OIL AND GAS FIELDS OF THE FOUR CORNERS AREA

Volume I

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Editor

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General Chairman

FOUR CORNERS GEOLOGICAL SOCIETY
1978
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1978
GEOLOGY
Regional Setting: San Juan Basin, northwest New Mexico
Surface Formations: Tertiary, Nacimiento and San Jose Formations
Explorations Method Leading to Discovery: Subsurface geology, plug-back of Pictured Cliffs test
Type of Trap: Stratigraphic
Producing Formation: Cretaceous, Fruitland Formation
Gross Thickness and Lithology of Reservoir Rocks: 15 to 35 feet of sandstone
Geometry of Reservoir Rock: Channel deposits
Other Significant Shows: Dakota Sandstone, Mesaverde Group, and Pictured Cliffs Sandstone
Oldest Stratigraphic Horizon Penetrated: Cretaceous, Dakota Sandstone

DISCOVERY WELL
Name: Tenneco Oil Co. No. 1 Florence
Location: SE 1/4 sec. 29, T. 30 N., R. 8 W., NMPM
Elevation (KB): 6,180 feet
Date of Completion: March 1, 1968
Total Depth: 3,010 feet; plugged back to 2,860 feet
Production Casing: 8 5/8" at 123 feet; 3 1/2" at 3,002 feet
Perforations: 2,580 to 2,585 feet; 2,599 to 2,607 feet
Stimulation: Sand water-fracture with 30,000 gallons water, 20,000 lbs. sand; breakdown pressure 2,030 psi; injection rate 29 bbls./minute
Initial Potential: Flow 2,077 MCFGD; calculated absolute open flow 2,136 MCFGD
Bottom Hole Pressure: Shut in casing pressure 1,008 psi

DRILLING AND COMPLETION PRACTICES
Set surface casing; drill to base of Fruitland, run logs, run 2 7/8" casing to total depth, perforate selected intervals, break down and sand-water fracture. The Fruitland Formation could possibly be dually completed with the Pictured Cliffs or Mesaverde in this area.

RESERVOIR DATA
Productive Area:
- Proved (as determined geologically): 1,280 acres
- Unproved: 4,480 acres
- Approved Spacing: 160 acres
- No. of Producing Wells: 8
- No. of Abandoned Wells: 0
- No. of Dry Holes: 0
Average Net Pay: 20 feet
Porosity: 8 to 15 percent
Permeability: 3.8 millidarcies (calculated from logs)
Water Saturation: 40 percent
Initial Field Pressure: 950 psi
Type of Drive: Gas expansion
Gas Characteristics and Analysis: 1,121 Btu; (in molecular percentage): methane 88.68, ethane 7.18, propane 2.33; specific gravity 0.641
Associated Water Characteristics and Analysis: Unknown
Estimated Recovery: 11,400,000 MCFG
Present Daily Average Production: 525 MCFGD
Market Outlets: El Paso Natural Gas Company
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**BLANCO FRUITLAND (GAS)**
SAN JUAN CO, N.M.

**LIMIT OF PRODUCTIVE FRUITLAND SANDSTONE**
(THICKNESS > 0 FEET)

- **OIL**: FRUITLAND GAS WELL
- **S**: DISCOVERY WELL
- **2**: INITIAL POTENTIAL

**POOL ESTABLISHED**
JUNE 1, 1972

**PRODUCTION GRAPH**

**Cumulative Gas (MMCF)**

**Geology: T.L. Marshall**
**Drafting: J.L. Presson**
CONNER FRUITLAND
(Gas)
T. 30 N., R. 14 W., NMMP
San Juan County, New Mexico

GEOLOGY

Regional Setting: San Juan Basin
Surface Formations: Cretaceous, Kirtland Shale
Exploration Method Leading to Discovery: Subsurface geology, plug-back of abandoned Dakota Sandstone well
Type of Trap: Stratigraphic
Producing Formation: Cretaceous, Fruitland Formation
Gross Thickness and Lithology of Reservoir Rocks: 20 feet of fluvial sandstone
Geometry of Reservoir Rock: Channel sandstone deposits
Other Significant Shows: Cretaceous, Pictured Cliffs Sandstone and Dakota Sandstone
Oldest Stratigraphic Horizon Penetrated: Cretaceous, Dakota Sandstone

DISCOVERY WELL

Name: Odessa No. 1 Little Federal (Formerly, Shar Alan Oil No. 3 Dick Hunt Federal)
Location: NE SW (1920' FSL and 1565' FWL) sec. 1, T. 30 N., R. 14 W., NMMP
Elevation (KB): 5,746 feet
Date of Completion: December 28, 1976
Total Depth: Original total depth, 6,275 feet; plugged back to 1,406 feet
Production Casing: 8 5/8" at 250 feet; 4 1/2" at 1,406 feet
Perforations: 1,171 feet to 1,179 feet; 1,181 feet to 1,185 feet; 1,191 feet to 1,194 feet
Stimulation: Sand-water fracture with 23,000 gallons of water and 25,000 lbs sand
Initial Potential: 297 MCFGD
Bottom Hole Pressure: Shut-in casing pressure 419 psi

DRILLING AND COMPLETION PRACTICES

Set surface casing, drill to base of the Fruitland Formation, run logs, set casing at total depth, perforate selected intervals, break-down formation and sand-water fracture.

RESERVOIR DATA

Productive Area:
Proved (as determined geologically): 640 acres
Unproved: 0 acres
Approved Spacing: 160 acres
No. of Producing Wells: 4
No. of Abandoned Wells: 0
No. of Dry Holes: 0
Average Net Pay: 15 feet
Porosity: 12 to 16 percent
Permeability: Unknown
Water Saturation: 30 percent
Initial Field Pressure: 450 psi
Type of Drive: Gas expansion
Gas Characteristics and Analysis: 1,059 Btu/cu. ft.; (in molecular percentage) methane 94.14, ethane 4.21, propane 0.62; specific gravity 0.60
Associated Water Characteristics and Analysis: Very little produced water
Estimated Recovery: 200,000 MCFG
Present Daily Average Production: 30 MCFGD
Market Outlets: El Paso Natural Gas Company

PRODUCTION

Conner Fruitland first produced in May, 1977. Cumulative production through December 1977 was 7,971 MCFG with production declining rapidly.
CONNER FRUITLAND

(GAS)

SAN JUAN CO., N.M.

Limit of Productive Fruitland Sandstone

(Thickness > 10 feet)

• Fruitland Wells
• Discovery Well

3 I.P. in Mmcf

ODESSA NATURAL CORP.
No 5 Little Federal
NW 12-30N-14W
I.P. 0.3 Mmcf gd
FLORA VISTA FRUITLAND
(Gas)
T. 30 N., R. 12 W., NMPM
San Juan County, New Mexico

GEOLGY

Regional Setting: San Juan Basin
Surface Formations: Tertiary, Nacimiento Formation
Exploration Method Leading to Discovery: Subsurface geology; plug-back of Pictured Cliffs Sandstone well
Type of Trap: Stratigraphic
Producing Formation: Cretaceous, Fruitland Formation
Gross Thickness and Lithology of Reservoir Rocks: 10 to 50 feet of sandstone
Geometry of Reservoir Rock: Channel fluvial deposits
Other Significant Shows: Cretaceous, Pictured Cliffs Sandstone, Mesaverde Group, and Dakota Sandstone
Oldest Stratigraphic Horizon Penetrated: Cretaceous, Dakota Sandstone

DISCOVERY WELL

Name: Northwest Production Corporation, No. 3 Blanco 30-12 A
Location: NW SW (1510’ FSL and 990’ FWL) sec. 10, T. 30 N., R. 12 W.
Elevation (KB): 5,723 feet
Date of Completion: December 29, 1956
Total Depth: 4,568 feet, plugged back to 1,786 feet
Production Casing: 10 ¼ " at 228 feet; 5 ½ " at 4,568 feet
Perforations: 1,754 feet to 1,774 feet
Stimulation: Sand-water fracture with 20,550 gallons of water, 20,000 lbs sand; break-down pressure, 1,000 psi, injection rate 62.3 bbls/min
Initial Potential: 4,528 MCFGD; calculated absolute open flow 9,047 MCFGD
Bottom Hole Pressure: Shut-in tubing pressure 602 psi

DRILLING AND COMPLETION PRACTICES

Set surface casing, drill to base of Fruitland Formation, run logs, run 2 7/8" casing to total depth, perforate selected intervals, break-down and sand-water fracture.
The Fruitland Formation in this area could possibly be dually completed with the Pictured Cliffs Sandstone or the Mesaverde Group.

RESEVOIR DATA

Productive Area:
Proved (as determined geologically): 960 acres
Unproved: 1,280 acres
Approved Spacing: 160 acres
No. of Producing Wells: 5
No. of Abandoned Wells: 1
No. of Dry Holes: 0
Average Net Pay: 30 feet
Porosity: 8 to 16 percent
Permeability: Not available
Water Saturation: 40 percent
Initial Field Pressure: 650 psi
Type of Drive: Gas expansion
Gas Characteristics and Analysis: Btu 1,122; (in molecular percentage) methane 88.93, ethane 4.80, propane 3.04; specific gravity 0.651
Associated Water Characteristics and Analysis: little produced water
Estimated Recovery: 1,700,000 MCFG
Market Outlets: El Paso Natural Gas Company

By: T. Lynn Malone
El Paso Natural Gas Company

RESERVOIR DATA

Productive Area:
Proved (as determined geologically): 960 acres
Unproved: 1,280 acres
Approved Spacing: 160 acres
No. of Producing Wells: 5
No. of Abandoned Wells: 1
No. of Dry Holes: 0
Average Net Pay: 30 feet
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**FLORA VISTA FRUITLAND (GAS)**

- Limit of Productive Fruitland Sandstone
- *Produced by Fruitland Wells
- Discovery Well
- 2.3 Initial Potential in MMcf

**Yearly Production (MMcf)**

**Cumulative Gas (MMcf)**

**Production Graph**

**WW PRODUCTION CORR**

A 3 Blanco 30-12
SW 10 30W-12w
1 P 4.5 MMcf/d
GALLEGOS FRUITLAND
(Gas)
T. 27 N., R. 11 W., NMPM
San Juan County, New Mexico

By: P. S. Hopson
Gulf Oil Exploration and Production Company

GEOLOGY
Regional Setting: San Juan Basin
Surface Formations: Tertiary, Nacimiento Formation
Exploration Method Leading to Discovery: Subsurface mapping
Type of Trap: Lenticular sandstone bodies
Producing Formation: Cretaceous, Fruitland Formation
Gross Thickness and Lithology of Reservoir Rocks: 20 feet, sandstone
Geometry of Reservoir Rock: Isolated lenticular sandstone bodies
Other Significant Shows: None
Oldest Stratigraphic Horizon Penetrated: Cretaceous, Pictured Cliffs Sandstone

DISCOVERY WELL
Name: British-American No. 2 Douthit (Gulf Oil, present operator)
Location: NW NW (990' FNL and 990' FWL) sec. 27, T. 27 N., R. 11 W.
Elevation (KB): 6,360 feet
Date of Completion: March 16, 1952
Total Depth: 2,042 feet; plugged-back to 1,910 feet
Production Casing: 51/2" at 1,956 feet
Perforations: 1,672 feet to 1,682 feet with 24 shots
Stimulation: None
Initial Potential: 1,300 MCFGD
Bottom Hole Pressure: 800 psi

DRILLING AND COMPLETION PRACTICES
Surface casing: 101/4" at 100 feet with 90 sacks of cement
Production String: 51/2" at 1,956 feet with 85 sacks of cement

RESERVOIR DATA
Productive Area:
Proved (as determined geologically): 160 acres
Unproved: 0 acres
Approved Spacing: None
No. of Producing Wells: One
No. of Abandoned Wells: 0
No. of Dry Holes: 0
Average Net Pay: 12 feet
Porosity: No porosity logs run
Permeability: Unknown
Water Saturation: Unknown
Initial Field Pressure: 757 psi (shut-in tubing pressure)
Type of Drive: Gas expansion
Gas Characteristics and Analysis: Unknown
Oil Characteristics and Analysis: Unknown
Associated Water Characteristics and Analysis: Unknown
Original Gas, Oil, and Water Contact Datums: None
Estimated Ultimate Recovery: Unknown
Present Daily Average Production: 19.7 MCFGD (December, 1977)
Market Outlets: Gas Company of New Mexico

FIELD COMMENTARY
The No. 2 Douthit was originally drilled by British-American as a development well in the South Kutz Pictured Cliffs gas field. While tripping at 1,778 feet the well blew out, requiring 10.6 pound mud to kill the well. Logs indicated the blow-out zone to be a sandstone at 1,670 feet, identified as a stray sand in the Fruitland Formation. At the time there was considerable skepticism whether the sand was just another high pressure-low volume reservoir; after 26 years of continuous production and 800 million cubic feet of gas, the skepticism is no longer mentioned.

The producing zone is a lenticular sandstone within the Fruitland shale section having approximately 12 feet of porosity in the discovery well; the west offset (NE NE of sec. 28) has approximately 13 feet of porosity. The sandstone lense in isopach appears to be a northeast trending sandstone body approximately 11/4 miles long and 1/4 mile wide. The No. 2 Douthit is the only well that has been completed in this Fruitland sandstone. All other wells in the immediate vicinity are either Pictured Cliffs or Dakota Sandstone gas wells.

REFERENCES
Operator’s file.
State of New Mexico monthly and annual production report.
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GALLEGOS FRUITLAND FIELD
STRUCTURE MAP
WITH 5' NET SAND CONTOURS SUPERIMPOSED

R 11 W

DATUM:
TOP OF FRUITLAND FORMATION
SAN JUAN CO. NEW MEXICO

British Amercian No. 2 Douthitt
990' FNL 990 FWL
Sew. 27, T-27-N R-11-N
San Juan County, New Mexico
Elev. 6360 KB
T.D. 2042 PB.1910 Completed 3-16-52
GALLEGOS FRUITLAND, SOUTH
(Gas)
T. 26-27 N., R. 11-12 W., NMPM
San Juan County, New Mexico

GEOLOGY

Regional Setting: Southwest flank San Juan Basin
Surface Formations: Tertiary, Ojo Alamo Sandstone
Exploration Method Leading to Discovery: Recompletion in the Fruitland Formation of a depleted “Gallup” sandstone oil well
Type of Trap: Stratigraphic
Producing Formation: Cretaceous, Fruitland Formation
Gross Thickness and Lithology of Reservoir Rocks: Approximately 40 feet of channel sandstones and 15 feet of interbedded siltstones and coals
Geometry of Reservoir Rock: Lenticular channel sandstones, and uniform interbedded siltstones and coals
Other Significant Shows: Cretaceous, Farmington Sandstone Member of the Kirtland Shale
Oldest Stratigraphic Horizon Penetrated: Jurassic, Morrison Formation

DISCOVERY WELL

Name: Skelly Oil No. 1G Navajo
Location: SW NE SW (1770’ FSL and 1770’ FWL) sec. 12, T. 26 N., R. 12 W.
Elevation (KB): 5,949 feet
Date of Completion: May 27, 1968 (Fruitland Formation)
Total Depth: 5,115 feet (plug-back depth 1,150 feet)
Production Casing: 5½” at 5,114 feet with 125 sacks of cement
Perforations: 1,100 feet to 1,113 feet (52 shots)
Stimulation: Treated perforations with 500 gallons mud acid, fractured with 12,852 gallons water and 10,000 pounds 20-40 sand, maximum treating pressure 1,080 psi, minimum treating pressure 800 psi, average injection rate 38 barrels per minute
Initial Potential: Flow 1,767 MCFGD, no water, flowing tubing pressure 111 psi, casing pressure 163 psi
Bottom Hole Pressure: 350 psi

DRILLING AND COMPLETION PRACTICES

The first wells in the Gallegos Fruitland, South field were recompleted “Gallup” oil wells. A sandstone in the Lower Fruitland was perforated and fractured with a range of 7,000 to 40,000 gallons of water and 8,500 to 35,000 pounds of 20-40 sand. Injection rates averaged 40 barrels per minute. Breakdown pressures were 1,600 to 1,700 psi. Current wells are drilled using the slim-hole technique with drilling mud as the circulating medium. Two joints of 5½” pipe are set for surface casing with 10 sacks of cement. If the well is found to be capable of production, 2 7/8” tubing is set at total depth with approximately 75 sacks of cement. After fracturing, the wells are produced through 1¼” tubing.

RESERVOIR DATA

Productive Area:
- Proved: 2,500 acres
- Unproved: 1,800 acres
- Approved Spacing: 160 acres
- No. of Producing Wells: 14
- No. of Abandoned Wells: 0
- No. of Dry Holes: 1
Average Net Pay: 12 feet
Porosity: Not available
Permeability: Not available
Water Saturation: Not available
Initial Field Pressure: 350 psi (shut-in tubing pressure on discovery well)
Gas Characteristics and Analysis: Composition by molecular percent: carbon dioxide 0.03, nitrogen 1.04, methane 97.16, ethane 1.39, propane 0.23, butane 0.10, pentane 0.01, hexane plus 0.04, Btu 1,022, specific gravity 0.571, liquids 0.488 gallons per MCFG
Oil Characteristics and Analysis: None
Associated Water Characteristics and Analysis: None reported. Only one well on the eastern boundary of the field produces a very small amount of water along with the gas.
Original Gas, Oil, and Water Contact Datums: None
Estimated Gas, Oil, and Water Contact Datums: None
Type of Secondary Recovery: None planned
Estimated Ultimate Recovery: 10,000,000 MCFG (85 percent)
Present Daily Average Production: 1,754 MCFGD (December, 1977)
Market Outlets: El Paso Natural Gas Company

FIELD COMMENTARY

The Gallegos Fruitland, South field is located 13.5 miles south-southeast of Farmington, New Mexico, and 3.3 miles northwest of the Carson Trading Post in San Juan County. Geologically, the field is situated on the southwest flank of the San Juan Basin. Regional dip is to the northeast at approximately 100 feet per mile. The field was discovered in 1968 when Skelly Oil Company recompleted a depleted “Gallup” well (Navajo No. 1G) in a Fruitland channel sandstone. The initial potential for the Fruitland completion was
1,767 MCFGD, with a shut-in tubing pressure of 350 psi. Within the same year, several other depleted “Gallup” wells were recompleted in this Fruitland channel. Additional wells, drilled to the Pictured Cliffs, have been completed in several other intervals of the Fruitland Formation.

Gallegos Fruitland, South production is obtained from three separate sandstone intervals and an interval of interbedded siltstones and coals. The sandstones are channel or channel associated and laterally discontinuous. The discovery was completed in the middle sandstone. This sandstone trends eastward across the central part of the field, and terminates near the eastern boundary. The upper sandstone, producing in the Nassau No. 5R (NE NE sec. 36, T. 27 N., R. 12 W.) and the Western Federal No. 6 (NW SE sec. 7, T. 26 N., R. 11 W.) wells, appears to have a south-southeast trend. At the southern end of the field, the Chaco Plant No. 8 (SW SE sec. 25, T. 26 N., R. 12 W.) well is completed in a third sandstone just above the lower Fruitland coal. The trend of this sandstone appears to be southeast. The interbedded siltstones and coals produce a substantial amount of gas and have a greater areal extent. Production from the interbedded siltstone and coal sequence is located in the northeastern part of the field.

The other zone of interest in the Gallegos Fruitland, South field is the Farmington Sandstone Member of the Kirtland Shale. This sandstone was perforated and tested in the Ben Franklin No. 1 (NE NE sec. 10, T. 26 N., R. 12 W.) on the western side of the field. The production and potential of this interval is discussed in the Gallegos Farmington, South field paper elsewhere in this publication.

REFERENCES
New Mexico Oil Conservation Commission records.
Personal communications with operators and others.

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Oil and Gas Fields of the Four Corners Area
LA JARA FRUITLAND
(Gas)
T. 30 N., R. 5-6 W., NMPM
Rio Arriba County, New Mexico

GEOLOGY
Regional Setting: San Juan Basin
Surface Formations: Tertiary, San Jose Formation
Exploration Method Leading to Discovery: Subsurface geology, blow-out while drilling well to Mesaverde Group
Type of Trap: Stratigraphic
Producing Formation: Cretaceous, Fruitland Formation (did not produce)
Gross Thickness and Lithology of Reservoir Rocks: Thin coals and sandstone
Geometry of Reservoir Rock: Noncontinuous
Other Significant Shows: Cretaceous, Mesaverde Group and Dakota Sandstone
Oldest Stratigraphic Horizon Penetrated: Cretaceous, Dakota Sandstone

DISCOVERY WELL
Name: El Paso Natural Gas Co. No. 1 Abraham
Location: NW NE (990' FNL and 1450' FEL) sec. 13, T. 30 N., R. 6 W., NMPM
Elevation (KB): 6,417 feet
Date of Completion: June 15, 1955 (shut-in)
Total Depth: 3,485 feet
Production Casing: 9 5/8" at 176 feet; 7" at 3,485 feet
Perforations: 3,092 feet to 3,110 feet
Stimulation: Natural
Initial Potential: 2,530 MCFGD
Bottom Hole Pressure: 1,368 psi

PRODUCTION
The La Jara Fruitland pool never produced; the discovery well was deepened to the Mesaverde Group and renamed the San Juan 30-6 Unit No. 39. It was completed for 1,948 MCFGD on June 16, 1955. The Fruitland gas responsible for the blow-out probably was from overpressured fractured coals. These reservoirs are generally noncommercial and have a limited volume.

By: T. Lynn Malone
El Paso Natural Gas Company

RESERVOIR DATA
Productive Area:
Proved (as determined geologically): 0 acres
Unproved: 2,560 acres
Approved Spacing: 160 acres
No. of Producing Wells: 0
No. of Abandoned Wells: 1
No. of Dry Holes: 0
Average Net Pay: 10 feet
Porosity: Not available
Permeability: Not available
Water Saturation: Not available
Initial Field Pressure: 1,368 psi
Type of Drive: Gas expansion
Gas Characteristics and Analysis: Not available
Associated Water Characteristics and Analysis: Not available
Estimated Recovery: Insignificant with present technology
Present Daily Average Production: Abandoned
Market Outlets: Northwest Energy Company Pipeline
LA JARA FRUITLAND
(GAS)
RIO ARRIBA CO., N.M.

Abandoned Well
Discovery Well
2.5 Initial Potential in Mmcfgd

E.P.N.G. CO.
No. 1 Abraham
NE 13-30N-6W
I.P. 2.5 Mmcf

Geology: T.L. Malone
Drafting: M.D. Chambers

Four Corners Geological Society
PINON FRUITLAND
(Gas)
T. 28 N., R. 11 W., NMPM
San Juan County, New Mexico

GEOLGY
Regional Setting: Northwest San Juan Basin, east of Hogback Monocline
Surface Formations: Cretaceous, McDermott Member of the Animas Formation
Exploration Method Leading to Discovery: Seismic
Type of Trap: Stratigraphic
Producing Formation: Cretaceous, Fruitland Formation
Gross Thickness and Lithology of Reservoir Rocks: 117 feet, friable sandstone with clay matrix
Geometry of Reservoir Rock: Lenticular, channel sandstone
Other Significant Shows: None
Oldest Stratigraphic Horizon Penetrated: Cretaceous, Pictured Cliffs Sandstone

DISCOVERY WELL
Name: Amoco No. 220 Gallegos Canyon Unit
Location: NE SE (1850' FSL and 790' FEL) sec. 13, T. 28 N., R. 12 W.
Elevation (KB): 5,587 feet
Date of Completion: June 14, 1966
Total Depth: 1,332 feet
Production Casing: 4 1/2" at 1,332 feet with 150 sacks of cement
Perforations: 1,242 to 1,252 feet with 4 shots per foot
Stimulation: Acidized with 500 gallons; sand-water fractured with 30,000 lbs sand and 30,000 gallons of water
Initial Potential: 4,300 MCFD
Bottom Hole Pressure: 515 psi

DRILLING AND COMPLETION PRACTICES
Drill with mud, set casing, perforate, acidize and fracture with sand-water

RESERVOIR DATA
Productive Area:
Proved (as determined geologically): 1,920 acres
Unproved: 0 acres
Approved Spacing: 160 acres
No. of Producing Wells: 12
No. of Abandoned Wells: 2
No. of Dry Holes: 0
Average Net Pay: 26 feet
Porosity: 14.6 percent
Permeability: .1 millidarcy
Water Saturation: 41 percent
Initial Field Pressure: 480 psi
Type of Drive: Volumetric
Gas Characteristics and Analysis: (Percent) CO₂ .13, N₂ .36, methane 89.96, ethane 5.66, propane 2.32, iso-butane .48, normal butane .56, iso-pentane .21, normal pentane .14, hexane plus .18; Btu 1,129
Oil Characteristics and Analysis: Not available
Original Gas, Oil, and Water Contact Datums: Unknown
Estimated Primary Recovery: See Ultimate Recovery
Type of Secondary Recovery: None
Estimated Ultimate Recovery: 3,079,000 MCFG for 5 Amoco wells and 2,327,000 MCFG from other wells by ratio with daily production, total 5,406,000 MCFG
Present Daily Average Production: 925 MCFGD
Market Outlets: El Paso Natural Gas

By: Jim Maynard
Amoco Production Company

[Four Corners Geological Society]
## Oil and Gas Fields of the Four Corners Area

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**PINON FIELD**
San Juan Co., New Mexico
Contoured on Top of Fruitland C.L. 50'
Scale: Thousands Feet

**FORMATION DENSITY LOG**
Gallegos Canyon #220
FRUITLAND AM.
PAY 1242-1252
ZONE
WAW FRUITLAND-PIC TURED CLIFFS

(Gas)
T. 26-27 N., R. 13 W., NMPM
San Juan County, New Mexico

GEOLOGY

Regional Setting: Southwest flank, San Juan Basin
Surface Formations: Tertiary, Ojo Alamo Sandstone and Nacimiento Formation
Exploration Method Leading to Discovery: Subsurface study
Type of Trap: Stratigraphic
Producing Formation: Cretaceous, Fruitland Formation and Pictured Cliffs Sandstone
Gross Thickness and Lithology of Reservoir Rocks: 15 feet, sandstone
Geometry of Reservoir Rock: Lenticular sandstone bodies
Other Significant Shows: None
Oldest Stratigraphic Horizon Penetrated: Cretaceous, Pictured Cliffs Sandstone

DISCOVERY WELL

Name: Dugan Production Corporation No. 1 WAW
Location: NW SW (1500' FSL and 950' FWL) sec. 32, T. 27 N., R. 13 W.
Elevation (KB): 6,175 feet
Date of Completion: June 30, 1970
Total Depth: 1,411 feet
Production Casing: 2 7/8" set at 1,400 feet with 50 sacks of cement
Perforations: 1,325 to 1,329 feet
Stimulation: Sand-water fracture, 10,000 lbs sand and 360 barrels water
Initial Potential: 603 MCFGD (absolute open flow)
Bottom Hole Pressure: 200 psia

DRILLING AND COMPLETION PRACTICES

The discovery well was sand-water fractured but it has subsequently been learned that fracturing does not greatly enhance producibility from these wells. Dugan Production now spuds a 7 7/8" hole and sets one joint of 5 7/8" casing cemented to surface. A 4 1/2" hole is then drilled with water or minimum mud to a total depth of approximately 125 feet into the Pictured Cliffs Sandstone. An Induction Electrical log is then run to total depth, and 2 7/8" tubing is run for production casing and cemented with a lightweight cement slurry with lost circulation material to avoid formation damage. The drilling rig is then released and after waiting at least 48 hours, a swabbing unit is moved in. A gamma-ray correlation and collar log is run, and the 2 7/8" casing is swabbed down to within 300 to 400 feet of the interval to be perforated. After perforating with 2 1/8" glass jet charges of selected intervals, the casing is swabbed down. If commercial production is indicated at this point 1 1/2" tubing is run and the well completed ready for production. If natural production is not indicated or of very slight amount, a small job of 250 gallons of 15 percent regular HCl acid followed by enough water to displace the acid into the formation is performed. The well is then swabbed in and tubing run. This field is located in an area of relatively flat terrain making it possible to use truck-mounted shot-hole rigs and requires a minimum of road and location building.

RESERVOIR DATA

Productive Area:
Proved (as determined geologically): 8,960 acres (August 1, 1978)
Unproved: 1,920 acres
Approved Spacing: None
No. of Producing Wells: 30 (plus 7 wells drilling)
No. of Abandoned Wells: 10
No. of Dry Holes: 7
Average Net Pay: 10 feet
Porosity: 18 percent
Permeability: 1 to 100 millidarcies (estimate)
Water Saturation: 50 percent
Initial Field Pressure: 250 psia
Type of Drive: Gas expansion
Gas Characteristics and Analysis: Btu 1,050, 90 percent methane
Associated Water Characteristics and Analysis: Not available
Original Gas, Oil, and Water Contact Datums: Unknown
Estimated Primary Recovery: 4,000,000 MCFG
Type of Secondary Recovery: Not available
Estimated Recovery: Unknown
Present Daily Average Production: 750 MCFGD (January 1, 1978)
Market Outlet: El Paso Natural Gas Co.

FIELD COMMENTARY

The WAW Pictured Cliffs Pool was discovered by the drilling of the Dugan Production Corp. WAW No. 1 well. This well was spudded May 19, 1970, on a farmout from Aztec Oil and Gas Company, hence the well name "WAW" (Wild Aztec Well). A 7 7/8" hole was drilled to 14 feet and 5 7/8" casing run and cemented to surface with 5 sacks of cement; a 4 1/2" hole was then drilled to a total depth of 1,411 feet with water and minimum mud; an electric log was run; and 2 7/8" tubing run and cemented for casing. The well was perforated from 1,325 to 1,329 feet. This well was sand-water fractured with 10,000 pounds of sand and 260 barrels of water; 1 1/4" tubing was set at 1,303 feet. The well tested on a one point back pressure test for an absolute open flow of 603 MCFGD on June 30, 1970 with a seven-day shut-in pressure of 193 psig.

Because of the remote location of the discovery well from existing gas gathering facilities, a contract could not be
secured for the sale of gas from the discovery well. In December, 1974, Dugan Production Corp. made an application to the Bureau of Land Management to secure a pipeline right-of-way to lay approximately 4 miles of pipeline to tie into the El Paso Natural Gas Company low pressure gathering facility located in the NE¼ sec. 35, T. 27 N., R. 13 W. This application was granted April 15, 1975, and a 3" fiberglass line was laid to connect the WAW No. 1 and the Notosowaw No. 1 well, which was completed April 12, 1975. During the remainder of 1975 and 1976, Dugan Production completed 13 additional wells for which more right-of-way was secured and there are now 15 wells operated by Dugan producing into the pipeline system. Two additional wells have been completed in the field by Kirby Exploration, neither of which has gas sales outlets at this writing, and one well has been completed by Dietrich Exploration Company for which approximately one mile of pipeline was laid.

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WAW FRUITLAND
PICTURED CLIFFS
SAN JUAN CO., N.M.

- Proposed Wells
- Abandoned Wells
- Discovery Well
- Dry Holes
- Producing Wells

DATUM: Top Pictured Cliffs Fm.
C.I. = 25'

Geology: K. Fogelius
Drafting: M.D. Chambers
HARPER HILL FRUITLAND AND PICTURED CLIFFS

Gas

T. 29 N., R. 14 W., NMPM
San Juan County, New Mexico

GEOLOGY

Regional Setting: West-central edge, San Juan Basin
Surface Formations: Cretaceous, Kirtland Shale
Exploration Method Leading to Discovery: Subsurface geology
Type of Trap: Stratigraphic
Producing Formation: Cretaceous, Pictured Cliffs Sandstone and Fruitland Formation commingled
Gross Thickness and Lithology of Reservoir Rocks: 200 feet, silicious sandstone
Geometry of Reservoir Rock: Uniform throughout field; tabular
Other Significant Shows: None
Oldest Stratigraphic Horizon Penetrated: Cretaceous, Pictured Cliffs Sandstone

DISCOVERY WELL

Name: Dugan Production Corporation No. 4 Federal I
Location: NE NW (1100' FNL and 1600' FWL), sec. 1, T. 29 N., R. 14 W.
Elevation (GL): 5,552 feet
Date of Completion: February 24, 1969
Total Depth: 1,274 feet
Production Casing: 2 7/8" at 1,268 feet with 75 sacks of cement
Perforations: 860 to 865 feet and 1,203 to 1,208 feet with 2 shots per foot
Stimulation: Sand-water fracture
Initial Potential: Single point back pressure test; absolute open flow 1,069 MCFGD
Bottom Hole Pressure: 367 psig

DRILLING AND COMPLETION PRACTICES

Surface casing 5 1/2" set at 44 feet with 25 sacks of cement; 2 7/8" production string set at 1,268 feet cemented with 75 sacks of cement. Fruitland and Pictured Cliffs zones perforated with 2 shots per foot and sand-water fractured.

RESERVOIR DATA

Productive Area:
Proved (as determined geologically): 320 acres
Unproved: 1,280 acres
Approved Spacing: 160 acres
No. of Producing Wells: 2
No. of Abandoned Wells: 0
No. of Dry Holes: 0
Average Net Pay: 10 feet
Porosity: 15 percent (estimate)
Permeability: 5 to 25 millidarcies (estimate)
Water Saturation: 48 percent (estimate)
Initial Field Pressure: 365 psi
Type of Drive: Gas expansion
Gas Characteristics and Analysis: (Dry basis at 14.73 psi and 60°F) Btu 1,101; specific gravity .635; composition (molecular percent): CO₂ 0.47, H₂S 0, N₂ .34, methane 95.84, ethane 2.15, propane .67, butane .27, pentane .10, hexane .16; liquids 2.01 gallons per MCFG
Associated Water Characteristics and Analysis: Unknown
Original Gas, Oil, and Water Contact Datums: Unknown
Estimated Primary Recovery: 3,900,000 MCFG
Type of Secondary Recovery: None
Estimated Recovery: 3,900,000 MCFG
Present Daily Average Production: 270 MCFGD
Market Outlets: El Paso Natural Gas Co. Pipeline

FIELD COMMENTARY

The Harper Hill Pictured Cliffs-Fruitland pool is located on the northwest outskirts of Farmington, New Mexico. The Federal I No. 4, the discovery well, was drilled after a study of the logs from several Dakota wells in the area indicated possible production from the Fruitland Formation and Pictured Cliffs Sandstone. It was necessary to set 7" casing through surface boulders with a cable tool rig; a small rotary seismograph-type rig was used to drill a 4 3/4" hole through the Pictured Cliffs Sandstone. An open hole log was not run on the Federal I No. 4 because of its proximity to the Federal I No. 3.

The Pictured Cliffs Sandstone was perforated and stimulated with 15,000 gallons of water and 10,000 lbs of 10-20 sand. Next, the Fruitland Formation was perforated, the Pictured Cliffs Sandstone was balled off, and the Fruitland was stimulated with 15,000 gallons of water and 10,000 lbs of 10-20 sand. The well kicked off after fracturing without swabbing and gauged 2,700 MCFGD with a heavy spray of water. Later a bridge plug was set between the Pictured Cliffs and Fruitland to isolate the zones. The Fruitland Formation tested 394 MCFGD with no water. A request was made and approval received from the New Mexico Oil Conservation Commission to commingle both zones in the wellbore. The bridge plug was removed and the well was completed.
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HARPER HILL FRUITLAND PICTURED CLIFFS (GAS)

SAN JUAN CO., N.M.

STRUCTURE CONTOUR MAP
TOP OF PICTURED CLIFFS SANDSTONE
CONTOUR INTERVAL: 25'

- Abandoned Wells
- Harper Hill Fruitland Pictured Cliffs Wells
- Discovery Well
- Pictured Cliffs - Gas Only

[Diagram of gas production and structure contour map]
JASIS CANYON FRUITLAND
(Gas)
T. 28-29 N., R. 7-8 W., NMPM
San Juan County, New Mexico

GEOLOGY
Regional Setting: Central San Juan Basin
Surface Formations: Tertiary, San Jose Formation
Exploration Method Leading to Discovery: Old well workover, subsurface geology
Type of Trap: Stratigraphic, lateral permeability and porosity pinch-out
Producing Formation: Unnamed sandstone member of Cretaceous Fruitland Formation
Gross Thickness and Lithology of Reservoir Rocks: 46 feet, fine-grained sandstone
Geometry of Reservoir Rock: Northwest trending fluvial sandstone body
Other Significant Shows: Cretaceous, Pictured Cliffs Sandstone, Mesaverde Group, and Dakota Sandstone (all gas)
Oldest Stratigraphic Horizon Penetrated: Jurassic, Morrison Formation at about 7,500 feet

DISCOVERY WELL
Name: Mesa Petroleum Company No. 39 State Comm.
Location: NE NW (990' FNL and 1850' FWL) sec. 36, T. 29 N., R. 8 W., NMPM
Elevation (KB): 6,175 feet
Date of Completion: June 6, 1976
Total Depth: 2,980 feet
Production Casing: 3½" at 2,960 feet with 400 sacks of cement
Perforations: Fruitland: 2,594 feet to 2,618 feet; 24 feet with 2 holes per foot
Stimulation: Acidize perforations; fracture with 27,000 gallons of water and 25,000 lbs of sand
Initial Potential: 965 MCFGD
Bottom Hole Pressure: 1,132 psig

DRILLING AND COMPLETION PRACTICES
Set 8 5/8" surface casing at 140 feet with 90 sacks of cement; 3½" production string set at 2,700 feet with 400 sacks of cement; perforate with 2 holes per foot and sand-water fracture the Fruitland sandstone.

RESERVOIR DATA
Productive Area:
Proved (as determined geologically): 160 acres
Unproved: 750 acres as determined by net sandstone isopach
Approved Spacing: 160 acres
No. of Producing Wells: 1
No. of Abandoned Wells: 0
No. of Dry Holes: 0
Average Net Pay: Approximately 20 feet
Porosity: 13.5 percent, average
Permeability: Unknown
Water Saturation: 28 percent (calculated using resistivity of 0.25 ohm)
Initial Field Pressure: 1,144 psia
Type of Drive: Volumetric gas reservoir
Gas Characteristics and Analysis: Dry, sweet; Btu 1,140; 64° API gravity
Oil Characteristics and Analysis: No oil produced
Associated Water Characteristics and Analysis: No formation water produced
Original Gas, Oil, and Water Contact Datums: No gas-water contact
Estimated Primary Recovery: 400,000 MCFG (by analogy)
Type of Secondary Recovery: None
Estimated Ultimate Recovery: Same as primary
Present Daily Average Production: 100 MCFGD
Market Outlets: Gas gatherer, El Paso Natural Gas Company

REFERENCES
Mesa Petroleum Co. geologic and well files.
JASIS CANYON FRUITLAND FIELD
SAN JUAN CO., NEW MEXICO
——+3400—— STRUCTURE MAP: FRUITLAND MARKER: C.I. = 25'
——20—— ISOPACH: FRUITLAND NET SAND: C.I. = 20'

GEOLOGY BY: D.P. HAMILTON

SCALE: 1" = 4000'
KUTZ FRUITLAND
(Gas)
T. 28 N., R. 10-11 W., NMPM
San Juan County, New Mexico

GEOLGY
Regional Setting: San Juan Basin
Surface Formations: Tertiary, Nacimiento Formation
Exploration Method Leading to Discovery: Subsurface geology, plug-back of Pictured Cliffs well
Type of Trap: Stratigraphic
Producing Formation: Cretaceous, Fruitland Formation
Gross Thickness and Lithology of Reservoir Rocks: 10 to 35 feet, sandstone
Geometry of Reservoir Rock: Channel sandstones
Other Significant Shows: Cretaceous, Farmington Sandstone Member of Kirtland Shale, Pictured Cliffs Sandstone, and Dakota Sandstone

DISCOVERY WELL
Name: R & G Drilling Company No. 25 Schlosser (dual completion, Pictured Cliffs-Fruitland)
Location: NW SE (1850' FSL and 1850' FEL) sec. 27, T. 28 N., R. 11 W., NMPM
Elevation (KB): 5,628 feet
Date of Completion: October 30, 1956
Total Depth: 1,610 feet
Production Casing: 8 5/8" at 95 feet; 5 1/2" at 1,609 feet
Perforations: Pictured Cliffs, 1,535 to 1,545 feet and 1,557 to 1,572 feet; Fruitland, 1,330 to 1,345 feet
Stimulation: Sand-water fracture at 1,535 to 1,572 feet with 10,000 gallons water, 10,000 lbs sand, injection rate 40 barrels per minute, break-down pressure 2,000 psi; sand-water fracture at 1,330 to 1,345 feet with 10,000 gallons water, 10,000 lbs sand, breakdown pressure 2,250 psi.
Initial Potential: Pictured Cliffs 2,000 MCFGD; Fruitland, 5,000 MCFGD
Bottom Hole Pressure: Shut-in casing pressure 670 psi

DRILLING AND COMPLETION PRACTICES
A single completion Fruitland well: set surface casing, drill to base of Fruitland Formation, run logs, run 2 7/8" casing to total depth, perforate selected intervals, breakdown and sand-water fracture (in this area the Fruitland could possibly be dually completed with the Farmington Sandstone or Pictured Cliffs Sandstone).

RESERVOIR DATA
Productive Area:
- Proved (as determined geologically): 2,080 acres
- Unproved: 2,560 acres
- No. of Producing Wells: 13
- No. of Abandoned Wells: 0
- No. of Dry Holes: 0
Average Net Pay: 20 feet
Porosity: 10 to 16 percent
Permeability: Not available
Water Saturation: 40 percent
Initial Field Pressure: 650 psi
Type of Drive: Gas expansion
Gas Characteristics and Analysis: Btu 1,133; in molecular percentage: methane 88.73, ethane 6.11, propane 3.06; specific gravity 0.647
Associated Water Characteristics and Analysis: Resistivity .38 ohm at 74°F; total dissolved solids, 17,448 ppm
Estimated Recovery: 16,000,000 MCFG
Present Daily Average Production: 1,328 MCFGD (January 1, 1977)
Market Outlets: El Paso Natural Gas Company, Southern Union Gas Company

By: T. Lynn Malone
El Paso Natural Gas Company

Oil and Gas Fields of the Four Corners Area]
FARMER FRUITLAND  
(Gas)  
T. 30 N., R. 11 W., NMPM  
San Juan County, New Mexico  

GEOLOGY  
Regional Setting: North-central San Juan Basin  
Surface Formations: Tertiary, Nacimiento Formation  
Exploration Method Leading to Discovery: Discovered while drilling to Pictured Cliffs Sandstone in Aztec field  
Type of Trap: Stratigraphic  
Producing Formation: Upper Cretaceous, Fruitland Formation  
Gross Thickness and Lithology of Reservoir Rocks: 0 to 18 feet; sandstone  
Other Significant Shows: Cretaceous, Farmington Sandstone member of Kirtland Shale and Pictured Cliffs Sandstone  
Oldest Stratigraphic Horizon Penetrated: Cretaceous, Dakota Sandstone  

DISCOVERY WELL  
Name: No. 1 Bobbie Herrera  
Location: NE SW (1,830' FSL, 1,620' FWL) sec. 4, T. 30 N., R. 11 W., NMPM  
Elevation (GL): 5,743 feet  
Date of Completion: February 14, 1979  
Total Depth: 2,350 feet (plugged back to 2,312 feet)  
Production Casing: 2 7/16" at 2,312 feet with 300 sacks of cement  
Perforations: 1,950 to 1,956 feet and 2,053 to 2,055 feet (with 1 shot per foot)  
Stimulation: Sand-water fracture  
Initial Potential: 830 MCFGD after 3 hours (back-pressure testing method)  
Bottom Hole Pressure: 722 psi (shut-in pressure casing)  

DRILLING AND COMPLETION PRACTICES  
The discovery well was drilled to 78 feet with a cable tool rig and 7 inch surface casing was set and cemented with 80 sacks of cement. The remainder of the 4 1/2" hole was drilled with a rotary drilling rig to a total depth of 2,350 feet. 2 7/16" production casing was run to 2,312 feet and cemented with 300 sacks of cement. The pay zones in the Fruitland and Pictured Cliffs were selected from open hole logs (I-SFL, FDC-GR) and were perforated. Both zones were sand-water fractured separately. 1 1/4" tubing was run to 2,229 feet and a compression packer was set at 2,068 feet. The Pictured Cliffs produces up the tubing and the Fruitland produces up the annulus in this dual completion.  

RESERVOIR DATA  
Productive Area:  
Approved Spacing: 160 acres  
No. of Producing Wells: 4  
No. of Abandoned Wells: 0  
No. of Dry Holes: 0  
Shut-in Wells: 2  
Average Net Pay: Two pay zones totaling 8 feet  

By: D. B. Fortner and R. W. Jentgen  
Bureau of Land Management  
and  
A. Allen Middleman  
Southland Royalty Co.  

Porosity: 12 percent (average of 3 wells)  
Permeability: Unknown  
Water Saturation: 27 percent; 41 percent, average of 3 wells  
Initial Field Pressure: 722 psi  
Type of Drive: Gas expansion  
Gas Characteristics and Analysis: None  
Market Outlets: El Paso Natural Gas Co. pipeline  

FIELD COMMENTARY  
The Farmer Fruitland field is located adjacent to, and within the city limits of Aztec, New Mexico. The field produces from the Fruitland Formation which represents sedimentation that occurred along a deltaic plain covered by numerous swamps and drained by streams. Gas production is from distributary channel sandstones and overbank deposits. The erratic distribution of the sandstone sequences makes correlation of beds and confident mapping difficult. The discovery well, the Manana No. 1 Bobby Herrera, was completed in two intervals of the Fruitland: the upper zone is a well developed fining-upward channel sequence capped by a coal and may represent an abandoned river meander which eventually silted up and was covered by swamp deposits. The C & E No. 8 Aztec (SW sec. 8) and the C & E No. 8-A Fee (NW sec. 8) appear to be completed in the same sandstone interval. The No. 1 Bobby Herrera (SW sec. 4) and the C & E No. 9 Aztec (SW sec. 9) appear to be completed at the same stratigraphic level but in a different sandstone bed from the two wells mentioned previously. Three of the four wells in this field produce gas from the Fruitland commingled with Pictured Cliffs production and are listed under the Aztec Pictured Cliffs field, even though they are within the boundaries of the Farmer Fruitland field.  

Oil and Gas Fields of the Four Corners Area
AZTEC FRUITLAND
(Gas)
T. 29-30 N., R. 10-11 W., NMNM
San Juan County, New Mexico

By: T. Lynn Malone
El Paso Natural Gas Company

GEOLGY
Regional Setting: San Juan Basin, northwest New Mexico
Surface Formations: Tertiary, Nacimiento Formation
Exploration Method Leading to Discovery: Subsurface
geology, plug-back of Pictured Cliffs well
Type of Trap: Stratigraphic
Producing Formation: Fruitland Formation
Gross Thickness and Lithology of Reservoir Rocks: 10 to 60
feet of sandstone
Geometry of Reservoir Rock: Discontinuous fluvial deposits
Other Significant Shows: Farmington Sandstone Member of
Kirtland Shale, Pictured Cliffs Sandstone, "Chacra"
sandstones, Mesaverde Group, and Dakota Sandstone
Oldest Stratigraphic Horizon Penetrated: Cretaceous, Dakota
Sandstone

DISCOVERY WELL
Name: Francis L. Harvey No. 1 Hare
Location: SE SE (770' FSL and 1270' FEL) sec. 14, T. 29 N.,
R. 11 W., NMNM
Elevation: 5,540 feet
Date of Completion: June 20, 1952
Total Depth: 1,880 feet; plugged back to 1,747 feet
Production Casing: 8 5/8" at 100 feet; 5 1/2" at 1,766 feet
Perforations: 1,563 to 1,587 feet; 1,593 to 1,605 feet
Stimulation: Natural
Initial Potential: 500 MCFGD, gauge with pitot tube
Bottom Hole Pressure: Shut in casing pressure, 638 psi

DRILLING AND COMPLETION PRACTICES
For single completion, set surface casing, drill to base of
Fruitland Formation, run wireline logs, run 2 7/8" casing to
total depth, perforate selected intervals, break down and
sand-water fracture. The Fruitland could possibly be dually
completed with the Pictured Cliffs, "Chacra," or Mesaverde
in this area.

RESERVOIR DATA
Productive Area:
Proved (as determined geologically): 8,160 acres
Unproved: 2,720 acres
Approved Spacing: 160 acres
No. of Producing Wells: 49
No. of Abandoned Wells: 2
No. of Dry Holes: 0
Average Net Pay: 30 feet
Porosity: 10 to 18 percent
Permeability: Not known
Water Saturation: 40 percent
Initial Field Pressure: 650 psi
Type of Drive: Gas expansion
Gas Characteristics and Analysis: 1,146 Btu; in molecular
percentage: methane 87.72, ethane 6.90, propane 2.88;
specific gravity 0.650
Associated Water Characteristics: Rw .38 ohm, total dis­
solved solids 17,480 ppm
Estimated Recovery: 33,600,000 MCFG
Present Daily Average Production: 2,473 MCFGD
Market Outlets: El Paso Natural Gas Company

FIELD COMMENTARY
Cretaceous strata above the Pictured Cliffs comprising the
Fruitland and Kirtland Formations are nonmarine and con­
tain sandstones with limited lateral extent. Close control is
needed to delineate the stratigraphic trends in these upper for­
mations.
A transition zone lay between the Pictured Cliffs sea and
the continental conditions to the west. The sediments which
were deposited in this transitional environment now comprise
the Fruitland Formation. Lush vegetation which existed in
this swampy area is now represented in the rock record as coal
and carbonaceous shale. Much of the floor of the swamp was
covered with still-standing waters. Small sluggish streams
flowed through these waters, perpendicular to the Pictured
Cliffs strandline.
A massive coal bed is often present near the base of the
Fruitland. Overlying this coal is a shale-silt sequence approxi­
ately 50 feet thick which is overlain by a 200-foot section of
the Fruitland which contains the sandstones of economic
potential. The upper portion of the Fruitland Formation is
comprised of siltstone and shale and grades into the overlying
Kirtland Shale.

Four Corners Geological Society
1978, V. 1
### Oil and Gas Fields of the Four Corners Area

**Table: Number of Wells at Year's End**

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<th>YEAR</th>
<th>TYPE</th>
<th>PROD</th>
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</table>

**Diagram: Aztec Fruitland (Gas)**

- **Limit of Productive Fruitland Sandstone (thickness >10 feet)**
  - Fruitland well
  - Abandoned Fruitland well
  - Discovery well
  - Initial potential

**Production Graph**

**Cumulative Gas (MMCFG)**

**Yearly Production (MMCFG)**

- 1960: 800
- 1962: 400
- 1964: 200
- 1966: 100
- 1968: 50
- 1970: 25
- 1972: 12.5
- 1974: 6.25
- 1976: 3.125

**Production Graph**

- 1960: 400
- 1962: 200
- 1964: 100
- 1966: 50
- 1968: 25
- 1970: 12.5
- 1972: 6.25
- 1974: 3.125
- 1976: 1.5625

**Geology:** T. Warden
**Drafting:** J. L. Harper

**Mezole 1978**
KUTZ FRUITLAND, WEST
(Gas)
T. 29 N., R. 12-13 W.
San Juan County, New Mexico

By: Michael F. Conlon
Energy Reserves Group

GEOLOGY

Regional Setting: West-central San Juan Basin
Surface Formations: Tertiary, Ojo Alamo Sandstone; Cretaceous, Kirtland Shale
Exploration Method Leading to Discovery: Subsurface geology
Type of Trap: Stratigraphic
Producing Formation: Cretaceous, Fruitland Formation
Gross Thickness and Lithology of Reservoir Rocks: 20 feet, sandstone
Geometry of Reservoir Rock: Elongate, lenticular, sandstone lense; northwest depositional strike
Other Significant Shows: Cretaceous, Pictured Cliffs Sandstone and Dakota Sandstone produce in the area
Oldest Stratigraphic Horizon Penetrated: Cretaceous, Dakota Sandstone

DISCOVERY WELL

Name: Locke-Taylor Drilling Co. No. 1 Tycksen
Location: NE NE (990' FNL and 990' FEL) sec. 23, T. 29 N., R. 13 W.
Elevation (KB): 5,300 feet (estimate)
Date of Completion: October 22, 1952
Total Depth: 1,230 feet
Production Casing: 5" at about 900 feet
Perforations: Open hole completion, 900 to 975 feet
Stimulation: Nitroglycerine
Initial Potential: 370 MCFGD
Bottom Hole Pressure: 350 psi

DRILLING AND COMPLETION PRACTICES

Well is drilled into the Pictured Cliffs where 51/2" casing is set and a completion is attempted. If the Pictured Cliffs is nonproductive, the well is plugged back and perforated in the Fruitland. Treatment is a sand-water fracture consisting of 21,000 gallons of water and 30,000 lbs of sand.

RESERVOIR DATA

Productive Area:
Proved (as determined geologically): 500 acres
Unproved: 2,000 acres (The boundary between Kutz, West, and Pinon, North is not defined. Combined total unproved area for both fields is 3,300 acres.)
Approved Spacing: None
No. of Producing Wells: 2
No. of Abandoned Wells: 0
No. of Dry Holes: 0
Average Net Pay: 12 feet
Porosity: 16 percent (estimated)
Permeability: Unknown
Water Saturation: 40 percent (estimated)
Initial Field Pressure: 382 psia
Type of Drive: Pressure depletion
Gas Characteristics and Analysis: Specific gravity 0.664
Oil Characteristics and Analysis: None
Associated Water Characteristics and Analysis: 3,000 to 5,000 ppm NaCl
Original Gas, Oil, and Water Contact Datums: Unknown
Estimated Primary Recovery: 1,370,000 MCFG (80 percent)
Type of Secondary Recovery: None
Present Daily Average Production: 115 MCFGD
Market Outlets: El Paso Natural Gas

REFERENCES

New Mexico Oil and Gas Engineering Committee records.
Operator's files.

Oil and Gas Fields of the Four Corners Area
<table>
<thead>
<tr>
<th>YEAR</th>
<th>TYPE</th>
<th>PROD.</th>
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</table>

**MMCF GAS**

**ANNUAL PRODUCTION**

**TYPE LOG**

**PAN AMERICAN**

**No. 77 GALLEGOS CANYON UNIT**

**FRUITLAND FIELD**

**SAN JUAN CO., NEW MEXICO**

**ISOPACH NET PAY**

**FRUITLAND SANDSTONE**

**SCALE: "1" = 4000'**

---

*Four Corners Geological Society*
PINON FRUITLAND, NORTH

(Gas)
T. 29 N., R. 12 W., NMPM
San Juan County, New Mexico

GEOLOGY
Regional Setting: West central San Juan Basin
Surface Formations: Tertiary, Ojo Alamo Sandstone; Cretaceous, Kirtland Shale
Exploration Method Leading to Discovery: Subsurface geology
Type of Trap: Stratigraphic
Producing Formation: Cretaceous, Fruitland Formation
Gross Thickness and Lithology of Reservoir Rocks: 20 feet, sandstone
Geometry of Reservoir Rock: Elongate lenticular sandstone with northwest depositional strike
Other Significant Shows: Cretaceous, Pictured Cliffs Sandstone and Dakota Sandstone produce in the area
Oldest Stratigraphic Horizon Penetrated: Cretaceous, Dakota Sandstone

DISCOVERY WELL
Name: Pan American No. 82 Gallegos Canyon Unit
Location: SW SW SE SW (790' FSL and 1190' FWL) sec. 28, T. 29 N., R. 12 W.
Elevation (KB): 5,334 feet
Date of Completion: Plugged and abandoned January, 1961; re-entered and completed in Fruitland August, 1966
Total Depth: 1,304 feet
Production Casing: 5 ½" to 1,304 feet with 200 sacks of cement
Perforations: 950 to 964 feet
Stimulation: Sand-water fracture; 18,400 gallons water, 20,000 lbs sand.
Initial Potential: 900 MCFGD, ¾" choke
Bottom Hole Pressure: 399 psia

RESERVOIR DATA
Productive Area:
Proved (as determined geologically): 320 acres
Unproved: 1,300 acres (The boundary between Pinon, North and Kutz, West is not defined. Total combined unproved area for both fields is 3,300 acres.)
Approved Spacing: None
No. of Producing Wells: 1
No. of Abandoned Wells: 0
No. of Dry Holes: 0
Average Net Pay: 14 feet
Porosity: 16 percent (estimated)
Permeability: Unknown
Water Saturation: 40 percent (estimated)
Initial Field Pressure: 399 psia
Type of Drive: Pressure depletion
Gas Characteristics and Analysis: Unknown
Associated Water Characteristics and Analysis: 3,000 to 5,000 ppm NaCl
Original Gas, Oil, and Water Contact Datums: Unknown
Estimated Primary Recovery: 180,000 MCFG, 75 percent of gas in place
Type of Secondary Recovery: None
Present Daily Average Production: 20 MCFGD
Market Outlets: El Paso Natural Gas

REFERENCES
Engineering Committee records.
Operator's files.

DRILLING AND COMPLETION PRACTICES
Well is drilled into the Pictured Cliffs where 5 ½" casing is set and a completion is attempted. If the Pictured Cliffs is non-productive, the well is plugged back and perforated in the Fruitland. Treatment is a sand-water fracture consisting of 18,400 gallons of water and 20,000 lbs of sand.
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<th>YEAR</th>
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**Legend**
- Discovery Well
- Primary Well
- Pictured Cliff or Older Well

**Type Log**
- Pan American
- No 82 Gallegos Canyon Unit

**Pinon, North Fruitland Field**
- San Juan Co., New Mexico
- Isopach Net Pay
- Fruitland Sandstone
- C 1, 15
- Scale: 1" = 4000'
CROUCH MESA FRUITLAND
(Gas)
T. 29 N., R. 12 W., NMPM
San Juan County, New Mexico

By: Elliott A. Riggs
Independent Petroleum Geologist

GEOLOGY

Regional Setting: Western part, San Juan Basin
Surface Formations: Tertiary, Ojo Alamo Sandstone
Exploration Method Leading to Discovery: Subsurface; found on logs during deeper drilling
Type of Trap: Stratigraphic, local sandstone lense
Producing Formation: Well was dual completion, Fruitland Formation and Pictured Cliffs Sandstone both producing

Gross Thickness and Lithology of Reservoir Rocks: Fruitland sandstone bed 10 feet, light gray sandstone; Pictured Cliffs, 25 feet, light gray, fine- to medium-grained, tight dirty sandstone

Geometry of Reservoir Rock: Fruitland, erratic sandstone body encased in shale; Pictured Cliffs, typical complex sandstone varies from location to location through 50 to 75 foot thick interval

Other Significant Shows: None

Oldest Stratigraphic Horizon Penetrated: Cretaceous, Pictured Cliffs Sandstone

DISCOVERY WELL

Name: Devonian Gas and Oil Co. No. 1 Federal
Location: SE NW sec. 4, T. 29 N., R. 12 W.
Elevation (KB): 5,731 feet
Date of Completion: June 26, 1959
Total Depth: 1,856 feet
Production Casing: 5 1/2" to 1,856 feet with 150 sacks of cement for dual completion
Perforations: Fruitland 1,566 to 1,576 feet; Pictured Cliffs 1,776 to 1,800 feet
Stimulation: Both zones were sand-water fractured
Initial Potential: Fruitland 1,500 MCFGD; Pictured Cliffs 1,300 MCFGD

Bottom Hole Pressure: Fruitland 410 psi (shut-in casing pressure); Pictured Cliffs 327 psi (shut-in casing pressure)

DRILLING AND COMPLETION PRACTICES

Set approximately 112 feet of 8 1/2" surface casing. Drill out with fresh water mud to total depth and run electric logs. If sandstone development on logs warrants, run 5 1/2" casing to base of Pictured Cliffs Sandstone. Selectively perforate Pictured Cliffs and Fruitland. Sand-water fracture each zone. Set production packer to isolate Pictured Cliffs and Fruitland intervals. Run 1 1/2" tubing siphon string to approximately 1,656 feet to produce Fruitland. Set 1 1/2" tubing siphon string to approximately 1,785 feet through packer to produce Pictured Cliffs Sandstone. Completion of Fruitland interval depends primarily on satisfactory appearance of the interval on electric logs.

PRODUCTIVE AREA:

Proved (as determined geologically): Less than 160 acres
Unproved: 0

REFERENCES

New Mexico Oil & Gas Engineering Committee, annual production figures.
Riggs, E. A., personal files and geologic data.

Drilling and Completion Practices

Set approximately 112 feet of 8 1/2" surface casing. Drill out with fresh water mud to total depth and run electric logs. If sandstone development on logs warrants, run 5 1/2" casing to base of Pictured Cliffs Sandstone. Selectively perforate Pictured Cliffs and Fruitland. Sand-water fracture each zone. Set production packer to isolate Pictured Cliffs and Fruitland intervals. Run 1 1/2" tubing siphon string to approximately 1,656 feet to produce Fruitland. Set 1 1/2" tubing siphon string to approximately 1,785 feet through packer to produce Pictured Cliffs Sandstone. Completion of Fruitland interval depends primarily on satisfactory appearance of the interval on electric logs.

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REFERENCES

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**CROUCH MESA FRUITLAND**

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*operator changed to Riggs Oil & Gas Corporation.*

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**DEVONIAN GAS & OIL CO.**

**#1 Federal**

SE 1/4 NW 1/4 Sec. 4-T29N-R12W
San Juan Co., New Mexico

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**Fruitland Formation**

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**Fruitland Sand Mbr.**

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**Pictured Cliffs Sand**

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**Lewis Shale**

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GEOLOGIST: Elliott A. Riggs

DRAFTING: James L. Hopkins
CROUCH MESA FRUITLAND
(GAS)
SAN JUAN CO., NEW MEXICO

RIGGS -
Fed. 5731' 1-59
PF 1856' T.D.
F 1500 Mcf
P 1322 Mcf

KIMBALL -
Dev. Fed. 5736' 1-59
D 6548' T.D.
D 2421 Mcf

PIONEER -
Std. 5794' 1-60
D 6600' T.D.
D 3653 Mcf

F = FRUITLAND COMPLETION
P = PICTURED CLIFFS
D = DAKOTA

GEOLOGIST: Elliott A. Riggs
DRAFTING: James L. Hopkins

Oil and Gas Fields of the Four Corners Area]