form of a differential temperature survey could indicate where produced fluids are coming from.
 - If it were known that the Cameo coal seam definitely contained producible quantities of gas, the absence of post-frac gas production would mean that the coalbed itself was not fractured and that the fracture proceeded elsewhere. It can be inferred, however, from the test results that the coalbed within the drainage area of the well contains insufficient gas to make it producible. This is based on the estimated average permeability to liquid being relatively high for a coalbed (about 19 md). The effective permeability to gas should be considerably higher provided that the formation is dewatered, which would be the case with a permeability to water of 19 md.
 - It is possible that the injected fluids entered an adjacent formation by channeling behind the casing for some distance up to down the well and/or through fractures created by the previous stimulation treatment. However, according to Coors Energy Division personnel, a cement bond log was run previously in the well as part of the original well completion procedures and indicated competent bonding between the casing string and cement sheath at that time.

PICEANCE BASIN
MESA COUNTY, COLORADO

Site FAK

STATUS

Field Operations Complete

November 1980

CO-OPERATING COMPANY

Adolph Coors
Golden, Colorado

Location: Nichols #1-23 - SW/4, NE/4
Sec. 23, T10S, R97W

CONTRACT(S)

FIELD TEST PERIOD(S)

3-10 November 1980

OBJECTIVE

To determine the quality and quantity of the coal, the methane content of the coal, and some reservoir properties of the Cameo coalbeds of the Mesaverde Formation in the Piceance Basin.

FIELD ACTIVITY PROGRESS

- Testing was performed during the original drilling at 5966 feet.
- Tests Performed
 - Conventional coring
 - Cored 147 feet, recovered 140.6 feet
 - Coalbeds cored at: 2672.2-2673.3, 2697.1-2697.6, 2709.4-2709.8, 2710.2-2710.9, 2728.5-2731.0, 2737.9-2738.3, 2749.1-2751.9 (all of the above are local beds)
 - Cameo coalbeds at 2711.9-2721.5, 2766.4-2769.4
 - Drill stem tests
 - Intervals tested 2769.5-2754, 2708-2723
 - Logging
 - Dual induction, compensated neutron, and formation density to be run after reaching T.D.

OTHER TESTING

- Coal core and drill chips desorption
- Proximate/ultimate analysis of coal
- Rock mechanics testing of floor and roof rock
- Analysis of coalbed gas

ANALYSIS STATUS

- Desorption in progress

FIELD ACTIVITIES

- November 3 - Veco Rig #6 cemented casing and completed rigging up
- November 4 - Drilled out from under casing, mud logger set up and taking samples
- November 5 - Depth 1000 feet, drilling rate 50'/hr
- November 6 - Depth 1650 feet, core barrel delivered by Christensen
- November 7 - Depth 2453 feet, mud log shows gas kicks from local coalbeds, chips collected for desorption
- November 8 - Christensen arrives and begins coring; coring rate is 6'/hr; cored 58.6'; sampled coal and roof rock. Tripped in with core barrel for second run
- November 9 - Cored 22 feet during second run, sampled coal from the Upper Cameo. Third coring run recovers 60 feet, sampled from the Lower Cameo and local beds
- November 10- Drill stem test performed on the Upper and Lower Cameo coalbeds.

ANALYSIS ACTIVITIES

- Desorption in progress
- DST results:

	<u>DST #1</u>		<u>DST #2</u>	
	<u>Inside</u>	<u>Outside</u>	<u>Inside</u>	<u>Outside</u>
Initial Flow psig	13.5	26.6	8.1	13.3
Initial Shut-In psig	120.7	132.7	13.5	26.6
Final Flow psig	26.9	26.6	8.1	13.3
Final Shut-In psig	93.9	106.2	13.5	26.6
Initial Hyd. psig	1240.1	1265.8	1187.1	1239.5
Final Hyd. psig	1226.8	1239.5	1173.8	1160.6

DST #1 recovered 40 feet of water in the drill string

DST #2 recovered 2 feet of water in the drill string

RESULTS

Preliminary desorption from core samples:

Sample Depth (ft)	Lithology	Sample Weight (gm)	Desorbed Gas (cc/gm)	Residual Gas (cc/gm)	Lost Gas (cc/gm)	Total Gas (cc/gm)	Per Unit* (cf/ton)
2631	Coal (chips)	1191	3642			3.06	98
2670	SS	5022	247			.05	2
2672	Coal	2632	6375			2.42	77
2714	Coal	2110	3833			1.82	58
2721	Coal	1494	5316			3.56	114
2729	Coal	2063	4142			2.00	64
2730	Coal	1161	2936			2.53	81
2750	Coal	1342	4872			3.63	116
2765	SS	3611	1564			0.43	14
2766	Coal	2152	7078			3.29	105
2768	Coal	2501	12108			4.84	155

*Does not include residual or lost gas

GREEN RIVER BASIN

GREEN RIVER BASIN
MOFFAT COUNTY, COLORADO

Site GAA

STATUS

Type I testing complete

May 1980

CO-OPERATING COMPANY

Energy Reserves Group
Casper, Wyoming

Location: Sec. 29, T7N, R90W

CONTRACT(S)

DE-AC21-78MC08089
GRI-5011-321-0101

FIELD TEST PERIOD(S)

November 1978 -
December 1979

OBJECTIVE

To determine the methane content and reservoir properties of several coal seams within the Mesaverde Formation in the Green River Basin as part of an effort to delineate the potential for production from this resource area.

FIELD ACTIVITY PROGRESS

- Testing was performed during the original drilling at 6540 feet.
- Tests Performed
 - Conventional coring
 - 139 feet of core, coal at 3652-3652.6, 3674.7 to 3676.1, 3923 to 3924.1, 3937 to 3937.2, 3947.9 to 3948.2, 4649 to 4659.8, 4660.8 to 4661, 4704.4 to 4706 feet.
 - Logging
 - Compensated neutron, caliper, natural gamma, borehole compensated sonic, dual induction
 - Sidewall coring
 - 26 cores obtained
 - Sample depth 3683-4988 feet
 - Drill stem tests
 - Interval tested 3700-3800, 4634-4714 feet

OTHER TESTING

- Coal core desorption
- Proximate/ultimate analysis
- Coal structural/strength testing at Colorado School of Mines

ANALYSIS STATUS

- Desorption completed
- Produced gas sample analysis: 48.8% CH₄, 31.7% N₂, 18.1% CO₂, and 1% ethane.

FIELD ACTIVITIES

November 6 - Spud date
 November 16 - Began coring at 3642 feet, 30 foot core barrel
 November 17, 18 - Cored 3642 - 3702 feet
 November 19, 20 - Drill stem test #1, 3700 - 3800 feet
 November 22, 28, 29 - Cored 3923 - 3953, 4649 - 4679, 4679 - 4709 feet
 November 29 - Drill stem test #2, 4634 - 4714 feet
 December 2 - Ran Schlumberger log for sidewall core points

Refer to type III testing report for frac and post-frac activities

ANALYSIS ACTIVITIES

- Laboratory analysis (Proximate/ultimate, heating value, sulfur form)
- Conventional core desorption complete
- Drill stem test results complete
- Sidewall core desorption results:

<u>Depth</u>	<u>Lithology</u>	<u>Gas in Place (cf/ton)</u>
4984	Coal	144
4982	Very carbonaceous shale	90
4980	Coal w/shale	157
4978	Coal	158
4976	Coal	142
4872	Coal	179
4868	Coal	157
4864	Coal	210
4986	Coal	133
4814	Coal	190
4720	Coal	136
4666	Coal	179

RESULTS

Desorption data from conventional cores:

<u>Sample Depth (ft)</u>	<u>Lithology</u>	<u>Sample Weight (gm)</u>	<u>Desorbed Gas (cc/gm)</u>	<u>Residual Gas (cc/gm)</u>	<u>Lost Gas (cc/gm)</u>	<u>Total Gas Per Unit (cc/gm) (cf/ton)</u>
3675	Coal	1624	4.0	3.4	.6	8.0 256
3922	Coal	1162	0.8	2.6	.4	3.8 121
3930	Shale	511	0.9	2.2	.8	3.9 124
3948	Coal	987	0.8	1.4	.5	2.7 87
4654	Coal	1410	2.0	6.5	.5	9.0 288
4655	Coal	1785	1.5	6.5	.4	8.4 270
4656	Coal	1753	3.0	5.7	.6	9.3 296
4657	Coal	1403	2.6	6.2	.6	9.4 301
4658	Coal	1718	2.6	5.5	.5	8.6 274
4659	Coal	1389	3.3	6.3	.5	10.1 323
4708	Coal	1701	3.1	7.6	1.1	11.8 376

GREEN RIVER BASIN
MOFFAT COUNTY, COLORADO

Site GAA
(New test series)

STATUS

Type III pre-frac testing complete/post-frac testing in progress

May 1980

CO-OPERATING COMPANY

Energy Reserves Group
Casper, Wyoming

Location: Sec. 29, T7N, R90W

CONTRACT(S)

DE-AC21-78MC08089
GRI-5011-321-0101

FIELD TEST PERIOD(S)

December 1979 - February
1980

OBJECTIVE

Complete well in one coal interval, frac and conduct long-term production testing to determine the methane content and reservoir properties of several coal seams within the Mesaverde Formation in the Green River Basin as part of an effort to delineate the potential for production from this resource area.

FIELD ACTIVITY PROGRESS

- See initial test series performed during the original drilling at 6540 feet in Type I report.
- Tests Performed
 - Initial post-frac flow
 - Producing 3-10 mcf gas/day, 3-4 bbl water/day
 - Present post-frac flow
 - Producing less than 1 mcf gas/day
 - Water total production during November 1979 was 138.7 bbl
 - Still lack 128.5 bbl of load to recover

OTHER TESTING

- Coal structural/strength testing at Colorado School of Mines

ANALYSIS STATUS

- Post-frac well clean-up continuing
- Produced gas sample analysis: 48.8% CH₄, 31.7% N₂, 18.1% CO₂ and 1% ethane

FIELD ACTIVITIES

See initial field activities - Type I report

June 22, 1979 - Well completion began
June 27 - Injectivity-pressure fall-off testing
July 5 - Halliburton frac (guar gel hydraulic with nitrogen assist)
July 27 - Post-frac clean-up underway
September 9 - Water production -- 6.5 bbl/day
October 24 - Production rates (2-3 bbl/day water, 6 Mcf/day gas)
November 17 - Producing 5 bbl water/day, less than 0.5 Mcf/day gas
February - Field operations complete

ANALYSIS ACTIVITIES

See initial series - Type I report

RESULTS

See initial results - November 1978

- Bottomhole pressure determined from pressure fall-off test is 2080 psi; average effective radial permeability is 1.6 md
- Continue post-frac flow testing until either rates fall off completely or all injected frac fluids are produced back

GREEN RIVER BASIN
SUBLETTE COUNTY, WYOMING

Site GAB

STATUS

Testing complete/analysis complete

August 1980

CO-OPERATING COMPANY

Belco Petroleum Corporation
Lakewood, Colorado

Location: S-29-27
Sec. 28, T30N, R113W

CONTRACT(S)

FIELD TEST PERIOD(S)

2-14 January 1979

OBJECTIVE

To determine the methane content and reservoir properties of numerous coal horizons within the Mesaverde Formation in the Green River Basin as part of an effort to delineate the potential for production from this resource area.

FIELD ACTIVITY PROGRESS

- Testing was performed during the original drilling at 7298 feet.
- Tests Performed
 - Conventional coring
 - 90 feet of core. Coal at 3479.1-3481.4, 3494.8-3496.5, 3526.6-3528.2 feet
 - Logging
 - Borehole compensated sonic/gamma ray dual induction - SFL
 - Compensated neutron/formation density caliper
 - Sidewall coring
 - 18 cores obtained
 - Sample depths: 3498' - 3500'
3484' - 3487'
3438' - 3440'

OTHER TESTING

- Coal core desorption
- Proximate/ultimate analysis

ANALYSIS STATUS

- Analysis by gas chromatograph complete
- Desorption complete

FIELD ACTIVITIES

- January 2 - Spud date
- January 11 - Started coring at 3450 feet, 30 foot core barrel
 - Intervals 3450-3540.9, 3480.6-3510.9
 - Coal samples collected and placed in desorption canisters
- January 12 - Cored interval 3510.9-3540.9
 - Coal samples collected and -laced in desorption canisters
- January 13 - Sidewall cores taken
 - Ran logs
 - Drill stem testing canceled at the request of Belco due to inclement weather and potential hole problems
 - Completion of testing

Service

Contractors: Geochem - Desorption
 Christensen - Conventional coring
 Schlumberger - Logging and sidewall cores

ANALYSIS ACTIVITIES

- Laboratory analysis (proximate/ultimate, heating value, sulfur forms)
- Desorption complete for conventional cores
- Sidewall core desorption complete
- Sidewall core desorption data by Geochem - March 11, 1979

<u>Sample Depth Range (ft)</u>	<u>Lithology</u>	<u>Range of Total Gas (cf/ton)</u>
3438.5	Coal (1 spl)	214
3440.0 - 3485.5	Carb. Shale (3 spls)	98 - 212
3498.0 - 3499.5	Coal (3 spls)	215 - 350

RESULTS

Desorption data from conventional cores

<u>Sample Depth (ft)</u>	<u>Lithology</u>	<u>Sample Weight (gm)</u>	<u>Desorbed Gas (cc/gm)</u>	<u>Residual Gas (cc/gm)</u>	<u>Lost Gas (cc/gm)</u>	<u>Total Gas (cc/gm)</u>	<u>Per Unit (cf/ton)</u>
3479	Coal	856	13.5	0.7	0.9	15.1	485
3480	Coal	1269	13.8	0.5	0.9	15.2	485
3481	Coal	1312	12.6	0.5	0.5	13.6	435
3495	Coal	1321	15.4	0.2	1.2	16.8	539
3496	Coal	1057	15.5	0.5	0.8	16.8	539
3507	Coal	1864	5.6	0.4	0.6	6.6	210
3520	Coal	2065	0.9	0.0	0.2	1.1	33
3527	Coal	1342	13.1	0.2	1.3	14.6	466
3528	Coal	1167	14.2	0.3	1.5	16.0	513

GREEN RIVER BASIN
CARBON COUNTY, WYOMING

Site GAC

STATUS

Testing complete/analysis in progress

November 1980

CO-OPERATING COMPANY

Kemmerer Coal Company
Denver, Colorado

Location: Barrel Springs Unit 29-2
SE $\frac{1}{4}$, Section 29, T16N, R93W

CONTRACT(S)

FIELD TEST PERIOD(S)

24-30 June 1980

OBJECTIVE

To determine the methane content and reservoir properties of three coal zones within the Fort Union Formation in the Green River Basin as part of an effort to delineate the potential for production from this resource area.

FIELD ACTIVITY PROGRESS

- Testing was performed during the original drilling at 6550 feet.
- Tests Performed
 - Mud logging
 - 1500 feet of the Fort Union Formation was logged (mud gas analysis from chromatograph and lithological description)
 - Drill chip collection
 - Collected four samples from two coalbeds (4638-4646, 4976-4986)

OTHER TESTING

- Borehole geophysical logging will be performed at a later date
- Desorption of coal chips

ANALYSIS STATUS

- Analysis by gas chromatograph complete
- Desorption of coal chips in progress

FIELD ACTIVITIES

- June 24 - Drilling in progress, depth 2160 feet, rate about 50 ft/hr
June 25 - Drilling continues, bit changed, depth 3050 feet, rate about 45 ft/hr
June 26 - Drilling rate slows to 15 ft/hr, mud logging begins at 4,000 feet
June 27 - Depth 4191 feet, drilling rate 15-17 ft/hr
June 28 - New bit installed, coal cuttings collected for desorption (poor sample - no gas)
June 29 - Depth 4638 feet, coal from 4638-4646 ("F" bed), two samples taken for desorption. Coalbed encountered at 4976-4986 ("H" bed), two samples of chips taken for desorption. Mud logging recorded gas kicks at both the "F" and "H" coalbeds.
June 30 - Obtained mud logs and left site

ANALYSIS ACTIVITIES

- Desorption of chips in progress

RESULTS

Preliminary desorption from coal chips:

Sample Depth (ft)	Lithology	Sample Weight (gm)	Desorbed Gas (cc/gm)	Residual Gas (cc/gm)	Lost Gas (cc/gm)	Total Gas (cc/gm)	Per Unit* (cf/ton)
4638	Coal/sh shaker	1293	0.4	-	-	0.4	13
4638	Coal/sh shaker	1197	0.4	-	-	0.4	13
4976	Coal/sh shaker	1135	0.5	-	0.1	0.5	17
4976	Coal/sh shaker	1337	0.8	-	0.0	0.8	26

*Does not include residual gas

GREEN RIVER BASIN
CARBON COUNTY, WYOMING

Site GAD

STATUS

Field Operations Complete

October 1980

CO-OPERATING COMPANY

Confidential

CONTRACT(S)

FIELD TEST PERIOD(S)

1-6 October 1980

SITE LOCATION CONFIDENTIAL

OBJECTIVE

To determine the methane content of two coalbeds within the Almond Formation of the Mesaverde Group in the Little Snake River Coal Field. To field test new desorption apparatus and to collect coalbed gas samples for composition/quality analysis.

FIELD ACTIVITY PROGRESS

- Testing was performed during the original drilling at an elevation of 6657 feet.
- Tests Performed
 - Conventional coring
 - 128 feet of core recovered. Coal at 481.0-483.8, 485.9-498.5, 686.0-709.0
 - Logging
 - Gamma ray, spontaneous potential and single point resistivity
 - Gas sampling
 - Intervals 485.9-498.5, and 686.0-709.0

OTHER TESTING

- Gas sampling from cased gas charged artesian water wells
- Coal core desorption
- Proximate/ultimate analysis

ANALYSIS STATUS

- Desorption in progress
- Gas analysis in progress

FIELD ACTIVITIES

- October 2 - Spudded and drilled to core point (450 feet)
 - Cored 10 feet of roof rock
- October 3 - Cored from 460 to 490 feet
 - Collected one roof rock and two coal core samples for desorption
- October 4 - Cored from 490 to 510 feet
 - Collected one coal core sample for desorption
 - Reamed upper core interval and drilled to lower core point (650 feet)
- October 5 - Cored from 650 to 680 feet
 - Collected one roof rock sample for desorption
- October 6 - Cored from 680 to 710 feet
 - Collected five coal core samples for desorption
 - Logged hole (gamma-ray, spontaneous potential and single point resistivity)

ANALYSIS ACTIVITIES

- Coal core desorption in progress
- Gas sample analysis in progress

RESULTS

Preliminary desorption for core samples:

Sample Depth (ft)	Lithology	Sample Weight (gm)	Desorbed Gas (cc/gm)	Residual Gas (cc/gm)	Lost Gas (cc/gm)	Total Gas Per Unit*	
						(cc/gm)	(cf/ton)
479	SS	972	38			0.04	1
481	Coal	852	1379			1.61	52
486	Coal	998	1742			1.75	56
494	Coal	665	1005			1.51	48
678	SS	1114	61			0.05	2
686	Coal	839	1165			1.39	44
692	Coal	829	1169			1.41	45
696	Coal	879	1351			1.54	49
700	Coal	843	1266			1.50	48
706	Coal	1173	1928			1.64	53

*Does not include residual or lost gas

SAN JUAN BASIN

SAN JUAN BASIN
SAN JUAN COUNTY, NEW MEXICO

Site HAA

STATUS

Testing and analysis complete
No further activity

May 1980

CO-OPERATING COMPANY

Western Coal Company
Albuquerque, New Mexico
(505) 842-1023

Location: SE 1/4, Sec. 22, T30N, R15W

CONTRACT(S)

FIELD TEST PERIOD(S)

16-17 June 1978

OBJECTIVE

To determine the methane content and reservoir properties of coal seams within the Fruitland Formation in the San Juan Basin as part of an effort to delineate the potential for production from this resource area.

FIELD ACTIVITY PROGRESS

- Testing on this well was done during original coring at 393.5 feet.
- Tests Performed
 - Conventional coring
 - 43.5 ft. of core cut between 370 and 413.5 ft. encountering cumulative coal thickness of 12.2 feet.

OTHER TESTING

- Coal core desorption
- Proximate/ultimate analysis

ANALYSIS STATUS

- Desorption and analyses complete

FIELD ACTIVITIES

June 16-17 - Participate in coring activities, core description, sample collection, and initial desorption

Coal Cored

<u>Core No.</u>	<u>Coal Interval</u>	<u>Seam Thickness (ft)</u>
3	387.3-387.8	0.5
4&5	395.5-403.7	8.2
5	404.0-407.5	3.5

ANALYSIS ACTIVITIES

- Desorption of coal samples completed
- Laboratory analyses (proximate/ultimate, heating value, sulfur forms) completed

RESULTS

Desorption data from conventional cores:

<u>Sample Depth (ft)</u>	<u>Lithology</u>	<u>Sample Weight (gm)</u>	<u>Desorbed Gas (cc/gm)</u>	<u>Residual Gas (cc/gm)</u>	<u>Lost Gas (cc/gm)</u>	<u>Total Gas (cc/gm)</u>	<u>Per Unit (cf/ton)</u>
398	Coal	526	2.1	0.0	.2	2.3	73
399	Coal	580	0.5	0.0	0.0	0.5	16

SAN JUAN BASIN
SAN JUAN COUNTY, NEW MEXICO

Site HAB

STATUS

Testing complete/analysis in progress

June 1980

CO-OPERATING COMPANY

Navajo Nation Minerals Dept.
Window Rock, Arizona
USGS Coal Branch
Denver, Colorado

Location: K-3 well, NW $\frac{1}{4}$ of SW $\frac{1}{4}$
Section 18, T28N, R14W

CONTRACT(S)

FIELD TEST PERIOD(S)

26-30 April 1980

OBJECTIVE

To determine the methane content and reservoir properties of coal seams within the Fruitland Formation in the San Juan Basin as part of an effort to delineate the potential for production from this resource area.

FIELD ACTIVITY PROGRESS

- Testing was performed during the original drilling at 5645 feet.
- Tests Performed
 - Conventional coring
 - Cancelled due to blowout
 - Drill chip collection
 - Coal chips were collected from a coalbed at 815-835 feet
 - Borehole geophysical logging
 - Cancelled due to blowout

OTHER TESTING

- Drill chip desorption
- Sample of gas taken during blowout sent to laboratory for analysis

ANALYSIS STATUS

- Desorption in progress
- Analysis of gas from blowout in progress

FIELD ACTIVITIES

- April 26 - Completed shakedown hole at location F-1 and moved rig to K-3
- April 27 - Spudded K-3, drilling rate 80-100 ft/hr. Pull down chain broke, drilling delayed for repairs
- April 29 - Drilling resumed after repairs and inspection by Portadrill representatives. Samples taken from drill chips for desorption by University of New Mexico. Blowout occurred after penetrating bottom of coalbed between 815-835 feet.
- April 30 - Well continued to flow gas to surface, lifting water from 400 to 500 feet. Samples of gas taken for laboratory analysis. Driller plugged hole.

ANALYSIS ACTIVITIES

- Desorption of coal chips in progress, initial indication of low gas content
- Analysis of gas sample taken during blowout in progress

RESULTS

SAN JUAN BASIN
SAN JUAN COUNTY, NEW MEXICO

Site HAC

STATUS
Testing complete/analysis in progress

November 1980

CO-OPERATING COMPANY
Navajo Nation Minerals Dept.
Window Rock, Arizona
USGS Coal Branch
Denver, Colorado

Location: A-5 well, NW $\frac{1}{4}$ of NE $\frac{1}{4}$ of SE $\frac{1}{4}$
Section 35, T15N, R14W

CONTRACT(S)

FIELD TEST PERIOD(S)

18-25 October 1980

OBJECTIVE To determine the methane content and reservoir properties of coal seams within the Fruitland Formation in the San Juan Basin as part of an effort to delineate the potential for production from this resource area.

FIELD ACTIVITY PROGRESS

- Testing was performed during the twin hole drilling at 6070 feet.
- Tests Performed
 - Conventional coring
 - 49.9 feet cored, 44.55 feet recovered coalbeds cored:
 - Bed A at 683.6 - 703.0 feet
 - Bed B at 712.4 - 720.4 feet
 - Bed C at 748.4 - 765.0 feet
 - Logging
 - Borehole geophysical logs (gamma-ray, density, caliper, and resistivity)

OTHER TESTING

- Analysis of gas from desorption
- Laboratory analysis of coal

ANALYSIS STATUS

- Desorption in progress

FIELD ACTIVITIES

- October 19 - Completed drilling at site PNW-4, logged hole and found coalbeds too thin for testing, moved to PNW-3 which was previously logged and had several thick coalbeds. Driller discovered the diamond core bit was missing and postponed coring.
- October 20 - Moved rig to PNW-2 for drilling and logging, coalbeds too shallow for testing.
- October 21 - Moved rig to site A-3, drilled to 460' when caving forced relocation to new site one mile north.
- October 22 - Drilling at site A-4 proceeds smoothly, core bit arrives, hole is logged and decision made to core three coalbeds.
- October 23 - Rig is moved 15' to twin the core hole, drilled to core point at 680'.
- October 24 - Coring begins at 680 feet; four runs made to a depth of 756 feet (interval between A and B was drilled). Two samples taken from Bed A, one sample taken from Bed B, and one sample from Bed C.
- October 25 - Coring of Bed C is completed, a second sample of Bed C taken for desorption. Rigged down and left site.

ANALYSIS ACTIVITIES

<u>Coalbed</u>	<u>Sample Depth</u>
Bed A	683.9 - 687.1 697.2 - 699.5
Bed B	712.4 - 716.4
Bed C	748.5 - 750.35 750.8 - 752.2 758.0 - 760.0

RESULTS

Desorption data from conventional cores:

<u>Sample Depth (ft)</u>	<u>Lithology</u>	<u>Sample Weight (gm)</u>	<u>Desorbed Gas (cc)</u>	<u>Residual Gas (cc/gm)</u>	<u>Lost Gas (cc/gm)</u>	<u>Total Gas (cc/gm)</u>	<u>Per Unit (cf/ton)</u>
684	Coal		412				
637	Coal		327				
712	Coal		521				
748	Coal		300				
758	Coal		365				

SAN JUAN BASIN
RIO ARRIBA COUNTY, NEW MEXICO

Site HAD

STATUS

Field Operations Complete

November 1980

CO-OPERATING COMPANY

Dugan Production Company
Farmington, New Mexico

Location: Di's Delight #1, Sec. 17, T24N, R2W

CONTRACT(S)

FIELD TEST PERIOD(S)

2-6 November 1980

OBJECTIVE

To determine the quantity and quality of coal, the methane content of the coal, and some reservoir properties of Fruitland Formation coalbeds in the San Juan Basin.

FIELD ACTIVITY PROGRESS

- Perform continuous coring through Fruitland Formation coal zone, lying just above Pictured Cliffs Sandstone
- Collect core samples in each individual coalbed for methane desorption
- Log the hole, with logs to include caliper, SP, dual induction, natural gamma, density, and sonic
- Core upper portion of Pictured Cliffs Sandstone and collect core samples for determination of porosity and permeability.

OTHER TESTING

- Permeability, porosity, strength, and bulk density measurements on roof and rock samples

ANALYSIS STATUS

- Desorption in progress

FIELD ACTIVITIES

- November 2 - Drove from Denver to Farmington, New Mexico, and conferred with T. Dugan and W. Donovan of Dugan Production; then drove to Cuba, New Mexico.
- November 3 - Using geophysical and geolograph logs from the Joann Jewel No. 2 well--1700 feet to the south--calculated core point at 3001 feet. With the deeper depth, drilling rate has slowed to approximately 30'/hr in sandstone and 20'/hr in shale.
- November 4 - Intercepted Ojo-Alamo Sandstone at a depth of 2853 feet. Revised projection for coal point for a depth of 3021 feet. Planned core point depth based on a minimum of 5 feet of roof rock and a maximum of 10 feet.
- November 5 - Reached core point of 3021 feet. Circulated for 2 hours, tripped out for core barrel.
- Coring for Core No. 1 and Core No. 2.
- November 6 - Coring for Core No. 3 and Core No. 4.
- Coring operations were behind schedule, and core was jammed for both Cores Nos. 3 and 4. Because of hole conditions and drilling schedule, drill stem tests were not performed. A total of eight core samples for methane desorption were selected, as well as 10 roof, floor, and coal samples for lab analyses.

ANALYSIS ACTIVITIES

RESULTS

Preliminary desorption data from conventional cores:

Sample Depth (ft)	Lithology	Sample Weight (gm)	Desorbed Gas (cc/gm)	Residual Gas (cc/gm)	Lost Gas (cc/gm)	Total Gas (cc/gm)	Per Unit (cf/ton)
3039.7-3040.6	Coal	1723	130			0.075	2.4
3033.5-3034.5	Coal	1749	135			0.077	2.5
3034.7-3044.6	Coal	1537	145			0.094	3.0
3071.9-3072.8	Coal	1453	1150			0.791	25.3
3065.1-3065.9	Coal	1623	327			0.201	6.4
3058.6-3059.5	Coal	2088	268			0.128	4.1
3051.4-3052.3	Coal	1762	182			0.103	3.3
3084.7-3086.0	Coal	2443	336			0.138	4.4

POWDER RIVER BASIN

POWDER RIVER BASIN
POWDER RIVER COUNTY, MONTANA

Site IAA

STATUS

Field operations complete

July 1980

CO-OPERATING COMPANY

U.S. Geological Survey
Coal Branch
Denver, Colorado

Location: USGS Well 79-BR-6, 1400' FSL, 2900' FSL
Sec. 22, T8S, R47E

CONTRACT(S)

FIELD TEST PERIOD(S)

28-31 August 1979

OBJECTIVE

To determine the methane content and some reservoir properties of the Anderson and Canyon A&B (Dietz) coalbeds in the Fort Union Formation.

FIELD ACTIVITY PROGRESS

- Drilling and coring completed.
Conventional coring started at 236.5 feet
Anderson seam top at 243.2 feet; seam 52.6 feet thick
Canyon A-B (Dietz) seam top at 377.0 feet; seam 24.5 feet thick.
- Borehole geophysical logs run - gamma-ray, density, S.P., and resistivity.

OTHER TESTING

- Desorption of coal samples
- Laboratory analysis of coal samples and roof and floor rock to be completed

ANALYSIS STATUS

- Desorption in progress

FIELD ACTIVITIES

- August 29 - Drill to core point, 236.5 feet, and core Anderson seam from 243.5 to 305.1 feet
- August 30 - Waiting on repairs to water truck
- August 31 - Drill to second core point, ~367 feet, and core the Dietz (Canyon A&B) seam from 377.0 to 401.5 feet
- Log hole

ANALYSIS ACTIVITIES

- Coal core desorption in progress:

<u>Seam</u>	<u>Depth (ft)</u>
Anderson	247.5
	266.0
	291.0
Dietz	377.6
	385.0
	400.5

- Laboratory analysis of coal samples to be conducted upon completion of desorption (proximate/ultimate, equilibrium, moisture).

RESULTS

Desorption data from conventional cores:

<u>Sample Depth (ft)</u>	<u>Lithology</u>	<u>Sample Weight (gm)</u>	<u>Desorbed Gas (cc/gm)</u>	<u>Residual Gas (cc/gm)</u>	<u>Lost Gas (cc/gm)</u>	<u>Total Gas (cc/gm)</u>	<u>Per Unit (cf/ton)</u>
248	Coal	1600	0.06	-	0.0	0.06	2
266	Coal	1652	0.05	0.0	0.0	0.05	2
291	Coal	1710	0.03	0.0	0.0	0.03	1
378	Coal	1603	0.10	0.0	0.0	0.10	3
385	Coal	1710	0.04	0.0	0.0	0.04	1
401	Coal	1637	0.10	0.0	0.0	0.10	3

POWDER RIVER BASIN
BIG HORN COUNTY, MONTANA

Site IAB

STATUS

Field Operations Complete

July 1980

CO-OPERATING COMPANY

Montana Bureau of Mines
and Geology
Butte, Montana

Location: Site I: Well No. US-7735, Section 5,
T7S, R40E, 60 ft FNL, 1700 ft FEL

CONTRACT(S)

FIELD TEST PERIOD(S)

6-9 September 1979

OBJECTIVE

To determine the quantity and quality of the coal, the methane content of the coal, and some reservoir properties of the coal seams in the Powder River Basin. This effort will help determine the potential producibility of coalbed methane from this resource area.

FIELD ACTIVITY PROGRESS

- Testing was performed during the original drilling at 4100 feet:

Tests Performed

Conventional Coring

- 114.6 feet of core. Coal at 121 - 145.5, 347 - 352.5, 390.3 - 402.8, 620 - 673.5 feet

Logging

- Gamma-gamma density, SP, resistivity log, gamma-ray

Drill Stem Testing

- Plugged tool, limited results, formation pressure is 51 psig

OTHER TESTING

- Desorption of coal samples
- Physical properties analysis of overburden, interburden, and underburden

ANALYSIS STATUS

- Desorption complete

FIELD ACTIVITIES

- September 6 - Began coring at 115 feet, recovered 45.2 ft. of coal from eight coring runs, stopped coring at 403 feet
- September 7 - Coring continued, recovered 48.5 feet of coal, total of six cores, stopped coring at 658.5 feet
- September 8 - Coring completed, depth of 676.5 feet, recovered 5.0 feet of coal from one core
- September 9 - Drill stem test of the Wall bed, plugged tool, limited results, formation pressure 51 psig

ANALYSIS ACTIVITIES

- Coal desorption complete
- Laboratory analysis of coal, overburden, interburden, and underburden complete

RESULTS

Desorption data from conventional cores:

Sample Depth (ft)	Lithology	Sample Weight (gm)	Desorbed Gas (cc/gm)	Residual Gas (cc/gm)	Lost Gas (cc/gm)	Total Gas (cc/gm)	Per Unit (cf/ton)
121	Coal	1310	0.1	0.0	0.0	0.1	3
134	Coal	1349	0.1	0.0	0.1	0.2	3
144	Coal	857	0.1	0.0	0.1	0.2	6
348	Coal	913	0.04	0.0	0.0	0.04	1
390	Coal	886	0.03	0.0	0.0	0.03	1
401	Coal	1091	0.03	0.0	0.0	0.03	1
621	Coal	1208	0.04	0.0	---	0.04	1
631	Coal	852	0.1	0.0	0.1	0.2	6
657	Coal	963	0.1	0.0	0.1	0.2	6
672	Coal	1004	0.1	0.0	0.2	0.3	10

POWDER RIVER BASIN
BIG HORN COUNTY, MONTANA

Site IAC

STATUS

Field Operations Complete

July 1980

CO-OPERATING COMPANY

Montana Bureau of
Mines & Geology
Butte, Montana

Location: Site II: Well No. US-7746, Section 7,
T9S, R40E, 290 ft FNL, 1800 ft FWL

CONTRACT(S)

FIELD TEST PERIOD(S)

10-12 September 1979

OBJECTIVE

To determine the quantity and quality of the coal, the methane content of the coal, and some reservoir properties of the coal seams in the Powder River Basin. This effort will help determine the potential producibility of coalbed methane from this resource.

FIELD ACTIVITY PROGRESS

- Testing was performed during the original drilling at 3896 feet:

• Tests Performed

Conventional Coring

- 157 feet of core. Coal at 154.7-169.4, 171.1-172.7, 172.9-173.3, 173.5-174.5, 424.0-503.4, 538.8-603.0, 742.7-762.2, 762.5-769.7

Logging

- Gamma-gamma density, SP, resistivity log, gamma-ray

OTHER TESTING

- Desorption of coal samples
- Physical properties analysis of overburden, interburden, and underburden

ANALYSIS STATUS

- Desorption in progress
- Analysis complete

FIELD ACTIVITIES

- September 10 - Coring began at 154.5 ft, recovered 19.8 ft of coal
- September 11 - Coring continued, recovered 79.4 ft of coal
- September 12 - Coring completed, recovered 41.7 ft of coal with shale parting
Coring stopped at a depth of 772.5 feet

ANALYSIS ACTIVITIES

- Coal desorption in progress
- Laboratory analysis of coal, overburden, interburden, and underburden complete

RESULTS

Desorption data from conventional cores:

Sample Depth (ft)	Lithology	Sample Weight (gm)	Desorbed Gas (cc/gm)	Residual Gas (cc/gm)	Lost Gas (cc/gm)	Total Gas (cc/gm)	Per Unit (cf/ton)
168	Coal	1016	0.04	0.0	-	0.04	1
173	Shale + Coal	877	0.05	0.0	-	0.05	2
448	Coal	861	0.10	0.0	0.0	0.10	3
456	Coal	1032	0.07	0.0	0.08	0.10	3
479	Coal	872	0.07	0.0	0.07	0.15	5
491	Coal	943	0.04	0.0	-	0.04	1
502	Coal	1234	0.02	0.0	-	0.02	1
602	Coal	1051	0.20	0.0	0.02	0.20	7
755	Coal	1094	0.25	0.0	-	0.25	8
769	Coal	1159	0.41	0.0	-	0.4	13

POWDER RIVER BASIN
CAMPBELL COUNTY, WYOMING

Site IAD

STATUS

Field Operations Complete

November 1980

CO-OPERATING COMPANY

U.S. Geological Survey
Coal Branch
Denver, Colorado

Location: USGS Well 80-AU-14, Sec. 20, T55N, R75W

CONTRACT(S)

FIELD TEST PERIOD(S)

15-22 July 1980

OBJECTIVE

To determine the quantity and quality of the coal, the methane content of the coal, and some reservoir properties of the coal seams of the Fort Union Formation in the Powder River Basin.

FIELD ACTIVITY PROGRESS

- Testing was performed during the twin hole drilling at 4100 feet.

• Tests Performed

Conventional Coring

- 126.2 feet cored, recovered 113.7 feet
Coalbeds cored:
Smith bed at 294.8-329.3 feet
Anderson/Canyon bed at 680.6-755.0 feet

Logging

- Borehole geophysical logs (gamma-ray, density, resistivity, and caliper)

OTHER TESTING

- Desorption of coal samples
- Proximate and ultimate analyses of coal samples

ANALYSIS STATUS

- Desorption in progress

FIELD ACTIVITIES

- July 15 - Spudded twin hole 80-AU-14 and drilled to top of Smith bed. Cored the Smith bed from 285.0 to 324.0. Collected two samples of the Smith bed for desorption.
- July 16 - Continued coring the Smith bed from 324.0-334.2. Drilled to 675.0 and cored the Anderson bed from 675 to 711.0. Four samples of the Anderson/Canyon bed were collected for desorption. Methane flowing from the well.
- July 17 - Continued coring the Anderson/Canyon bed to 752 feet. Methane detector continues to monitor CH₄ flowing from the well.
- July 18 - About 180 feet of hole caved in during the previous night; tried to drill out the hole when the hydraulic pump broke down.
- July 19 - Repaired hydraulics, abandoned hole, and moved rig 100 feet south to drill a new hole for logging.
- July 20 - Drilled to 1,000 feet and logged the hole, moved rig to 80-AU-13 for drilling and logging. Planned to complete hole on 7/21 and move to second core hole at 80-AU-16 on 7/21.
- July 21 - Air compressor broken, water truck breaks down, having trouble obtaining water.
- July 22 - Drilling with mud since air compressor is broken, 80 feet of hole caved in, USGS decides to end the drilling cycle and core at 80-AU-16 during the next drilling cycle.

ANALYSIS ACTIVITIES

- Coal desorption in progress
- Laboratory analysis of coal in progress

RESULTS

Preliminary desorption data from conventional cores:

Sample Depth (ft)	Lithology/ Coal Horizon	Sample Weight (gm)	Desorbed Gas (cc/gm)	Residual Gas (cc/gm)	Lost Gas (cc/gm)	Total Gas Per Unit* (cc/gm) (cf/ton)
685	Coal/Anderson-Canyon	1416	0.7		0.0	0.7 21
724	Coal/Anderson-Canyon	1334	0.9		0.1	1.0 32
738	Coal/Anderson-Canyon	852	0.6		0.1	0.7 21
742	Coal/Anderson-Canyon	1273	0.9		0.1	1.0 32

*Does not include residual gas

POWDER RIVER BASIN
SHERIDAN COUNTY, WYOMING

Site IAE

STATUS

Field Operations Complete

November 1980

CO-OPERATING COMPANY

U.S. Geological Survey
Coal Branch
Denver, Colorado

Location: USGS Well 80-AU-16, Sec. 5, T54N, R76W

CONTRACT(S)

FIELD TEST PERIOD(S)

29 July - 2 August 1980

OBJECTIVE

To determine the quantity and quality of the coal and the methane content of the coal in the Powder River Basin.

FIELD ACTIVITY PROGRESS

● Tests Performed

Conventional Coring

Geophysical logging

● Arvada, Smith, and Anderson seams

● Gamma, density, resistivity, and caliper

OTHER TESTING

- Desorption of coal samples
- Proximate and ultimate analyses of coal samples

ANALYSIS STATUS

- Desorption in progress

FIELD ACTIVITIES

- July 29 - Twin well was spud in using native mud, and drilling proceeded to 60 feet. Two cores were taken from the Arvada (60'-77.5'). Drilling proceeded to 260 feet, and 4 cores were taken from the Smith (260'-319'). Three desorption samples were taken (cansiters 96, 116, and 101).
- July 30 - Drilling continued to 585 feet, and 3 cores were taken from the Anderson (585'-630'). Two desorption samples were taken (canisters 117 and 51).
- July 31 - Coring continued through the Anderson (642 feet), and one sample was taken for desorption (canister 103). Drilling proceeded to TD of 1000 feet. Gamma-ray, bulk density, resistivity, and caliper logs were run.

ANALYSIS ACTIVITIES

RESULTS

Preliminary desorption data from conventional cores:

Sample Depth (ft)	Lithology/ Coal Horizon	Sample Weight (gm)	Desorbed Gas (cc)	Residual Gas (cc/gm)	Lost Gas (cc)	Total Gas (cc/gm)	Per Unit* (cf/ton)
73	Coal/Arvada	1597	57		**	0.04	1
271	Coal/Smith	1212	203		**	0.2	5
312	Coal/Smith	1366	311		**	0.3	8
619	Coal/Anderson	1115	1261		0.01	1.1	35
625	Coal/Anderson	1434	1313		0.05	0.9	29
635	Coal/Anderson	1254	1480		0.06	1.2	37

*Does not include residual gas

**Unable to calculate lost gas

POWDER RIVER BASIN
SHERIDAN COUNTY, WYOMING

Site IAF

STATUS

Field Operations Complete

November 1980

CO-OPERATING COMPANY

U.S. Geological Survey
Coal Branch
Denver, Colorado

Location: USGS Well 80-AU-7, Sec. 3, T54N, R77W

CONTRACT(S)

FIELD TEST PERIOD(S)

29 July - 2 August 1980

OBJECTIVE

To determine the quantity, quality, and the methane content of coal in the Powder River Basin.

FIELD ACTIVITY PROGRESS

• Tests Performed

Conventional Coring

Geophysical logging

• Smith and Anderson seams

• Gamma, density, resistivity, and caliper

OTHER TESTING

- Desorption of coal samples
- Proximate and ultimate analyses of coal samples

ANALYSIS STATUS

- Desorption in progress

FIELD ACTIVITIES

- August 1 - Pilot hole 80-AU-7 was spud in and drilled to approximately 850 feet. A suite of logs (gamma, density, resistivity, and caliper) were run for the entire hole, and the rig was moved six feet to the west and twin hole was spud in.
- August 2 - Water and gas were flowing from the pilot hole. Cores were taken from the Smith (200'-215' and 296'-311') and the Anderson (585'-613') before coring was halted due to a plugged bit. Four desorption samples were taken (canisters 7, 138, 140, 136).

ANALYSIS ACTIVITIES

RESULTS

Preliminary desorption data from conventional cores:

Sample Depth (ft)	Lithology/ Coal Horizon	Sample Weight (gm)	Desorbed Gas (cc/gm)	Residual Gas (cc/gm)	Lost Gas (cc)	Total Gas (cc/gm)	Per Unit (cf/ton)
206	Coal/Smith	1597	0.40		0.02	0.42	13
300	Coal/Smith	1474	0.34		0.03	0.37	12
594	Coal/Anderson	1502	0.71		0.01	0.72	23
604	Coal/Anderson	2384	0.09		0.01	0.10	3

POWDER RIVER BASIN
JOHNSON COUNTY, WYOMING

Site IAG

STATUS

Field Operations Complete

November 1980

CO-OPERATING COMPANY

Bass Enterprises, Inc.
Denver, Colorado

Location: J. H. Enochs Ranch #7-11, Sec. 7, T52N, R77W

CONTRACT(S)

FIELD TEST PERIOD(S)

3-5 October 1980

OBJECTIVE

To determine the quantity and quality of the coal, the methane content of the coal in the Powder River Basin. This effort will help determine the potential producibility of coalbed methane from this resource.

FIELD ACTIVITY PROGRESS

- Testing was conducted during original drilling at 6000 feet.
- Tests Performed
 - Mud Logging
 - 3640 feet of coal bearing Fort Union Formation (500-4140 feet) was logged (mud gas analysis from chromatograph and lithologic description)
 - Drill Chip Collection
 - Collected 9 samples from 9 of 18 coalbeds encountered (550-570, 705-740, 850-860, 940-955, 1050-1080, 1240-1270, 1630-1655, 1795-1850, and 2150-2170)
 - Borehole Geophysical Logging
 - Dual induction-SFL and Compensated neutron density

OTHER TESTING

- Desorption of coal samples
- Proximate and ultimate analyses of coal samples

ANALYSIS STATUS

- Analysis in progress

FIELD ACTIVITIES

- October 3 - Drilling began at 50 ft. Coal samples collected from estimated depths of 550-570 ft., 705-740 ft., 850-860 ft., 940-955 ft., 1050-1080 ft., and 1240-1270 ft. Desorbed gas sample obtained from canisters representing coals at 705-740 ft. and 1240-1270 ft. Bag samples representing depths of 503-520, 1110, and 1170 ft. were collected.
- October 4 - Drilling continues. Coal samples collected from estimated depths of 1630-1655 ft., 1795-1850 ft., and 2150-2170 ft. Bag samples representing depths of 1801-1850 and 2000 ft. were collected.
- October 5 - Drilling continues. Bag sample representing depth of 3060-3080 ft. was collected.

ANALYSIS ACTIVITIES

- Coal desorption continuing

RESULTS

Desorption data from chip samples:

Sample Depth (ft)	Lithology	Sample Weight (gm)	Desorbed Gas (cc/gm)	Residual Gas (cc/gm)	Lost Gas (cc/gm)	Total Gas (cc/gm)	Per Unit (cf/ton)
550-570	Coal						
705-740	Coal	1662	0.41		0.01	0.42	13.4
850-860	Coal	1635	0.58		0.02	.60	19.1
940-955	Coal	2186	0.18		0.02	.20	6.5
1050-1080	Coal	1898	0.24		0.002	.243	7.8
1240-1270	Coal	1772	0.75		0.03	.84	26.9
1630-1655	Coal	1885	0.62		0.08	0.71	22.6
1795-1850	Coal	1531	1.03		0.08	1.12	35.8
2150-2170	Coal	2042	0.65		0.07	0.72	23.0

POWDER RIVER BASIN
JOHNSON COUNTY, WYOMING

Site IAH

STATUS

Field Operations Complete

November 1980

CO-OPERATING COMPANY

Anschutz Corporation
Denver, Colorado

Location: 10-20 State 2945 well, NW/4, SE/4, Sec. 20,
T51N, R81W

CONTRACT(S)

FIELD TEST PERIOD(S)

24-26 October 1980

PROJECT LOCATION

WYOMING

JOHNSON COUNTY

OBJECTIVE

To determine the quantity and quality of the coal and the methane content of the coal in the Powder River Basin. This effort will help determine the potential producibility of coalbed methane from this resource.

FIELD ACTIVITY PROGRESS

- Testing was performed during the original drilling at 12,000 feet.
- Tests Performed
 - Mud logging
 - 2000 feet of coal-bearing Ft. Union Formation (750-2800 feet) was logged (mud gas analysis from chromatograph and lithologic description)
 - Drill chip collection
 - Collected seven samples from seven coalbeds (810-820, 1170-1190, 1545-1554, 1885-1890, 2120-2135, 2400-2417, 2665-2685)
 - Borehole geophysical logging
 - Resistivity, caliper, and formation compensated density

OTHER TESTING

- Desorption of coal samples
- Proximate and ultimate analyses of coal samples

ANALYSIS STATUS

- Desorption in progress

FIELD ACTIVITIES

October 24 - Drilling began at 765 ft.

- Coal samples collected from estimated depths of 810-820 and 1170-1190.

October 25 - Drilling continues.

- Coal samples collected from estimated depths of 1545-1554, 1885-1980, 2120-2135, 2400-2417, and 2665-2685. Bag samples collected representing depths of 1320-1330 and 2201-2215.

ANALYSIS ACTIVITIES

- Coal desorption continuing

RESULTS

Desorption data from drill chips:

Sample Depth (ft)	Lithology	Sample Weight (gm)	Desorbed Gas (cc/gm)	Residual Gas (cc/gm)	Lost Gas (cc/gm)	Total Gas Per Unit (cc/gm) (cf/ton)
810-820	Coal	1717	0.02			
1170-1190	Coal	1853				
1545-1554	Coal	1727				
1885-1890	Coal	1914				
2120-2135	Coal	1614	0.01			
2400-2417	Coal	1741				
2665-2685	Coal	1473+30	0.20			

WESTERN WASHINGTON

WESTERN WASHINGTON
THURSTON COUNTY, WASHINGTON

Site LAA

STATUS

Field operations complete/analyses in progress

July 1980

CO-OPERATING COMPANY

Sandia/Lawrence Livermore
Labs
Albuquerque, New Mexico

Location: Sec. 21, T15N, R1W
Thurston County, Washington

CONTRACT(S)

FIELD TEST PERIOD(S)

29 Oct. - 7 Nov. 1979

OBJECTIVE

To provide gas content and desorption data on coal from the "Big Dirty," coalbed, Thurston County, Washington

FIELD ACTIVITY PROGRESS

- Field operations complete
- Desorption samples were taken from the "Big Dirty" Coalbed at the intervals listed below:

<u>Sample #</u>	<u>Depth (ft)</u>
1	602.8 - 603.8
2	610.0 - 611.0
3	617.9 - 618.9
4	623.2 - 623.9

OTHER TESTING

- Rock property testing of roof and floor rock samples
- Proximate/ultimate analyses of coal samples upon completion of desorption.

ANALYSIS STATUS

- Desorption in progress

FIELD ACTIVITIES

- October 29 - Coring initiated at 403 feet
- November 6 - "Big Dirty" coalbed intercepted at 601.9 feet;
desorption samples 1-3 taken
- November 7 - Continued coring of "Big Dirty" coalbed zone;
desorption sample 4 taken

ANALYSIS ACTIVITIES

- Coal core desorption in progress

RESULTS

Desorption data from conventional cores:

Sample Depth (ft)	Lithology	Sample Weight (gm)	Desorbed Gas (cc/gm)	Residual Gas (cc/gm)	Lost Gas (cc/gm)	Total Gas (cc/gm)	Per Unit* (cf/ton)
603	Coal	629	2.5	?	0.2	2.7	86
610	Coal	741	2.4	?	0.0	2.4	77
618	Coal	842	1.0	?	0.0	1.0	32
623	Coal	639	0.9	?	0.1	1.0	32

*Does not include residual gas

WIND RIVER BASIN

WIND RIVER BASIN
FREMONT COUNTY, WYOMING

Site NAA

STATUS

Field Operations Complete

November 1980

CO-OPERATING COMPANY

USGS/Coal Branch
Reston, Virginia

Location: Well 80-WR-27, Sec. 10, T1S, R6E

CONTRACT(S)

FIELD TEST PERIOD(S)

3-5 November 1980

OBJECTIVE

To determine the quantity and quality of the coal and the methane content of the coal in the Wind River Basin. This effort will help determine the potential producibility of coalbed methane from this resource.

FIELD ACTIVITY PROGRESS

- Tests Performed

Geophysical logs run - density, resistivity, and caliper

Coal core samples collected for desorption from 580-595', 820-835', and 964.5-979.5' intervals. Coal chip sample from 640-645' interval for desorption.

OTHER TESTING

- Desorption of coal samples

ANALYSIS STATUS

- Desorption in progress

FIELD ACTIVITIES

- October 9 - Initiate drilling activities
- October 9-15 - Drill pilot hole
- October 15-19 - Drilling break
- October 19-25 - Redrill pilot hole, core possible 5 feet coal with no recovery
- November 3 - Travel to drill hole site A-1 and observe drilling operation. Drilled to 565 feet.
- November 4 - Coring operations begin. Cored from 565-580 feet and 580-595 feet. Obtained one coalbed sample for desorption purposes. Collected coal chips from coalbed at approximately 645 feet. Third core run from 645 to 658 feet was completed. No samples from this run.
- November 5 - Continue drilling operations. Cored from 820 to 835 feet. Collected one sample for desorption purposes. Drilled to 964.5 feet and cored from 964.5 to 979.5 feet. Collected one sample for desorption purposes.

ANALYSIS ACTIVITIES

- Coal desorption continuing

RESULTS

Desorption data from conventional cores:

Sample Depth (ft)	Lithology	Sample Weight (gm)	Desorbed Gas (cc)	Residual Gas (cc/gm)	Lost Gas (cc/gm)	Total Gas (cc/gm)	Per Unit (cf/ton)
644	Coal						
829	Coal						
965	Coal						

WIND RIVER BASIN
FREMONT COUNTY, WYOMING

Site NAB

STATUS

Field Operations Complete

November 1980

CO-OPERATING COMPANY

USGS/Coal Branch
Reston, Virginia

Location: Well 80-WR-18, Sec. 22, T33N, R95W

CONTRACT(S)

FIELD TEST PERIOD(S)

6 November 1980

OBJECTIVE

To determine the quantity and quality of the coal and the methane content of the coal in the Wind River Basin. This effort will help determine the potential producibility of coalbed methane from this resource.

FIELD ACTIVITY PROGRESS

• Tests Performed

Geophysical logs run - density, resistivity, and caliper

Collected 2 samples for desorption from 3 core runs from 155-200 feet.

OTHER TESTING

- Desorption of coal samples

ANALYSIS STATUS

- Desorption in progress

FIELD ACTIVITIES

November 6 - Moved to drill hole site DD. Drilled to 263 feet and logged hole. Moved rig 10 feet and drilled to 155 feet. Cored from 155 to 170 feet. Collected one sample for desorption purposes. Ran two core runs from 170 to 200 feet and collected one sample for desorption.

ANALYSIS ACTIVITIES

- Desorption of coal samples in progress

RESULTS

Desorption data from conventional cores:

<u>Sample Depth (ft)</u>	<u>Lithology</u>	<u>Sample Weight (gm)</u>	<u>Desorbed Gas (cc)</u>	<u>Residual Gas (cc/gm)</u>	<u>Lost Gas (cc/gm)</u>	<u>Total Gas Per Unit (cc/gm) (cf/ton)</u>
188	Coal		37			

WIND RIVER BASIN
FREMONT COUNTY, WYOMING

Site NAC

STATUS

Field Operations Complete

November 1980

CO-OPERATING COMPANY

USGS/Coal Branch
Reston, Virginia

Location: Well 80-WR-11, Sec. 17, T5N, R1W

CONTRACT(S)

FIELD TEST PERIOD(S)

7-8 November 1980

OBJECTIVE

To determine the quantity and quality of the coal and the methane content of the coal in the Wind River Basin. This effort will help determine the potential producibility of coalbed methane from this resource.

FIELD ACTIVITY PROGRESS

• Tests Performed

Geophysical logs run - density, resistivity, and caliper

Collected one coal core sample for desorption from 178-193 feet.

OTHER TESTING

- Desorption of coal samples

ANALYSIS STATUS

- Desorption in progress

FIELD ACTIVITIES

November 7 - Moved rig to drill hole site U. Drilled to 200 feet. Moved rig 10 feet and drilled to 178 feet. Logged first hole.

November 8 - Cored hole from 178 to 193 feet. Collected one sample for desorption purposes. Left site and drove to Denver.

ANALYSIS ACTIVITIES

- Coal core sample desorption in progress

RESULTS

Desorption data from conventional cores:

<u>Sample Depth (ft)</u>	<u>Lithology</u>	<u>Sample Weight (gm)</u>	<u>Desorbed Gas (cc)</u>	<u>Residual Gas (cc/gm)</u>	<u>Lost Gas (cc/gm)</u>	<u>Total Gas</u>	<u>Per Unit</u>
						<u>(cc/gm)</u>	<u>(cf/ton)</u>
184	Coal						