CASE 6233: AMOCO PRODUCTION CO. FOR SALT WATER DISPOSAL, SAN JUAN COUNTY, NEW MEXICO

CASE NO.

6233

APPLICATION,

TRANSCRIPTS,

SMALL EXHIBITS,

ETC.

Amoco Production Company
Security Life Building
Denver, Colorado 80202

February 15, 1978

Joe D. Ramey (3)
Secretary-Director
New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, NM 87501

File: RAS-247-986.511

Application for Water Disposal, Mt. Nebo
Fruitland Field Extension
San Juan County, New Mexico

On October 12, 1977, we filed the captioned application with you, complete with numerous exhibits, requesting your administrative approval without a hearing. Subsequent telephone conversations by Carl Ulvog with Amoco personnel in Denver indicated approval could not be granted until information was furnished as to the chemistry of the Ojo Alamo water in this particular area.

At its Leeper Gas Com "B" Fruitland No. 1 well in NW/4 of Section 34-32N-10W, Amoco perforated the Ojo Alamo and acidized the formation with 50 gallons of 15% HCl. After swabbing for one hour, a sample was taken followed by another sample one-half hour later. These water analyses are attached. Total solids content of the Ojo Alamo water is approximately 17,650 ppm, clearly non-usable water.

A water flow was encountered on a newly drilled Cedar Hill well, the Usselman Gas Com No. 1A, at a depth of 1190'. The analysis of this water, also attached, shows similar water of poor quality.

In a geological sense, aquifers generally are recharged where their outcrops are the highest, and they discharge water where their outcrops are the lowest. Recharge water derived from direct infiltration at the outcrop is of low salinity when it begins to move underground, but the salinity increases progressively with movement through the formation to places of discharge. The recharge of the Ojo Alamo sandstone occurs in the eastern and southern portion of

the basin, at altitudes of 7,000-8,000' (please see the enclosed exhibit). The water then moves northwestward and westward, becoming progressively more saline, from the recharge area across the basin to discharge points along the Animas and San Juan Rivers at an altitude of 5,500'. The Ojo Alamo sandstone at the disposal wells which we propose is far removed from areas of recharge, consequently has very poor water quality, and produces no oil or gas anywhere in the San Juan Basin. As a result, Amoco believes the Ojo Alamo offers the only prudent and plausible option for subsurface water disposal.

Amoco respectfully requests your administrative approval without a hearing, if you have no objection and the owners herein notified offer no objection, of its application to dispose of Fruitland water that is produced with the gas from its Cahn No. 1 and Leeper Gas Com "B" Fruitland No. 1 wells in Sections 33 and 34, T32N, R10W, by injection into the Ojo Alamo formation. Upon your approval, Amoco would drill a water disposal well, its Cahn No. 3 in NW/4 Section 33, T32N-R10W and would re-enter and complete as a water disposal well its abandoned 100% WI Keys Gas Com "F" No. 1 in SW/4 of Section 27, T32N, R10W. This would provide disposal wells at the Ojo Alamo level on both sides of the Animas River to handle the volumes of water that are produced from the Fruitland on each side of the river.

Please consider the attachments to our earlier application dated October 12, 1977 a part of this application.

The attached Verification and Affidavit demonstrates that a copy of this application was sent by certified mail to all offset owners, other than Amoco, and the surface owner of the land upon which each of the two disposal candidates is located.

RBGiles

R. B. Giles

RBG/fet
Encls.

cc:
A. R. Kendrick, Supervisor
District No. 3
New Mexico Oil Conservation Commission
1000 Rio Brazos Road
Aztec, NM 87410

P. T. McGrath
United States Geological Survey
Box 959
Farmington, NM 87401

VERIFICATION AND AFFIDAVIT

STATE OF COLORADO)
: ss
COUNTY OF DENVER)

R. B. Giles, of lawful age, being first duly sworn on his oath, deposes and says:

That he is employed in an engineering capacity by Amoco Production Company in its Denver Colorado office; that Amoco's application for approval to dispose of Fruitland produced water by injection into the Ojo Alamo horizon at Cahn No. 3 in NW/4 Section 33 and Keys Gas Com "F" No. 1 in SW/4 Section 27, both in T32N,R10W in San Juan County, New Mexico, was prepared under his direction and supervision; that the matters and things therein set forth are true and correct to the best of his knowledge and beliefs; and that a copy thereof was sent by certified mail from Applicant's Denver, Colorado office on February 15, 1978 to the following parties, at the addresses shown herein, to wit:

Offset Operator	Surface Owners
Supron Energy Corporation 400 S. Lorena Ave. Farmington, New Mexico 87401	Henry Knowlton Rt. 1, Box 65-E Aztec, New Mexico 87410
	Katie Cahn 3703 Sequoia St. Coral Gables, Florida 33134

and to the best of his information, knowledge and belief, the above named are the only parties to whom notice of such application is required to be given in accordance with Rule 701 of the New Mexico Oil Conservation Commission's Rules and Regulations.

R. B. Giles
R. B. GILES

Subscribed and sworn to before me this 15th day of February, 1978.

Sylvia L. Seaman
NOTARY PUBLIC

SYLVIA L. SEAMAN NOTARY PUBLIC STATE OF COLORADO

My Commission expires:

My Commission Expires Aug. 15, 1980

san juan testing laboratory, inc.

909 WEST APACHE • P.O. BOX 2079 • FARMINGTON, NEW MEXICO

PHONE:
327-9944

Date January 10, 1978

Report to AMOCO Production Company

Requested by Amoco Personnel Sampled by Amoco Personnel

Project Leeper B #1 Gas Well Location Cedar Hill Area

Source of Material Water Sample # 4 - Possibly from Ojo Alamo Formation 800' depth
1/9/78 1:00 p.m.

Lab No. 26906 Water Analysis for Petroleum Engineering

TEST RESULTS

WATER ANALYSIS FOR PETROLEUM ENGINEERING

Constitutents	Test Results
Total Solids	17,664 mg/L
pH	6.95
Specific Gravity	1.012 at 64°F
Resistivity	0.362 ohms/meter @ 70°F
Conductivity	27,600 micromhos / cm @ 70°F

Comments

Essentially a 1.77% salt solution

Constitutents		
Cations	Meg/L	mg/L
Sodium	190.9	4,389
Calcium	103.0	2,060
Magnesium	2.0	24
Iron	Iron Sulfide as black prec.	
Barium	0	0
Anions		
Chloride	253.5	8,975
Bicarbonate	0.6	37
Carbonate	0	0
Hydroxide	0	0
Sulfate	41.7	2,000

Copies to AMOCO Production Company (3) ✓

TEST NO. 24484

Certified by

LAWRENCE A. BREWER
REGISTERED
PROFESSIONAL ENGINEER AND LAND SURVEYOR
3122
STATE OF NEW MEXICO

Form 360-7

san juan testing laboratory, inc.

909 WEST APACHE • P. O. BOX 2079 • FARMINGTON, NEW MEXICO

PHONE: 327-9944

Date January 10, 1978

RECEIVED
JAN 13 1978
FARMINGTON AREA

Report to AMOCO Production Company

Requested by Amoco Personnel Sampled by Amoco Personnel

Project Leeper B #1 Gas Well Location Cedar Hill Area

Source of Material Water Sample #5 - Possibly from Ojo Alamo Formation 800' depth
1/9/78 shortly after 1:00 p.m.

Lab No. 26907 Water Analysis For Petroleum Engineering

AS
AAS
AE
AA
WRB

TEST RESULTS

WATER ANALYSIS FOR PETROLEUM ENGINEERING

File

Constitutents	Test Results
Total Solids	17,634 mg/L
pH	7.0
Specific Gravity	1.013 @ 64°F
Resistivity	0.365 ohms/meter @ 70°F
Conductivity	27,400 micromhos/cm @ 70°F

Comments

Essentially a 1.76% salt solution

Constitutents		
Cations	Meg/L	mg/L
Sodium	190.7	4,385
Calcium	101.5	2,030
Magnesium	3.2	39
Iron	Iron sulfate as black precp	
Barium	0	0
Anions		
Chloride	254.2	9,000
Bicarbonate	0.5	29
Carbonate	0	0
Hydroxide	0	0
Sulfate	40.6	1,950

Copies to AMOCO Production Company(3) ✓

Certified by:

LAWRENCE A. BREWER
REGISTERED
PROFESSIONAL ENGINEER AND LAND SURVEYOR
3122
STATE OF NEW MEXICO

TEST NO. 24485

CHEMICAL & GEOLOGICAL LABORATORIES

P. O. Box 2794
Casper, Wyoming

FARMINGTON AREA

1	AS	
	AAS	
2	AE	
	AA	
3		

WATER ANALYSIS REPORT

OPERATOR Amoco Production Co. DATE January 4, 1978 LAB NO. 26013
WELL NO. Usselman Gas Com No. 1A LOCATION Sec. 4-31N-10W
FIELD Blanco-Mesaverde FORMATION
COUNTY San Juan INTERVAL 1190
STATE New Mexico SAMPLE FROM Flow during drilling (12-29-77)

REMARKS & CONCLUSIONS: Suspect Ojo Alamo

cc: a.m. Roxey
E.E. Lefurge

Cations	mg/l	meq/l	Anions	mg/l	meq/l
Sodium	3195	139.00	Sulfate	4960	103.17
Potassium	14	0.36	Chloride	2000	56.40
Lithium			Carbonate	-	
Calcium	452	22.55	Bicarbonate	268	4.40
Magnesium	25	2.06	Hydroxide		
Iron	-		Hydrogen sulfide	-	
Total Cations		163.97	Total Anions		163.97

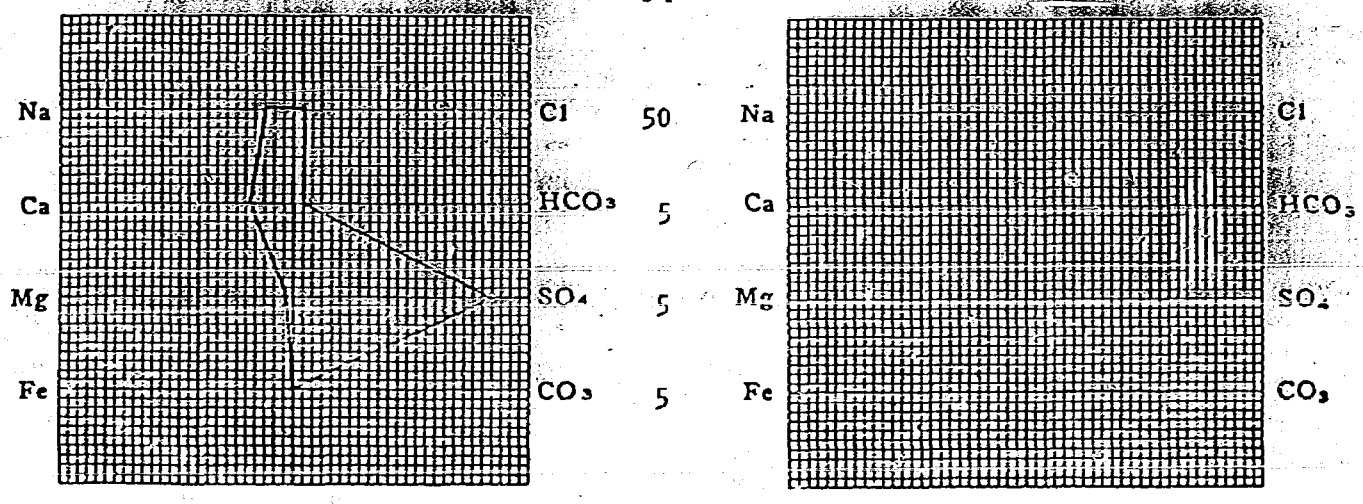
Total dissolved solids, mg/l 10778
NaCl equivalent, mg/l 8241
Observed pH 7.1

Specific resistance @ 68°F.:
Observed 0.88 ohm-meters
Calculated 0.80 ohm-meters

WATER ANALYSIS PATTERN

Sample above described

Scale
MEQ per Unit



(Na value in above graphs includes Na, K, and Li)
NOTE: Mg/l = Milligrams per liter Meq/l = Milligram equivalents per liter
Sodium chloride equivalent = by Dunlap & Hawthorne calculation from components

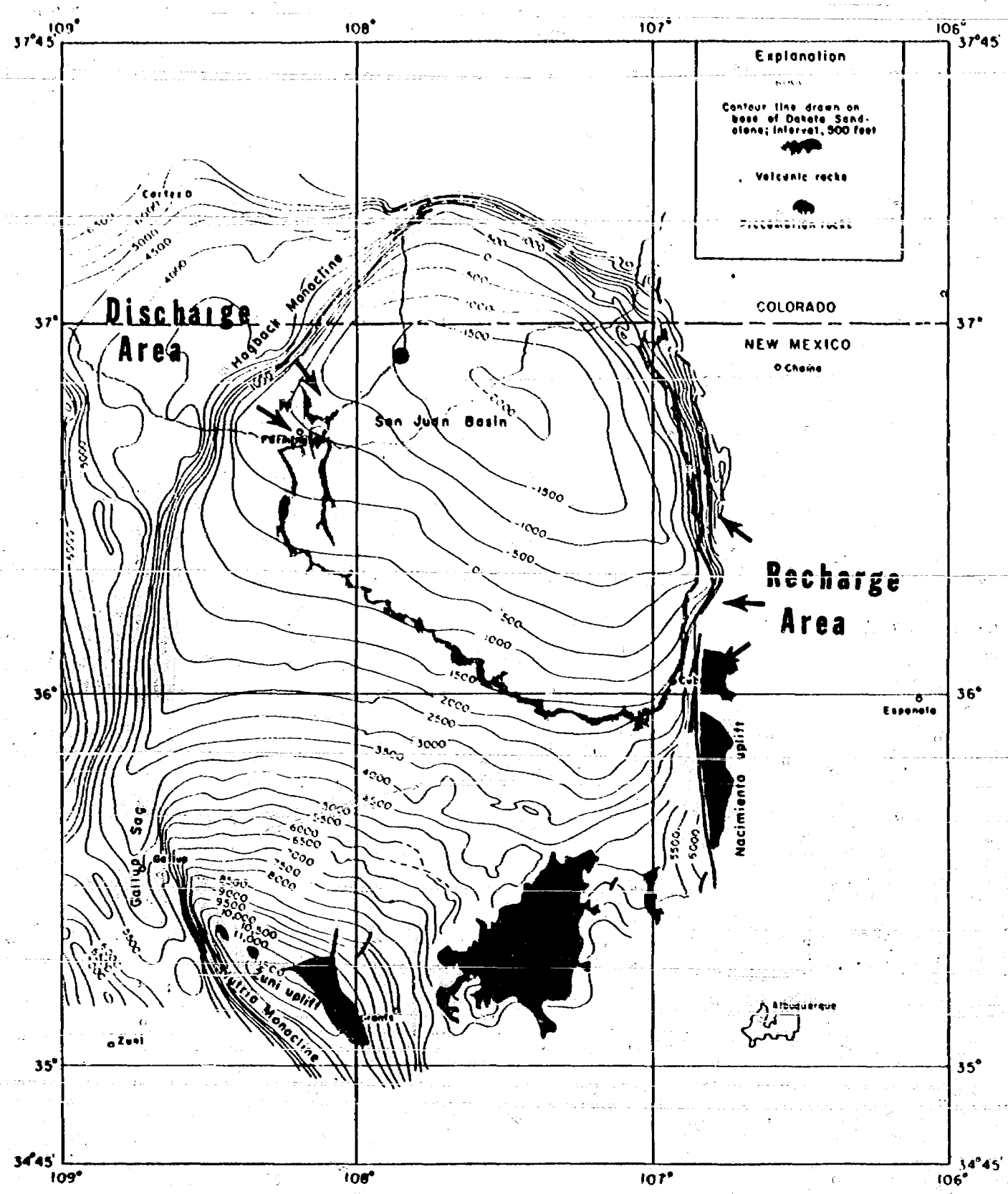


Figure 1.
Map showing structure of San Juan Basin. Modified from Silver (1950)

Ojo Alamo Outcrop
Disposal Location

Gary C. Harrison

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION

IN THE MATTER OF THE HEARING
CALLED BY THE OIL CONSERVATION
DIVISION FOR THE PURPOSE OF
CONSIDERING:

CASE NO. 6233
Order No. R-5780

APPLICATION OF AMOCO PRODUCTION
COMPANY FOR SALT WATER DISPOSAL,
SAN JUAN COUNTY, NEW MEXICO.

ORDER OF THE DIVISION

BY THE DIVISION:

This cause came on for hearing at 9 a.m. on May 17, 1978, at Santa Fe, New Mexico, before Examiner Richard L. Stamets.

NOW, on this 7th day of August, 1978, the Division Director, having considered the testimony, the record, and the recommendations of the Examiner, and being fully advised in the premises,

FINDS:

(1) That due public notice having been given as required by law, the Division has jurisdiction of this cause and the subject matter thereof.

(2) That the applicant, Amoco Production Company, is the owner and operator of the Keys Gas Com "F" Well No. 1 located in Unit K of Section 27 and the Cahn Gas Com Well No. 3 to be drilled in Unit F of Section 33, both in Township 32 North, Range 10 West, NMPM, Mt. Nebo-Fruitland Pool, San Juan County, New Mexico.

(3) That the applicant proposes to utilize said wells to dispose of produced salt water into the Ojo Alamo formation, with injection into the perforated intervals from approximately 1104 feet to 1122 feet and 1175 feet to 1230 feet, respectively.

(4) That there are five wells, as shown on Exhibit A attached to this order and made a part hereof, which wells are located within one-half mile of one or the other of said proposed disposal wells and which are not cemented across the Ojo Alamo formation in such a manner as to contain the proposed waters to be injected within said formation.

(5) That no disposal of salt water should be permitted into either of said wells until all five wells shown on said Exhibit A have been cemented across and above the Ojo Alamo formation in accordance with a program to be approved by the supervisor of the Division's district office at Aztec.

(6) That the injection into the aforesaid two wells should be accomplished through 2 3/8-inch plastic lined tubing installed in packers set at approximately 1050 feet and at approximately 1150 feet, respectively; that the casing-tubing annulus in each well should be filled with an inert fluid; and that a pressure gauge or approved leak detection device should be attached to the annulus of each well in order to determine leakage in the casing, tubing, or packer.

(7) That the injection wells or system should be equipped with a pressure limiting switch or other acceptable device which will limit the wellhead pressure at each injection well to no more than 220 psi.

(8) That the operator should notify the supervisor of the Aztec district office of the Division of the date and time of the installation of disposal equipment so that the same may be inspected.

(9) That the operator should take all steps necessary to ensure that the injected water enters only the proposed injection intervals and is not permitted to escape to other formations or onto the surface.

(10) That approval of the subject application will prevent the drilling of unnecessary wells and otherwise prevent waste and protect correlative rights.

IT IS THEREFORE ORDERED:

(1) That the applicant, Amoco Production Company, is hereby authorized to utilize its Cahn Gas Com Well No. 3 to be drilled in Unit F of Section 33 and its Keys Gas Com "F" Well No. 1 located in Unit K of Section 27, both in Township 32 North, Range 10 West, NMPM, Mt. Nebo-Fruitland Pool, San Juan County, New Mexico, to dispose of produced salt water into the Ojo Alamo formation, injection to be accomplished through 2 3/8-inch tubing installed in packers set at approximately 1150 feet and 1050 feet, respectively, with injection into the perforated interval from approximately 1175 feet to 1230 feet and 1104 feet to 1122 feet, respectively.

PROVIDED HOWEVER, that in each well, the tubing shall be plastic-lined; that the casing-tubing annulus shall be filled with an inert fluid; and that a pressure gauge shall be attached to the annulus or the annulus shall be equipped with an approved leak detection device in order to determine leakage in the casing, tubing, or packer.

PROVIDED FURTHER, that no injection of salt water shall take place in either of said wells until the intermediate casing in all five wells shown on Exhibit A attached to this order and made a part hereof shall have been cemented across and above the Ojo Alamo formation in a manner prescribed by the supervisor of the Division's district office at Aztec.

(2) That the injection wells or system shall be equipped with a pressure limiting switch or other acceptable device which will limit the wellhead pressure on the injection wells to no more than 220 psi.

(3) That the operator shall notify the supervisor of the Aztec district office of the Division of the date and time of the installation of disposal equipment so that the same may be inspected.

(4) That the operator shall immediately notify the supervisor of the Division's Aztec district office of the failure of the tubing, casing, or packer, in said wells or the leakage of water from or around said wells and shall take such steps as may be timely and necessary to correct such failure or leakage.

(5) That the applicant shall submit monthly reports of its disposal operations in accordance with Rules 704 and 1120 of the Division Rules and Regulations.

(6) That jurisdiction of this cause is retained for the entry of such further orders as the Division may deem necessary.

DONE at Santa Fe, New Mexico, on the day and year hereinabove designated.

STATE OF NEW MEXICO
OIL CONSERVATION DIVISION

JOE D. RAMEY
Director

S E A L

fd/

OPERATOR	LEASE	WELL NO.	UNIT	SEC.	TWP.	RGE.
Supron Energy Corp.	Payne	5A	O	27	32N	10W
Amoco Production Co.	Ealum Gas Com	1	H	33	32N	10W
Amoco Production Co.	Schneider Gas Com	1	L	28	32N	10W
Amoco Production Co.	Uptegrove Gas Com	1	L	33	32N	10W
Amoco Production Co.	Keys Gas Com "A"	1	K	27	32N	10W

Exhibit A

CASE NO. 6233
ORDER NO. R-5780

Amoco Production Company
Security Life Building
Denver, Colorado 80202

October 12, 1977

Joe D. Ramey (3)
Secretary-Director
New Mexico Oil Conservation Commission
P.O. Box 2088
Santa Fe, New Mexico 87501

Set for hearing on
12/14/77

File: VDP-1382-986.511

Application for Water Disposal, Mt. Nebo Fruitland Field Extension,
San Juan County, New Mexico

Amoco respectfully requests your administrative approval without a hearing, if you have no objection and the owners herein notified offer no objection, of its application to dispose of Fruitland water, that is produced with the gas from its Cahn No. 1 and Leeper Gas Com "B" Fruitland No. 1 wells in Sections 33 and 34, T32N-R10W, by injection into the Ojo Alamo formation. Upon your approval, Amoco would drill a water disposal well, its Cahn No. 3 in NW/4 Section 33, T32N-R10W and would re-enter and complete as a water disposal well its abandoned 100% WI Keys Gas Com "F" No. 1 in SW/4 Section 27, T32N-R10W. This would provide disposal wells at the Ojo Alamo level on both sides of the Animas River to handle the volumes of water that are produced from the Fruitland on each side of the river.

There is precedence for such a water disposal plan. El Paso obtained your administrative approval without a hearing to dispose of produced water into the Ojo Alamo at the Atlantic State No. 6 well in Section 16, T30N-R10W, approximately 10 miles to the south of the area involved with this application.

While the Ojo Alamo, where it's shallow, is used by the Indians as a potable water supply, the nearest Indian lands are more than 30 miles away. The Ojo Alamo under the lands involved with this application lies at a depth in excess of 1,000 feet and consequently is not used as a water supply by the fee owners. Also, there is no oil or gas production from the Ojo Alamo anywhere in the San Juan Basin. Therefore, the requirement of Rule 701 for Applicant to include a plat showing all leases and wells within a two-mile radius of the disposal wells would be inappropriate and needlessly burdensome.

Amoco encloses the following to support its water disposal application:

Attachment 1, a plat showing all wells and lessees in the vicinity of Amoco's two proposed water disposal candidates, Cahn No. 3 and Keys Gas Com "F" No. 1.

Completed Form C-108's for each of the two disposal well candidates.

Attachment 3 is a tabular summary of all wells, within one-half mile of the disposal wells, which penetrate the injection zone showing all casing strings, setting depths, sacks of cement used, cement tops, total depth, producing interval, well identification, and location.

Attachment 4, a downhole schematic of the Holmberg Gas Com "B" No. 1 in Section 28, which is the only plugged and abandoned well within one-half mile of either disposal candidate.

Attachments 5 and 6 are log sections of the Ojo Alamo zone in the Keys "F" No. 1 and the Schneider Gas Com "B" No. 1 which is located in the SW/4 Section 28, T32N-R10W, a direct north offset to the Cahn No. 3.

Attachments 7 a-c are water analyses of bradenhead samples taken from producing Mesaverde gas wells in the area of the two water disposal candidates.

Attachment 8 is an analysis of Cahn No. 1 produced water.

Both the Cahn Gas Com No. 1 and the Leeper Gas Com "B" No. 1 are awaiting a gas sales line connection. However, in our view, it would not be possible to produce these Fruitland wells without our recommended water disposal system. The Ojo Alamo offers the only plausible option available to us for subsurface water disposal. As for surface options available, there are none. There are no water disposal possibilities nearby, thus, trucking the produced water out of the area has to be eliminated from consideration.

If approval is granted for this water disposal system, Amoco, pursuant to Memo No. 3-77 from your office dated August 24, 1977, will not inject water into either disposal well using a surface injection pressure greater than 0.2 psi per foot of depth to the top of the Ojo Alamo, unless we find the Ojo Alamo has a fracture gradient which would support a higher pressure.

The attached Verification and Affidavit, a part of this application, demonstrates that a copy of this application was sent by certified mail to all offset owners, other than Amoco, and the surface owner of the land upon which each of the two disposal candidates is located.

RBG:ks
Attachments

cc: A.R. Kendrick, Supervisor
District No. 3
New Mexico Oil Conservation Commission
1000 Rio Brazos Road
Aztec, New Mexico 87410

P.T. McGrath
United States Geological Survey
Box 959
Farmington, New Mexico 87401

VERIFICATION AND AFFIDAVIT

STATE OF COLORADO)
: ss
COUNTY OF DENVER)

R. B. Giles, of lawful age, being first duly sworn on his oath, deposes and says:

That he is employed in an engineering capacity by Amoco Production Company in its Denver, Colorado office; that Amoco's application for approval to dispose of Fruitland produced water by injection into the Ojo Alamo horizon at Cahn No. 3 in NW/4 Section 33 and Keys Gas Com "F" No. 1 in SW/4 Section 27, both in T32N, R10W in San Juan County, New Mexico, was prepared under his direction and supervision; that the matters and things therein set forth are true and correct to the best of his knowledge and beliefs; and that a copy thereof was sent by certified mail from Applicant's Denver, Colorado office on October 12, 1977 to the following parties, at the addresses shown herein, to wit:

Offset Operator	Surface Owners
Supron Energy Corporation 400 S. Lorena Ave. Farmington, New Mexico 87401	Henry Knowlton Rt. 1, Box 65-E Aztec, New Mexico 87410
	Katie Cahn 3703 Sequoia St. Coral Gables, Florida 33134

and to the best of his information, knowledge and belief, the above named are the only parties to whom notice of such application is required to be given in accordance with Rule 701 of the New Mexico Oil Conservation Commission's Rules and Regulations.

R. B. Giles
R. B. GILES

Subscribed and sworn to before me this 12th day of October, 1977.

SYLVIA L. SEAMANS NOTARY PUBLIC STATE OF COLORADO

Lydia C Seamons
NOTARY PUBLIC

My Commission expires:
My Commission Expires Aug. 15, 1980

Amoco Production Company

ENGINEERING CHART

FILE Attachment 1

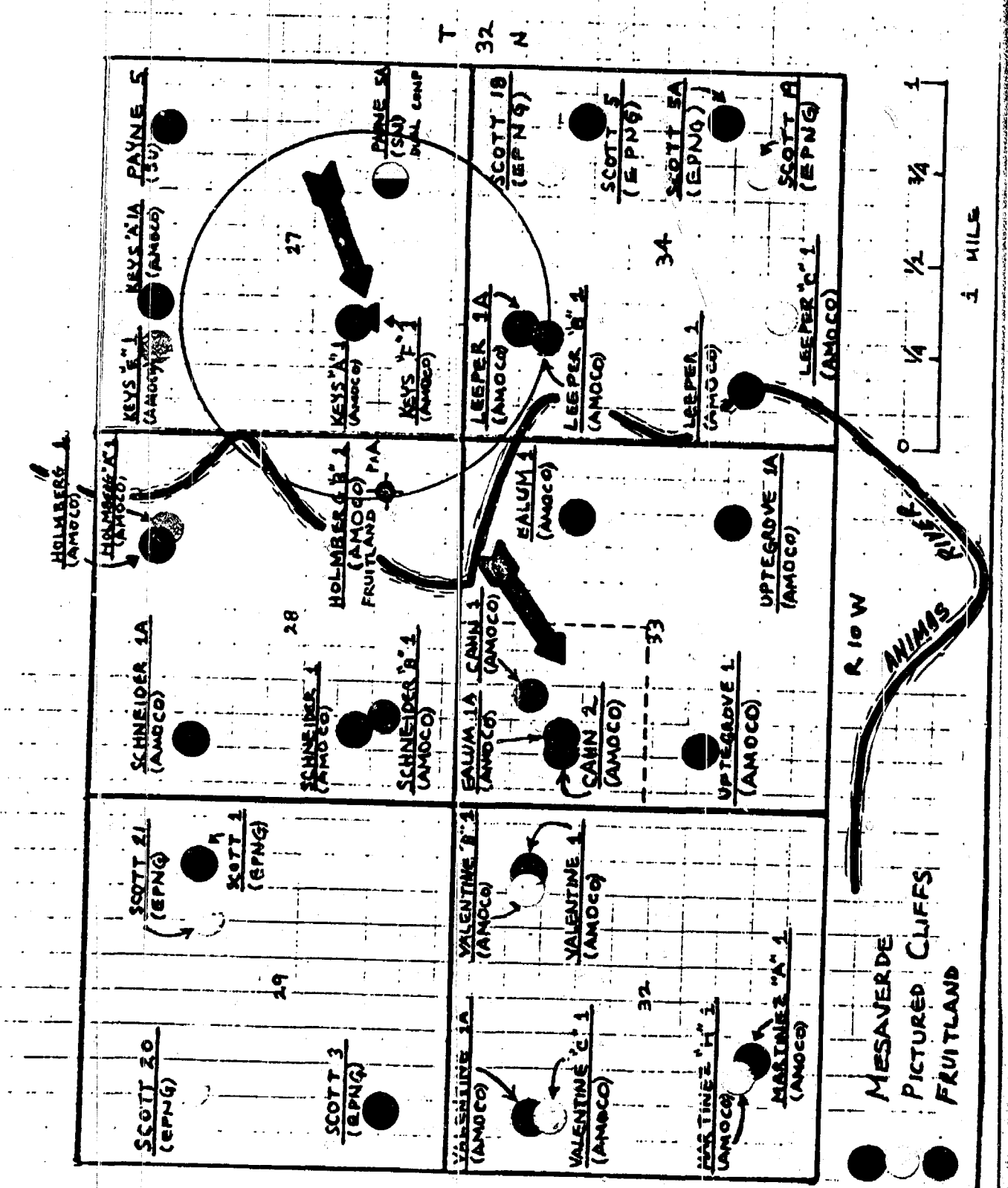
APPN

DATE 9-12-77

BY WRC

SUBJECT CEDAR HILL AREA

SAN JUAN COUNTY, NEW MEXICO



Form C-108
Revised 1-1-65

NEW MEXICO OIL CONSERVATION COMMISSION

APPLICATION TO DISPOSE OF SALT WATER BY INJECTION INTO A POROUS FORMATION

OPERATOR		ADDRESS	
AMOCO PRODUCTION COMPANY		501 AIRPORT DRIVE, FARMINGTON, NM 87401	
LEASE NAME	**WELL NO.**	**FIELD**	**COUNTY**
Cahn Gas Com	3	Undesignated Ojo Alamo	San Juan

LOCATION Not yet drilled. Proposed location: NW/4 Sec. 33, T-32-N, R-10-W

UNIT LETTER _____; WELL IS LOCATED _____ FEET FROM THE _____ LINE AND _____ FEET FROM THE _____ LINE, SECTION _____ TOWNSHIP _____ RANGE _____ NMPM.

CASING AND TUBING DATA

NAME OF STRING	SIZE	SETTING DEPTH	SACKS CEMENT	TOP OF CEMENT	TOP DETERMINED BY
SURFACE CASING	8-5/8" 24#	250'	250	Circulate	
INTERMEDIATE	4-1/2" 9.5#	1400'	500	Circulate	
LONG STRING					
TUBING	2-3/8" 4.7#	1150'	NAME, MODEL AND DEPTH OF TUBING PACKER: Baker Model "N" set at 1150'		

NAME OF PROPOSED INJECTION FORMATION	TOP OF FORMATION	BOTTOM OF FORMATION
Ojo Alamo	1175'	1230'

IS INJECTION THROUGH TUBING, CASING, OR ANNULUS?	PERFORATIONS OR OPEN HOLE?	PROPOSED INTERVAL(S) OF INJECTION
Tubing	Perf	1175-1230'

IS THIS A NEW WELL DRILLED FOR DISPOSAL?	IF ANSWER IS NO, FOR WHAT PURPOSE WAS WELL ORIGINALLY DRILLED?	HAS WELL EVER BEEN PERFORATED IN ANY ZONE OTHER THAN THE PROPOSED INJECTION ZONE?
Yes	-	-

LIST ALL SUCH PERFORATED INTERVALS AND SACKS OF CEMENT USED TO SEAL OFF OR SQUEEZE EACH

-

DEPTH OF BOTTOM OF DEEPEST FRESH WATER ZONE IN THIS AREA	DEPTH OF BOTTOM OF NEXT HIGHER OIL OR GAS ZONE IN THIS AREA	DEPTH OF TOP OF NEXT LOWER OIL OR GAS ZONE IN THIS AREA
Approximately 100 ft.	NONE	2800'

ANTICIPATED DAILY INJECTION VOLUME (BBLS.) MINIMUM	MAXIMUM	OPEN OR CLOSED TYPE SYSTEM	IS INJECTION TO BE BY GRAVITY OR PRESSURE?	APPROX. PRESSURE (PSI)
200	600	Closed	Pressure	*1200 Max

ANSWER YES OR NO WHETHER THE FOLLOWING WATERS ARE MINERALIZED TO SUCH A DEGREE AS TO BE UNFIT FOR DOMESTIC, STOCK, IRRIGATION, OR OTHER GENERAL USE — WATER TO BE DISPOSED OF	NATURAL WATER IN DISPOSAL ZONE	ARE WATER ANALYSES ATTACHED?
Yes	Yes	Yes

NAME AND ADDRESS OF SURFACE OWNER (OR LESSEE, IF STATE OR FEDERAL LAND)

Katie Cahn, 3703 Sequoia St., Coral Gables, Florida 33134

LIST NAMES AND ADDRESSES OF ALL OPERATORS WITHIN ONE-HALF (½) MILE OF THIS INJECTION WELL

No other operators.

HAVE COPIES OF THIS APPLICATION BEEN SENT TO EACH OF THE FOLLOWING? SURFACE OWNER	EACH OPERATOR WITHIN ONE-HALF MILE OF THIS WELL	THE NEW MEXICO STATE ENGINEER
ARE THE FOLLOWING ITEMS ATTACHED TO THIS APPLICATION (SEE RULE 701-B) PLAT OF AREA	ELECTRICAL LOG	DIAGRAMMATIC SKETCH OF WELL

I hereby certify that the information above is true and complete to the best of my knowledge and belief.

R B Giles — (Signature)

Sr Staff Engineer — (Title)

10/12/77 — (Date)

NOTE: Should waivers from the State Engineer, the surface owner, and all operators within one-half mile of the proposed injection well not accompany this application, the New Mexico Oil Conservation Commission will hold the application for a period of 15 days from the date of receipt by the Commission's Santa Fe office. If at the end of the 15-day waiting period no protest has been received by the Santa Fe office, the application will be processed. If a protest is received, the application will be set for hearing, if the applicant so requests. SEE RULE 701.

*Based on Pictured Cliffs-Fruitland frac gradient of 1 psi/ft (avg)

Form C-108
Revised 1-1-65

NEW MEXICO OIL CONSERVATION COMMISSION

APPLICATION TO DISPOSE OF SALT WATER BY INJECTION INTO A POROUS FORMATION

OPERATOR: AMOCO PRODUCTION COMPANY		ADDRESS: 501 AIRPORT DRIVE, FARMINGTON, NM 87401	
LEASE NAME: Keys Gas Com "F"	WELL NO.: 1	FIELD: Mt. Nebo Fruitland	COUNTY: San Juan

LOCATION: UNIT LETTER K; WELL IS LOCATED 1510 FEET FROM THE South LINE AND 1685 FEET FROM THE West LINE, SECTION 27 TOWNSHIP 32-N RANGE 10-W NMPM.

CASING AND TUBING DATA

NAME OF STRING	SIZE	SETTING DEPTH	SACKS CEMENT	TOP OF CEMENT	TOP DETERMINED BY
SURFACE CASING	8-5/8" 24#	250'	200	G.L.	Circ to surface
INTERMEDIATE	4-1/2" 9.5#	2886'	750	G.L.	Circ to surface
LONG STRING					
TUBING	2-3/8" 4.7#	1050'	NAME, MODEL AND DEPTH OF TUBING PACKER: Baker Model "N" set at 1050'		

NAME OF PROPOSED INJECTION FORMATION	TOP OF FORMATION	BOTTOM OF FORMATION
Ojo Alamo	1069'	1122'

IS INJECTION THROUGH TUBING, CASING, OR ANNULUS?	PERFORATIONS OR OPEN HOLE?	PROPOSED INTERVAL(S) OF INJECTION
Tubing	Perf	1104-22'

IS THIS A NEW WELL DRILLED FOR DISPOSAL?	IF ANSWER IS NO, FOR WHAT PURPOSE WAS WELL ORIGINALLY DRILLED?	HAS WELL EVER BEEN PERFORATED IN ANY ZONE OTHER THAN THE PROPOSED INJECTION ZONE?
NO	Gas Production	Yes

LIST ALL SUCH PERFORATED INTERVALS AND SACKS OF CEMENT USED TO SEAL OFF OR SQUEEZE EACH: 2780-84', 2794-98', 2804-08', 2820-24', 2832-36', x 2 SPF (Sqz. with 100 sx); 2451-59', 2600-08', and 2668-76' x 2 SPF. Cmt well x 200 sx.

DEPTH OF BOTTOM OF DEEPEST FRESH WATER ZONE IN THIS AREA	DEPTH OF BOTTOM OF NEXT HIGHER OIL OR GAS ZONE IN THIS AREA	DEPTH OF TOP OF NEXT LOWER OIL OR GAS ZONE IN THIS AREA
Approximately 100 ft.	None	2450'

ANTICIPATED DAILY INJECTION VOLUME (BBLS.) MINIMUM	MAXIMUM	OPEN OR CLOSED TYPE SYSTEM	IS INJECTION TO BE BY GRAVITY OR PRESSURE?	APPROX. PRESSURE (PSI)
200	600	Closed	Pressure	1100 *1200 MAX

ANSWER YES OR NO WHETHER THE FOLLOWING WATERS ARE MINERALIZED TO SUCH A DEGREE AS TO BE UNFIT FOR DOMESTIC, STOCK, IRRIGATION, OR OTHER GENERAL USE — WATER TO BE DISPOSED OF	NATURAL WATER IN DISPOSAL ZONE	ARE WATER ANALYSES ATTACHED?
Yes	Yes	Yes

NAME AND ADDRESS OF SURFACE OWNER (OR LESSEE, IF STATE OR FEDERAL LAND): Henry Knowlton, Rt. 1, Box 65-E, Aztec, New Mexico 87410

LIST NAMES AND ADDRESSES OF ALL OPERATORS WITHIN ONE-HALF (½) MILE OF THIS INJECTION WELL: Supron Energy Corporation, 400 S. Lorena Ave., Farmington, NM 87401

HAVE COPIES OF THIS APPLICATION BEEN SENT TO EACH OF THE FOLLOWING? SURFACE OWNER	EACH OPERATOR WITHIN ONE-HALF MILE OF THIS WELL	THE NEW MEXICO STATE ENGINEER

ARE THE FOLLOWING ITEMS ATTACHED TO THIS APPLICATION (SEE RULE 701-B) PLAT OF AREA	ELECTRICAL LOG	DIAGRAMMATIC SKETCH OF WELL

I hereby certify that the information above is true and complete to the best of my knowledge and belief.

R B Giles — (Signature)
Sr. Staff Engr. — (Title)
10/12/77 — (Date)

NOTE: Should waivers from the State Engineer, the surface owner, and all operators within one-half mile of the proposed injection well, not accompany this application, the New Mexico Oil Conservation Commission will hold the application for a period of 15 days from the date of receipt by the Commission's Santa Fe office. If at the end of the 15-day waiting period no protest has been received by the Santa Fe office, the application will be processed. If a protest is received, the application will be set for hearing, if the applicant so requests. SEE RULE 701.

*Based on Pictured Cliffs-Fruitland frac gradient of 1 psi/ft (avg)

CEDAR HILL WELLS WITHIN 1/2 MILE OF POTENTIAL WATER DISPOSAL WELLS

WELL NAME OPERATOR	WELL LOCATION	HOLE SIZE	CASING SIZE AND WT.	SETTING DEPTH (FT)	CEMENT	CEMENT TOPS	TD	PRODUCING INTERVAL
Payne No. 5A Southern Union	1140' FSL x 1725' FEL Sec. 27, T-32-N, R-10-W	13-3/4" 8-3/4" 6-1/4"	10-3/4" 30# 7" 23# 4-1/2" 10.5#	546' 3443' 3323-5690'	350 sx 230 sx 1.2 310 sx	CIRC 2400' 4600'	5770'	Pictured Cli Mesaverde
Jahn Gas Com No. 1 Amoco	1030' FNL x 1600' FWL Sec. 33, T-32-N, R-10-W	12-1/4" 8-3/4"	9-5/8" 32.3# 7" 20#	253' 2795'	250 sx 600 sx	CIRC. * 100-200'	2812'	Fruitland
Jahn Gas Com No. 2 Amoco	1510' FNL x 800' FWL Sec. 33, T-32-N, R-10-W	12-1/4" 7-7/8"	8-5/8" 24# 4-1/2" 11#	276' 2957'	250 sx 680 sx	CIRC * 100-200'	2946'	Fruitland
alum Gas Com No. 1 Amoco	1650' FNL x 1140' FEL Sec. 33, T-32-N, R-10-W	12-1/4" 8-3/4" 6-1/4"	9-5/8" 32.3# 7" 20# x 23# 5" 15# 5-1/2" 14#	256' 4642' 4346-5320'	200 sx 438ft^3 2.4 190 sx	CIRC 3585' * 4300'	5320'	Mesaverde
alum Gas Com No. 1A Amoco	1450' FNL x 1030' FWL Sec. 33, T-32-N, R-10-W	12-1/4" 8-3/4" 6-1/4"	9-5/8" 32.3# 7" 23# 4-1/2" 10.5#	259' 3200' 3018-5400'	280 sx 775 sx 4.1 375 sx	CIRC CIRC CIRC	5400'	Mesaverde
chneider Gas Com No. 1 Amoco	1450' FSL x 990' FWL Sec. 28, T-32-N, R-10-W	12-1/4" 8-3/4" 6-1/4"	9-5/8" 32.3# 7" 20# x 23# 5-1/2" 14#	255' 4646' 4570-5144'	275 sx 428ft^3 1.46 122 sx	CIRC 4020' 4700'	5410'	Mesaverde
chneider Gas Com No. 1A Amoco	1460' FNL x 810' FWL Sec. 28, T-32-N, R-10-W	12-1/4" 8-3/4" 6-1/4"	9-5/8" 36# 7" 23# 4-1/2" 10.5#	270' 3349' 3159-5514'	280 sx 685 sx 4.8 280 sx	CIRC CIRC 4796'	5525'	Mesaverde
chneider Gas Com "B" No. 1 Amoco	1110' FSL x 1185' FWL Sec. 28, T-32-N, R-10-W	12-1/4" 7-7/8"	8-5/8" 24# 4-1/2" 10.5#	258' 3050'	200 sx 930 sx 3.3	CIRC CIRC	3050'	Fruitland
tegrove Gas Com No. 1 Amoco	1850' FSL x 790' FWL Sec. 33, T-32-N, R-10-W	12-1/4" 8-3/4" 6-1/4"	9-5/8" 32.3# 7" 20# 5" 15#	279' 4579' 4445-5261'	190 sx 438ft^3 285 sx	CIRC 3210' CIRC	5270'	Mesaverde
tegrove Gas Com No. 1A Amoco	1470' FSL x 1190' FEL Sec. 33, T-32-N, R-10-W	12-1/4" 8-3/4" 6-1/4"	9-5/8" 36# 7" 23# 4-1/2" 10.5#	267' 3075' 2868-5250'	280 sx 635 sx 4.8 280 sx	CIRC CIRC CIRC	5250'	Mesaverde

CALCULATED CEMENT TOPS

WELL NAME OPERATOR	WELL LOCATION	HOLE SIZE	CASING SIZE AND WT.	SETTING DEPTH (FT)	CEMENT	CEMENT TOPS	TD	PRODUCING INTERVAL
eper Gas Com No. 1A	800' FNL x 1590' FWL	12-1/4"	9-5/8" 32.3#	254'	280 sx	CIRC	5305'	Mesaverde
Amoco	Sec. 34, T-32-N, R-10-W	8-3/4"	7" 23#	3149'	775 sx	*100-200'		
		6-1/4"	4-1/2" 10.5#	2962-5305'	375 sx	CIRC		
eper Gas Com "B" No. 1	1110' FNL x 1450' FWL	12-1/4"	8-5/8" 24#	258'	200 sx	CIRC	2851'	Fruitland
Amoco	Sec. 34, T-32-N, R-10-W	7-7/8"	4-1/2" 10.5#	2851'	870 sx	CIRC		
			x 11#					
lentine Gas Com No. 1	990' FNL x 990' FEL	12-1/4"	9-5/8" 32.3#	261'	250 sx	CIRC	5289'	Mesaverde
Amoco	Sec. 32, T-32-N, R-10-W	8-3/4"	7" 20#	4570'	800 sx	CIRC		
		4-3/4"	4" 11.34#	4196-5289'	225 sx	CIRC		
lentine Gas Com "B" No.1	1140' FNL x 1140' FEL	12-1/4"	8-5/8" 24#	261'	275 sx	CIRC	2960'	Pictured Clif
Amoco	Sec. 32, T-32-N, R-10-W	7-7/8"	4-1/2" 10.5#	2960'	640 sx	*100-200'		
			x 11#					
ys Gas Com "A" No. 1	1650' FSL x 1650' FWL	12-1/4"	9-5/8" 32.3#	250'	225 sx	CIRC	5243'	Mesaverde
Amoco	Sec. 27, T-32-N, R-10-W	8-3/4"	7" 20# x 23#	4551'	438ft^3	2490'		
		6-1/4"	5" 15#	4405-5243'	100 sx	*CIRC		

Calculated cement tops

Amoco Production Company

ENGINEERING CHART

SHEET NO. OF

FILE ATTACHMENT 1

APPN

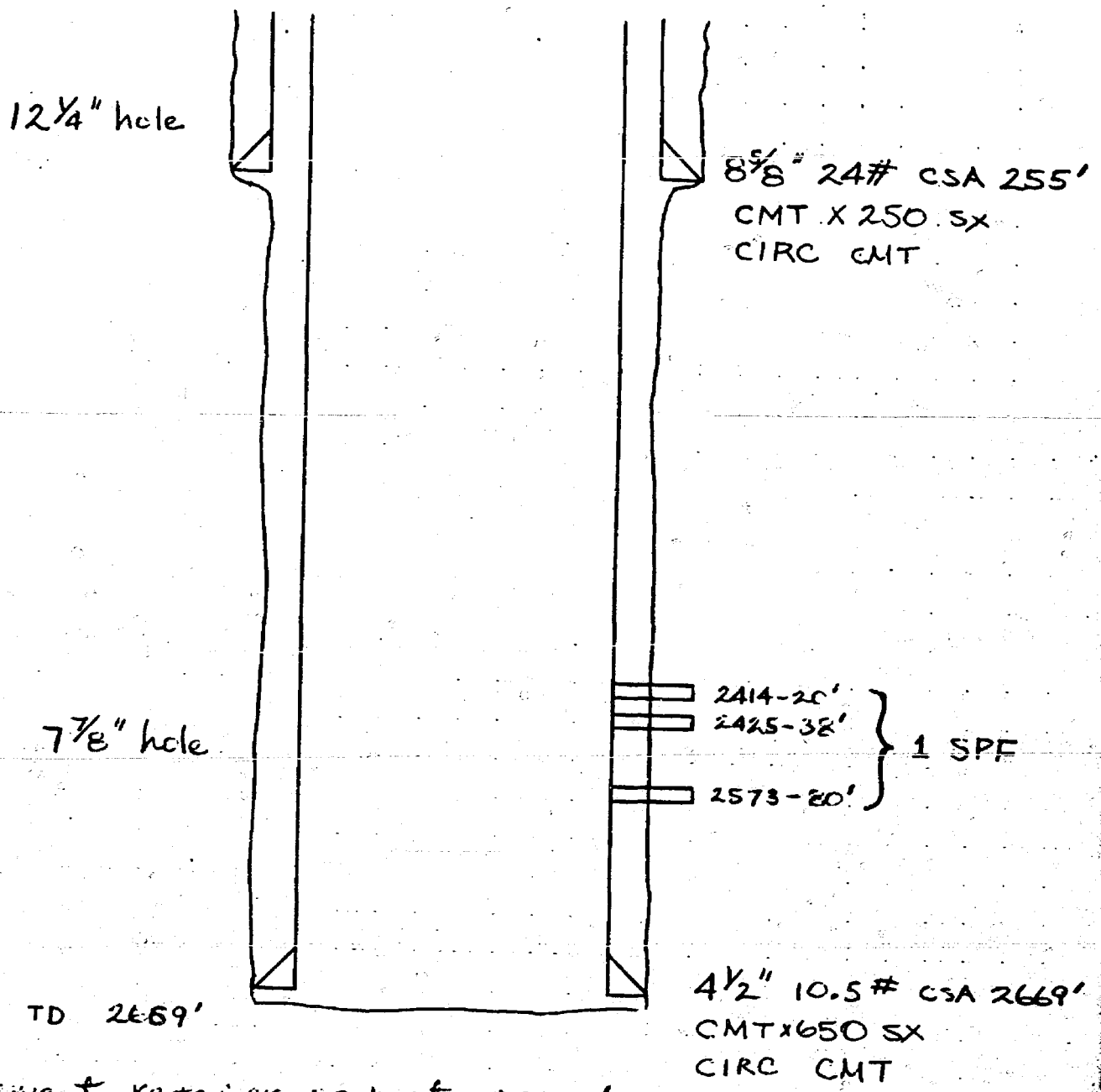
DATE 9-14-77

BY WRC

SUBJECT HOLMBERG GAS COM "B" No. 1

1190' FSL x 810' FEL, SEC 28 32-10

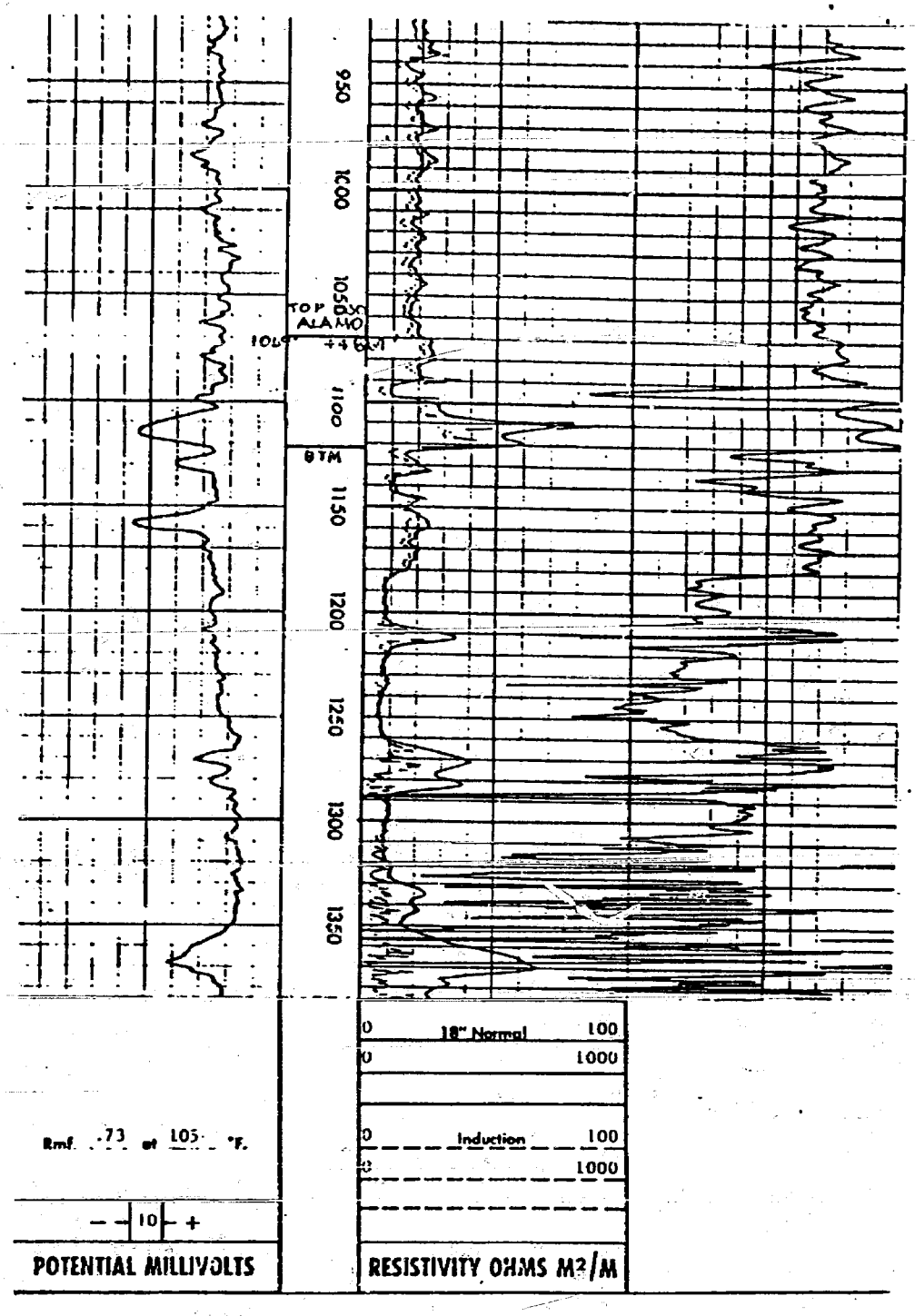
SAN JUAN COUNTY, NEW MEXICO



Cement retainer set at 2200'
Perfs squeezed with X 50 sx Class "A" cement
Plugs spotted from cement retainer - 2170', 1220-1100', 325-205', and 2 sx at surface.

WELL PLUGGED & ABANDONED 12-04-73.

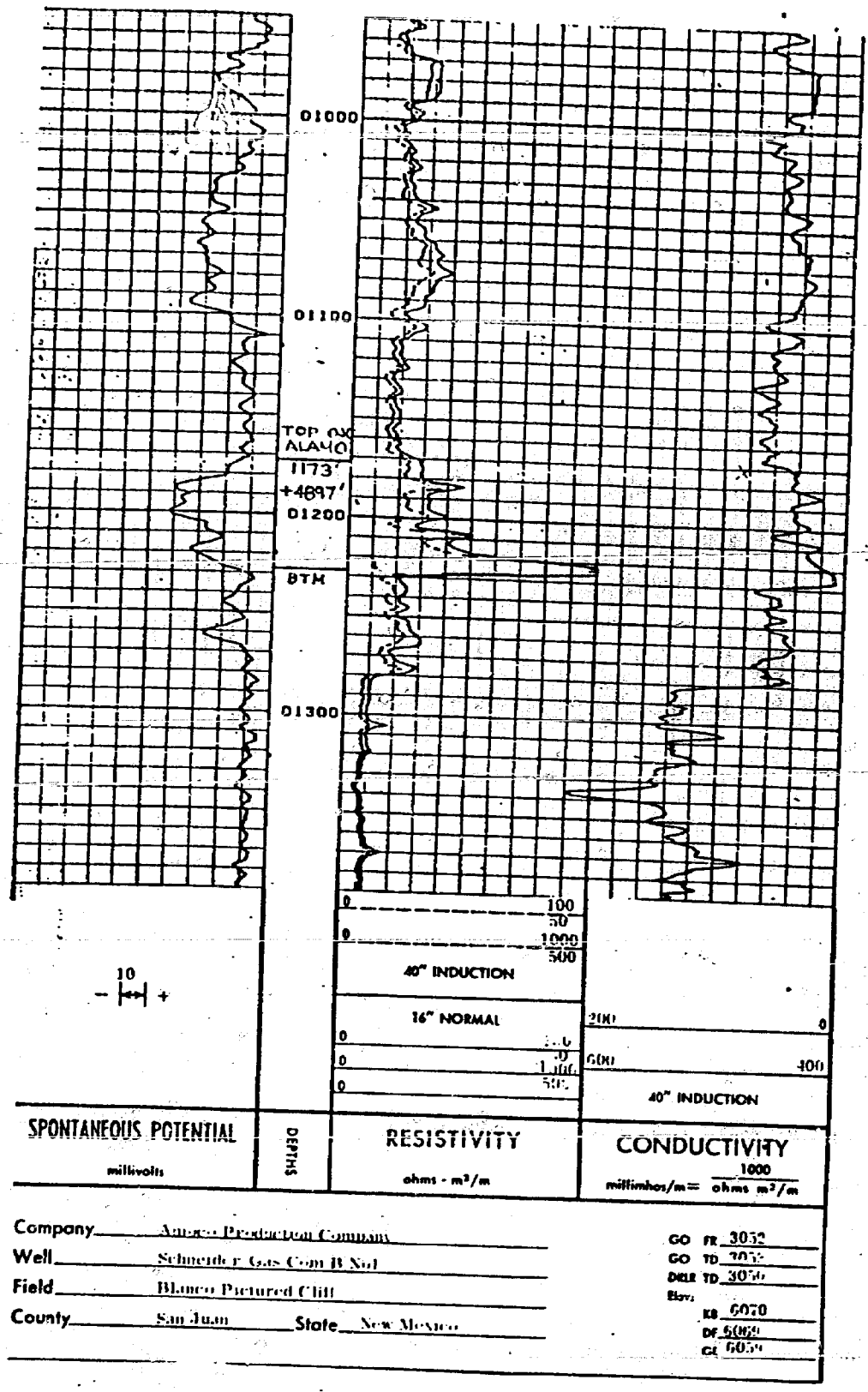
ATTACHMENT 5



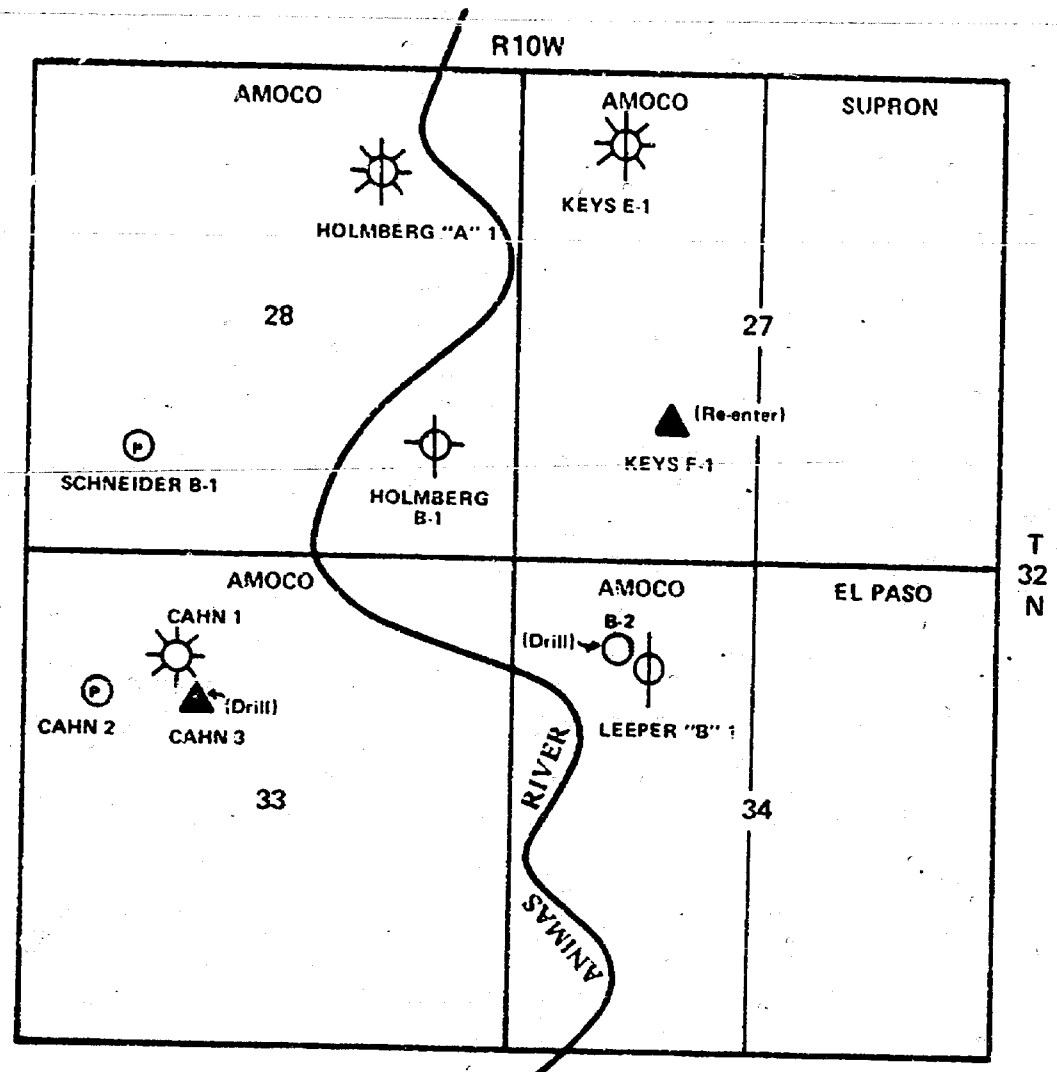
AMOCO PRODUCTION COMPANY
KEYS GAS COM. "F" NO. 1
UNDESIGNATED FRUITLAND
SAN JUAN COUNTY, NEW MEXICO
SEC. 27-32N-10W

T.D. LOGGED 2896'
T.D. DRILLER 2900'
T.D. WELEX [illegible]
K.B. ELEV. 5935'
G.L. ELEV. 5926'

ATTACHMENT 6



FRUITLAND GAS PLAY
CEDAR HILL AREA
SAN JUAN COUNTY, NEW MEXICO



○ PROPOSED FRUITLAND GAS WELL (TWIN TO LEEPER "B" 1 TEMPORARILY ABANDONED WELL)

✳ EXISTING FRUITLAND GAS WELL

Ⓟ FRUITLAND PRESSURE OBSERVATION WELL

▲ PROPOSED WELL FOR DISPOSAL OF PRODUCED FRUITLAND WATER INTO OJO ALAMO FORMATION

BEFORE EXAMINER STAMETS
OIL CONSERVATION COMMISSION
EXHIBIT NO. 1
CASE NO. 6233
Submitted by Amoco
Hearing Date 5/17/78

ATTACHMENT 8

Amoco Production Company

RESEARCH CENTER
WATER ANALYSIS

T S or File No.
Lab. No. T-23,207
Field No.
API Well No.

OCATION SAMPLED: Division Denver District South Area Farmington
perator (Plant) Amoco Well No. 1 Lease Cahn Gas Com.
ate (Province) New Mexico County (Parish) San Juan
wp. Rng. Sec. Quarter (Lsd.) Other (Meridian)
Wildcat ( ) Field Well ( ) Field name
mple collected from Wellhead Date 3/25/77 Sample collected by Inskeep
nterval sampled to Interval name
ecovery

rm 97 transmitted by H.Montgomery Date 3/25/77 Authorized by

ORGANIC CONSTITUENTS in mg/l

	BOTTOM	MIDDLE	TOP	MUD	
nzene					
oluene					
Gases					

DESCRIPTION OF SAMPLE

mple used for detailed analyses
ate received
ondition as received
olor
dor
spended solids
ottom sediment
il or fluorescence

QUALITY OF SAMPLE

	BOTTOM	MIDDLE	TOP
hloride n mg/l:			

OMMENTS:

BEFORE EXAMINER STAMETS
OIL CONSERVATION COMMISSION
EXHIBIT NO. 2
CASE NO. 6233
Submitted by Amoco
Hearing Date 5/17/78

CONVENTIONAL MAJOR ION ANALYSIS

			Major Ions mg/l	% of Total Major Ions	Reaction Value meq/l	% of Total Reaction Value
CATIONS	Sodium	Na^+	5,791	27.97	251.91	49.37
	Calcium	Ca^{++}	40	.19	2.00	.39
	Magnesium	Mg^{++}	15	.07	1.23	.24
	Potassium	K^+				
ANIONS	Chloride	Cl^-	964	4.65	27.18	5.33
	Bicarbonate	HCO_3^-	13,900	67.12	227.96	44.67
	Sulfate	SO_4^{--}	0	0	0	0
	Carbonate	CO_3^{--}	0	0	0	0
	TOTAL		20,710			

Total solids by evaporation 13,350 mg/l
NaCl resistivity equivalent (Dunlap) 10,576 mg/l
Resistivity .539 ohm-meters at 77 °F
pH 8.1 Specific gravity 1.015 at 72 °F
Ryznar stability index (2pHs-pH) at °F

OTHER IONS AND DISSOLVED SOLIDS

CATIONS	mg/l	ANIONS	mg/l	OTHERS	mg/l

REMARKS AND CONCLUSIONS:

MAY 2 1977
FARMINGTON AREA

1	AS	
	AAS	
2	AE	
	AA	
3		
4		
5		

wren 535.11

cc: Bob Reed
G. W. Schmidt

Analyst Bruce Barnes Date 4/15/77
jh
Water charts on back ( )

san juan testing laboratory, inc.

909 WEST APACHE • P.O. BOX 2079 • FARMINGTON, NEW MEXICO

PHONE:
327-9944

Date January 10, 1978

Report to AMOCO Production Company

Requested by Amoco Personnel Sampled by Amoco Personnel

Project Leeper B #1 Gas Well Location Cedar Hill Area

Source of Material Water Sample # 4 - Possibly from Ojo Alamo Formation 800' depth
1/9/78 1:00 p.m.

Lab No. 26906 Water Analysis for Petroleum Engineering

JAN 13 1978

TEST RESULTS

WATER ANALYSIS FOR PETROLEUM ENGINEERING

Constitutents	Test Results
Total Solids	17,664 mg/L
pH	6.95
Specific Gravity	1.012 at 64°F
Resistivity	0.362 ohms/meter @ 70°F
Conductivity	27,600 micromhos / cm @ 70°F

Constitutents		
Cations	Meg/L	mg/L
Sodium	190.9	4,389
Calcium	103.0	2,060
Magnesium	2.0	24
Iron	Iron Sulfide as black prec.	
Barium	0	0
Anions		
Chloride	253.5	8,975
Bicarbonate	0.6	37
Carbonate	0	0
Hydroxide	0	0
Sulfate	41.7	2,000

Comments

Essentially a 1.77% salt solution

BEFORE EXAMINER STAMETS
OIL CONSERVATION COMMISSION
EXHIBIT NO. 3
CASE NO. 6233
Submitted by Amoco
Hearing Date 5/17/78

Copies to AMOCO Production Company (3) ✓

TEST NO. 24484

Certified by

LAWRENCE A. BREWER
REGISTERED
PROFESSIONAL
ENGINEER AND LAND SURVEYOR
3122
STATE OF NEW MEXICO

Form 360-7

san juan testing laboratory, inc.

909 WEST APACHE • P.O. BOX 2079 • FARMINGTON, NEW MEXICO

PHONE:
327-9944

Date January 10, 1978

RECEIVED
JAN 13 1978
FARMINGTON AREA

Report to AMOCO Production Company

Requested by Amoco Personnel Sampled by Amoco Personnel

Project Leeper B #1 Gas Well Location Cedar Hill Area

Source of Material Water Sample #5 - Possibly from Ojo Alamo Formation 800' depth
1/9/78 shortly after 1:00 p.m.

Lab No. 26907 Water Analysis For Petroleum Engineering

AS AAS AC AA WRB

TEST RESULTS

WATER ANALYSIS FOR PETROLEUM ENGINEERING

File

Constitutents	Test Results
Total Solids	17,634 mg/L
pH	7.0
Specific Gravity	1.013 @ 64°F
Resistivity	0.365 ohms/meter @ 70°F
Conductivity	27,400 micromhos/cm @ 70°F

Constitutents		
Cations	Meg/L	mg/L
Sodium	190.7	4,385
Calcium	101.5	2,030
Magnesium	3.2	39
Iron	Iron sulfate as black prec	
Barium	0	0
Anions		
Chloride	254.2	9,000
Bicarbonate	0.5	29
Carbonate	0	0
Hydroxide	0	0
Sulfate	40.6	1,950

Comments

Essentially a 1.76% salt solution

BEFORE EXAMINER STAMETS
OIL CONSERVATION COMMISSION
EXHIBIT NO. 4
CASE NO. 6233
Submitted by Amoco
Hearing Date 5/17/78

Copies to AMOCO Production Company(3)

TEST NO. 24485

Certified by:

LAWRENCE A. BREWER REGISTERED PROFESSIONAL ENGINEER AND LAND SURVEYOR 3122 STATE OF NEW MEXICO

CL1-12A (REV. 1964)

JAN 9 1978
FARMINGTON AREA

CHEMICAL & GEOLOGICAL LABORATORIES

P. O. Box 2794
Casper, Wyoming

WATER ANALYSIS REPORT

OPERATOR Amoco Production Co. DATE January 4, 1978 LAB NO. 26013
WELL NO. Usselman Gas Com No. 1A LOCATION Sec. 4-31N-10W
FIELD Blanco Mesaverde FORMATION
COUNTY San Juan INTERVAL 1190
STATE New Mexico SAMPLE FROM Flow during drilling (12-29-77)

REMARKS & CONCLUSIONS: Suspect Ojo Alamo

cc: a.m. Roney
E.E. Kilfoyle

Cations	mg/l	meq/l	Anions	mg/l	meq/l
Sodium	3195	139.00	Sulfate	4960	103.17
Potassium	14	0.36	Chloride	2000	56.40
Lithium			Carbonate		
Calcium	452	22.55	Bicarbonate	268	4.40
Magnesium	25	2.06	Hydroxide		
Iron	-		Hydrogen sulfide	-	
Total Cations		163.97	Total Anions		163.97

Total dissolved solids, mg/l 10778
NaCl equivalent, mg/l 8241
Observed pH 7.1

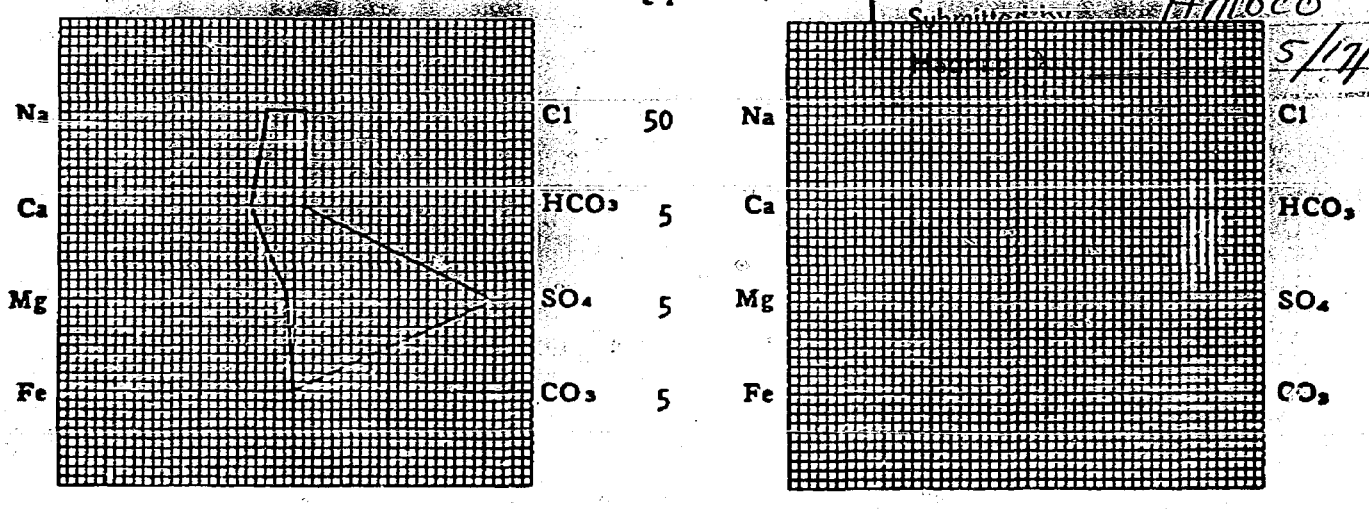
Specific resistance @ 68°F.:
Observed 0.88 ohm-meters
Calculated 0.80 ohm-meters

BEFORE EXAMINER STAMETS
OIL CONSERVATION COMMISSION
EXHIBIT NO. 5
CASE NO. 6233
Submitted by Amoco
Hearing Date 5/17/78

WATER ANALYSIS PATTERN

Sample above described

Scale
MEQ per Unit



(Na value in above graphs includes Na, K, and Li)
NOTE: Mg/l = Milligrams per liter Meq/l = Milligram equivalents per liter
Sodium chloride equivalent = by Dunlap & Hawthorne calculation from components

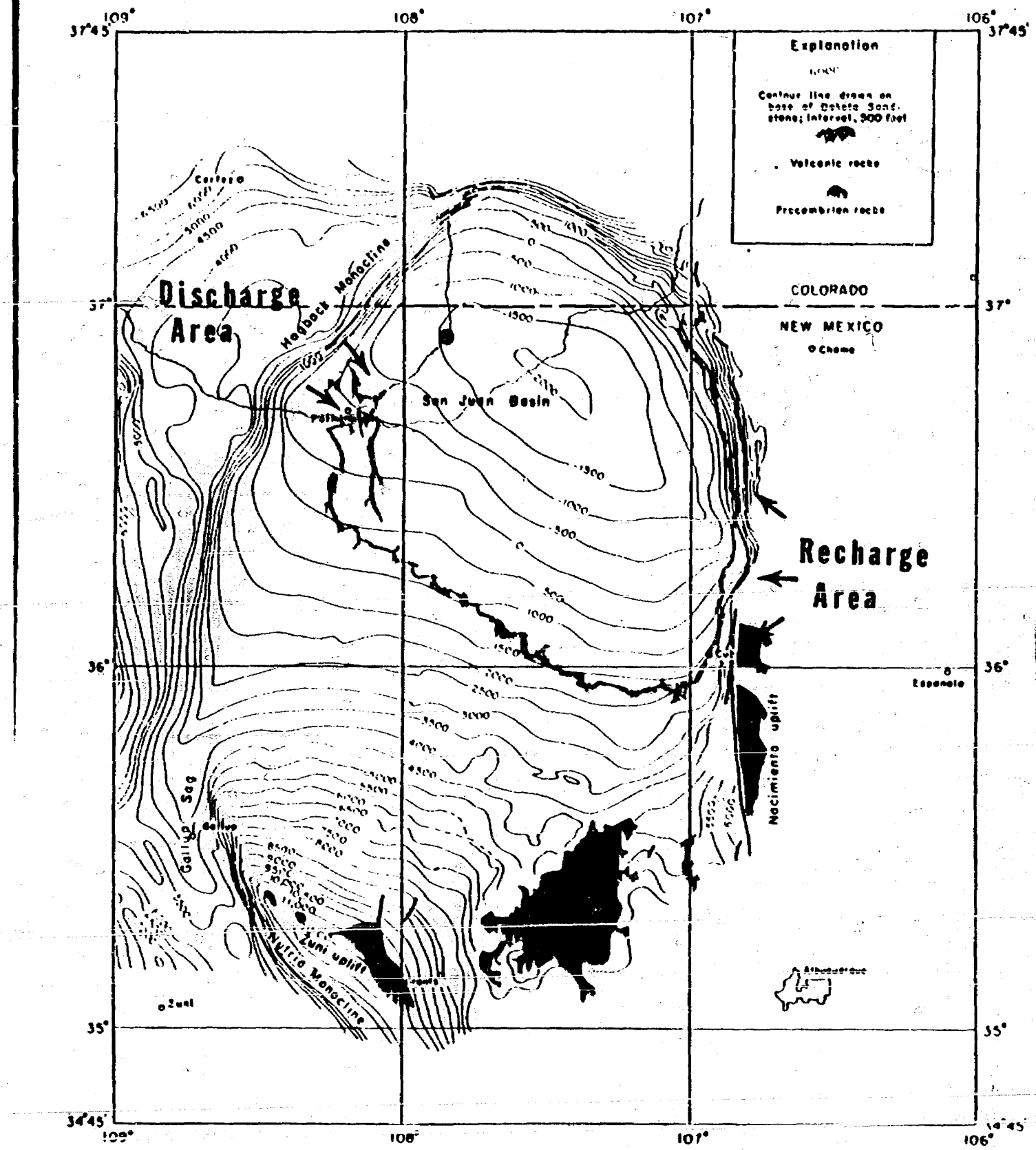


Figure 1.
Map showing structure of San Juan Basin. Modified from Silver (1950)

Gary C. Harrison

BEFORE EXAMINER STAMETS
OIL CONSERVATION COMMISSION
EXHIBIT NO. 6
CASE NO. 6233
Submitted by Amoco
Hearing Date 5-17-78

CHEM LAB NOV 5 1976

FARMINGTON AREA

WATER ANALYSIS EXCHANGE REPORT

ATTACHMENT 7b

MEMBER Amoco Production Company	LAB NO. 21618-1 REPORT NO.
OPERATOR Amoco Production Company	LOCATION
WELL NO. Keys Gas Com. No. 1	FORMATION Mesaverde
FIELD Blanco-Mesaverde	INTERVAL
COUNTY San Juan	SAMPLE FROM Bradenhead (10-18-76)
STATE New Mexico	DATE November 2, 1976

REMARKS & CONCLUSIONS:

Cations	mg/l	meq/l	Anions	mg/l	meq/l
Sodium	5251	228.40	Sulfate	5	0.10
Potassium	31	0.79	Chloride	820	23.12
Lithium			Carbonate	576	19.18
Calcium	64	3.19	Bicarbonate	11614	190.47
Magnesium	6	0.49	Hydroxide		
Iron	-		Hydrogen sulfide	-	
Total Cations		232.87	Total Anions		232.87

Total dissolved solids, mg/l	12473
NaCl equivalent, mg/l	10039
Observed pH	8.5

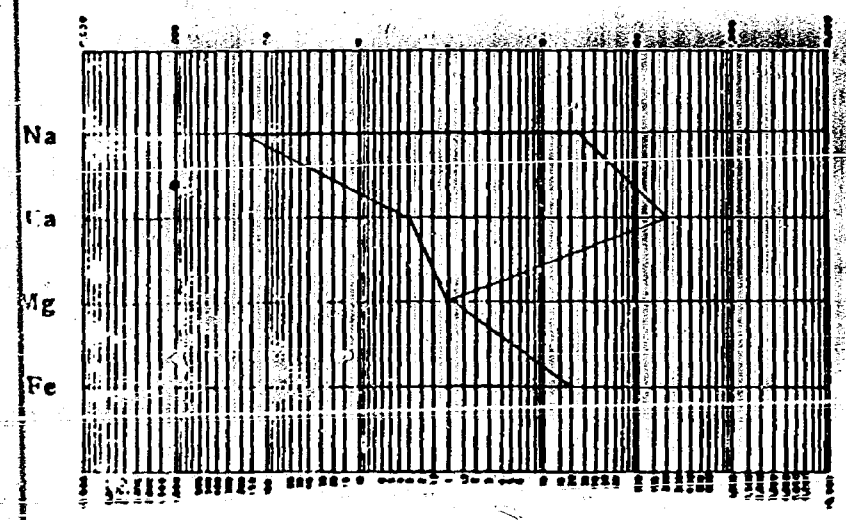
Specific resistance @ 68° F.:

Observed	0.72	ohm-meters
Calculated	0.66	ohm-meters

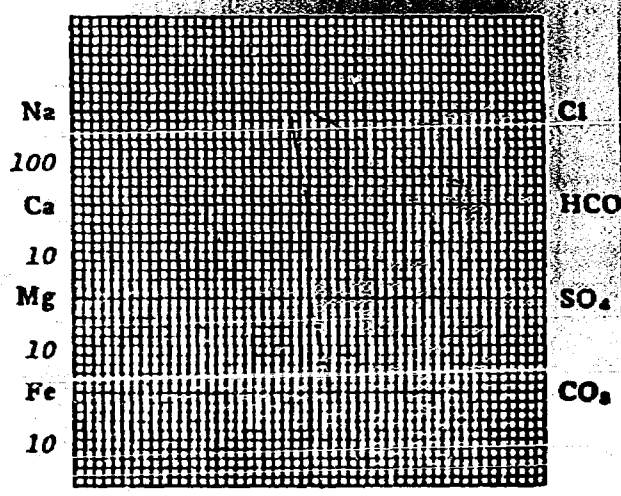
WATER ANALYSIS PATTERNS

MEQ per unit

LOGARITHMIC



STANDARD



(Na value in above graphs includes Na, K, and Li)

NOTE: Mg/l = Milligrams per liter. Meq/l = Milligram equivalents per liter

Sodium chloride equivalent = by Dunlap & Hawthorne calculation from components

RECEIVED
NOV 5 1976
FARMINGTON AREA

CHEM LAB

WATER ANALYSIS EXCHANGE REPORT

ATTACHMENT 7c

MEMBER	Amoco Production Company	LAB NO.	21618-3
OPERATOR	Amoco Production Company	LOCATION	
WELL NO.	Schneider Gas Com. No. 1	FORMATION	Mesaverde
FIELD	Blanco-Mesaverde	INTERVAL	
COUNTY	San Juan	SAMPLE FROM	Bradenhead (10-20-76)
STATE	New Mexico	DATE	November 2, 1976

REMARKS & CONCLUSIONS:

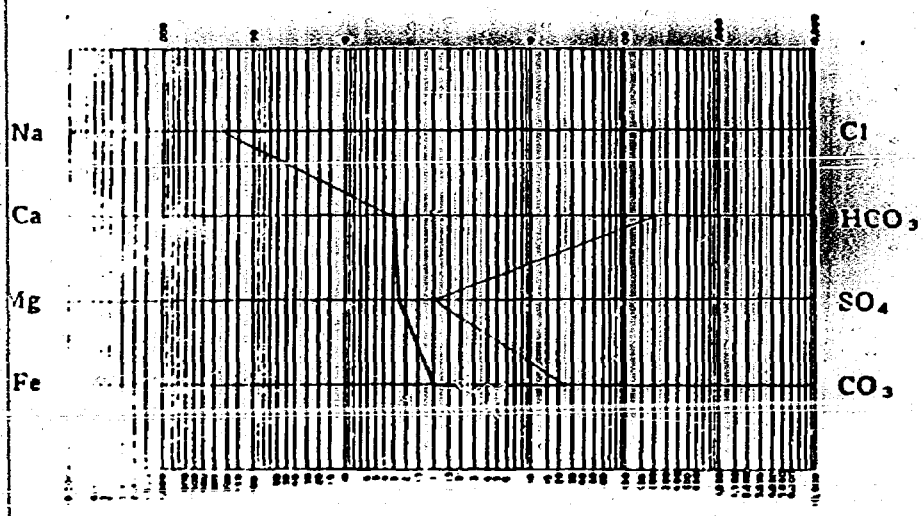
Cations	mg/l	meq/l	Anions	mg/l	meq/l
Sodium	5903	256.79	Sulfate	2	0.04
Potassium	40	1.02	Chloride	840	23.69
Lithium			Carbonate	720	23.98
Calcium	69	3.44	Bicarbonate	13176	216.09
Magnesium	31	2.55	Hydroxide		
Iron	-		Hydrogen sulfide	-	
Total Cations		263.80	Total Anions		263.80

Total dissolved solids, mg/l	14094	Specific resistance @ 68° F.:	
NaCl equivalent, mg/l	11376	Observed	0.64 ohm-meters
Observed pH	8.6	Calculated	0.58 ohm-meters

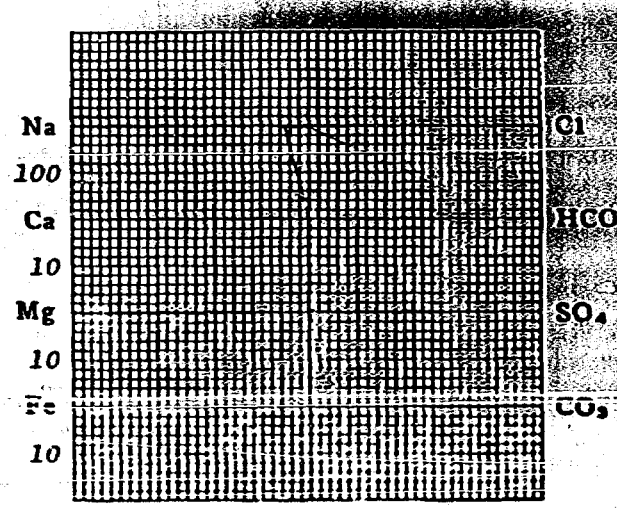
WATER ANALYSIS PATTERNS

MEQ per unit

LOGARITHMIC



STANDARD



(Na value in above graphs includes Na, K, and Li)

NOTE: Mg/l = Milligrams per liter. Meq/l = Milligram equivalents per liter

Sodium chloride equivalent = by Dunlap & Hawthorne calculation from components

ATTACHMENT 8

RESEARCH CENTER WATER ANALYSIS

T.S. or File No. 525.11
Lab. No. T-23,207
Field No.
API Well No.

LOCATION SAMPLED: Division Denver | District South | Area Farmington
Operator (Plant) Amoco | Well No. 1 | Lease Cahn Gas Com.
State (Province) New Mexico | County (Parish) San Juan
Twp. Rng. Sec. | Quarter (Lsd.) | Other (Meridian)
Wildcat ( ) Field Well ( ) | Field name
Sample collected from Wellhead | Date 3/25/77 | Sample collected by Inskeep
Interval sampled to | Interval name
Recovery

Form 97 transmitted by H.Montgomery | Date 3/25/77 | Authorized by

ORGANIC CONSTITUENTS in mg/l

	BOTTOM	MIDDLE	TOP	MUD	
Benzene					
Toluene					
C1 Gases					

DESCRIPTION OF SAMPLE

Sample used for detailed analyses
Date received
Condition as received
Color
Odor
Suspended solids
Bottom sediment
Oil or fluorescence

QUALITY OF SAMPLE

	BOTTOM	MIDDLE	TOP
Chloride in mg/l:			

COMMENTS:

CONVENTIONAL MAJOR ION ANALYSIS

			Major Ions mg/l	% of Total Major Ions	Reaction Value meq/l	% of Total Reaction Value
CATIONS	Sodium	Na^+	5,791	27.97	251.91	49.37
	Calcium	Ca^{++}	40	.19	2.00	.39
	Magnesium	Mg^{++}	15	.07	1.23	.24
	Potassium	K^+				
ANIONS	Chloride	Cl^-	964	4.65	27.18	5.33
	Bicarbonate	HCO_3^-	13,900	67.12	227.96	44.67
	Sulfate	SO_4^{--}	0	0	0	0
	Carbonate	CO_3^{--}	0	0	0	0
	TOTAL		20,710			

Total solids by evaporation 13,350 mg/l
NaCl resistivity equivalent (Dunlap) 10,576 mg/l
Resistivity .539 ohm-meters at 77 °F
pH 8.1 Specific gravity 1.015 at 72 °F
Ryznar stability index (2pHs-pH) at °F

OTHER IONS AND DISSOLVED SOLIDS

CATIONS	mg/l	ANIONS	mg/l	OTHERS	mg/l

REMARKS AND CONCLUSIONS:

MAY 2 1977
FARMINGTON AREA

1	AS	
	AAS	
2	AE	
	AA	
3		
4		
5		

wm 525.11

cc: Bob Reed
G. W. Schmidt

Analyst Bruce Barnes Date 4/15/77
jh
Water charts on back ( )

RECEIVED
CHEM LAB NOV 5 1976
FARMINGTON, N. MEX.

WATER ANALYSIS EXCHANGE REPORT
ATTACHMENT 7a

MEMBER Amoco Production Company	LAB NO. 21618-5 REPORT NO.
OPERATOR Amoco Production Company	LOCATION
WELL NO. Ealum Gas Com. No. 1	FORMATION Mesaverde
FIELD Blanco-Mesaverde	INTERVAL
COUNTY San Juan	SAMPLE FROM Bradenhead (10-20-76)
STATE New Mexico	DATE November 2, 1976

REMARKS & CONCLUSIONS:

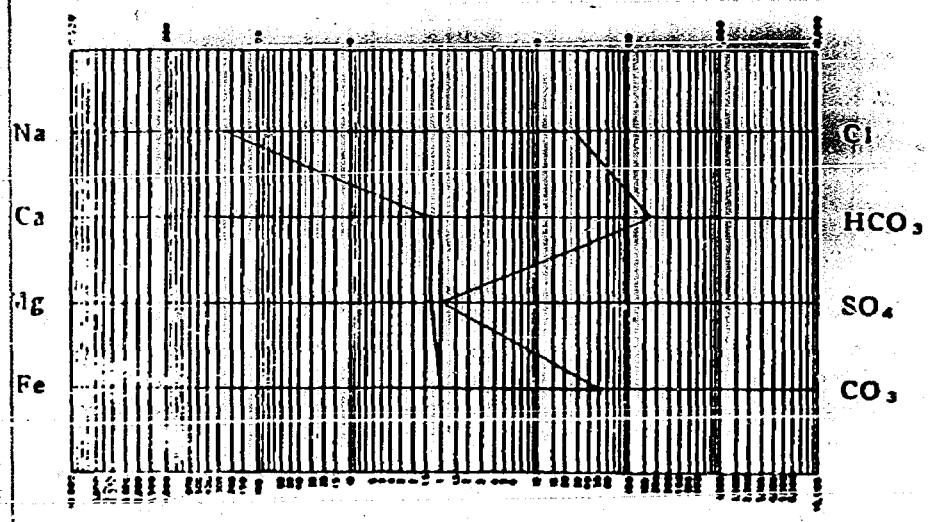
Cations	mg/l	meq/l	Anions	mg/l	meq/l
Sodium	5812	252.84	Sulfate	7	0.15
Potassium	41	1.05	Chloride	1010	28.48
Lithium			Carbonate	1680	55.94
Calcium	27	1.35	Bicarbonate	10492	172.07
Magnesium	17	1.40	Hydroxide		
Iron	-		Hydrogen sulfide	-	
Total Cations		256.64	Total Anions		256.64

Total dissolved solids, mg/l	13761
NaCl equivalent, mg/l	11876
Observed pH	9.0

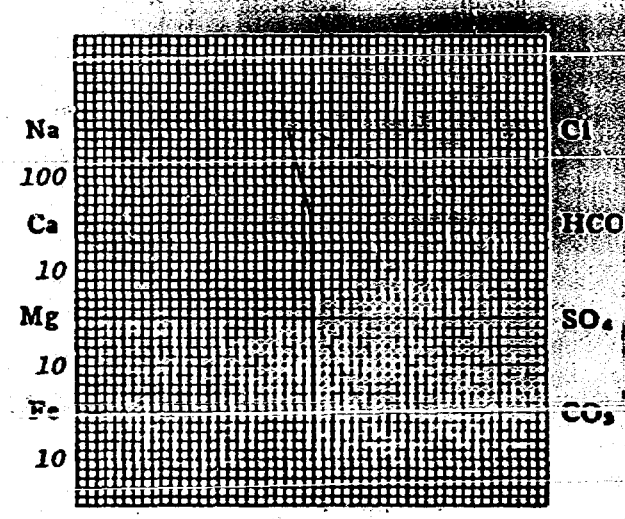
Specific resistance @ 68° F.:
Observed 0.60 ohm-meters
Calculated 0.56 ohm-meters

WATER ANALYSIS PATTERNS
MEQ per unit

LOGARITHMIC



STANDARD



(Na value in above graphs includes Na, K, and Li)
NOTE: Mg/l=Milligrams per liter. Meq/l=Milligram equivalents per liter
Sodium chloride equivalent=by Dunlap & Hawthorne calculation from components

Case 6233

AMOCO

Amoco Production Company
Security Life Building
Denver, Colorado 80202

April 21, 1978

Joe D. Ramey (3)
Secretary-Director
New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, NM 87501

File: RAS-410-986.511

Application for Water Disposal, Mt Nebo
Fruitland Field Extension
San Juan County, New Mexico

Pursuant to my telephone conversation with Dick Stamets, we ask that our captioned application filed with you by letter dated October 12, 1977 and supplemented by information contained in our letter dated February 15, 1978 be set for examiner hearing on Wednesday, May 17, 1978. The facts and statements in those two letters are correct except for one minor change. We can no longer use the Leeper Gas Com "B" Fruitland No. 1 well in NW/4 of Section 34, T32N-R10W as a Fruitland gas producing well because of damage to the formation. We have temporarily abandoned the well. We plan to drill a replacement Fruitland gas producing well as a twin to Leeper Gas Com "B" Fruitland No. 1 in the NW/4 of Section 34.

RBG Giles

RBG/ks
cc:
A. R. Kendrick, Supervisor
District No. 3
New Mexico Oil Conservation Commission
1000 Rio Brazos Road
Aztec, NM 87410

P. T. McGrath
United States Geological Survey
Box 959
Farmington, NM 87401

Case 6233

VERIFICATION AND AFFIDAVIT

STATE OF COLORADO)
: ss
COUNTY OF DENVER)

R. B. Giles of lawful age, being first duly sworn on his oath, deposes and says:

That he is employed in an engineering capacity by Amoco Production Company in its Denver, Colorado office; that Amoco's application for approval to dispose of Fruitland produced water by injection into the Ojo Alamo horizon at Cahn No. 3 in NW/4 Section 33 and Keys Gas Com "F" No. 1 in SW/4 Section 27, both in T32N, R10W in San Juan County, New Mexico, was prepared under his direction and supervision; that the matters and things therein set forth are true and correct to the best of his knowledge and beliefs; and that a copy thereof was sent by certified mail from Applicant's Denver, Colorado office on April 21, 1978 to the following parties, at the addresses shown herein, to wit:

Offset Operator

Supron Energy Corporation
400 S. Lorena Ave.
Farmington, New Mexico 87401

Surface Owners

Henry Knowlton
Rt. 1, Box 65-E
Aztec, New Mexico 87410

Katie Cahn
3703 Sequoia St.
Coral Gables, Florida 33134

and to the best of his information, knowledge and belief, the above named are the only parties to whom notice of such application is required to be given in accordance with Rule 701 of the New Mexico Oil Conservation Commission's Rules and Regulations.

R B Giles

R. B. Giles

Subscribed and sworn to before me this 21st day of April, 1978.

Sylvia J. Seamons
Notary Public

My Commission expires:

My Commission Expires Aug. 15, 1980

Case 6233

AMOCO

April 21, 1978

Amoco Production Company
Security Life Building
Denver, Colorado 80202

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Secretary-Director
New Mexico Oil Conservation Commission
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R B Giles

R. B. Giles

Subscribed and sworn to before me this 21st day of April, 1978.

Sylvia J. Seamons

Notary Public

My Commission expires:

My Commission Expires Aug. 15, 1980

NOTARY PUBLIC STATE OF COLORADO

ATWOOD, MALONE, MANN & COOTER
A PROFESSIONAL ASSOCIATION
LAWYERS

JEFF D. ATWOOD (1883-1960)
ROSS L. MALONE (1910-1974)

CHARLES F. MALONE
RUSSELL D. MANN
PAUL A. COOTER
BOB F. TURNER
ROBERT A. JOHNSON
JOHN W. BASSETT
ROBERT E. SABIN
R. E. THOMPSON

RANDAL W. ROBERTS

P. O. DRAWER 700
SECURITY NATIONAL BANK BUILDING
ROSWELL, NEW MEXICO 88201
(505) 622-6221

May 11, 1978

Mr. Joe D. Ramey
Oil Conservation Division
State Land Office Building
P. O. Box 871
Santa Fe, New Mexico

RE: Examiner hearing on May 17, 1978
Case No. 6233

Dear Mr. Ramey:

Please find the enclosed Entry of Appearance in the case, in behalf of Amoco Production Company.

With best regards, I am,

Very truly yours,

Charles F. Malone

CFM:sas
cc: Gordon Ryan, Esquire

BEFORE THE OIL CONSERVATION DIVISION

STATE OF NEW MEXICO

IN THE MATTER OF THE APPLICATION OF AMOCO PRODUCTION COMPANY FOR SALT WATER DISPOSAL, CAHN GAS COM WELL NO. 3 (SECTION 33) AND KEYS GAS COM "F" WELL NO. 1 (SECTION 27), TOWNSHIP 32 NORTH, RANGE 10 WEST, MT. NEBO-FRUITLAND POOL, SAN JUAN COUNTY, NEW MEXICO.	)	No. 6233

ENTRY OF APPEARANCE

The undersigned hereby enter appearance herein with Gordon Ryan, Esquire, of Denver, Colorado, in behalf of Amoco Production Company.

ATWOOD, MALONE, MANN & COOTER, P.A.

BY Charles Malone
P. O. Drawer 700
Roswell, New Mexico 88201

Attorneys for Amoco Production Company

BEFORE THE
NEW MEXICO OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO

MAY 17, 1978

COMMISSION HEARING

IN THE MATTER OF:

Application of Amoco Production Company for salt water disposal, San Juan County, New Mexico.

CASE 6233

BEFORE: Richard L. Stamets, Examiner

TRANSCRIPT OF HEARING

A P P E A R A N C E S

FOR THE NEW MEXICO OIL CONSERVATION COMMISSION:

Joe Ramey, Chairman
Emery Arnold, Commissioner
Phil Lucero, Commissioner
Richard L. Stamets, Staff Member

Lynn Teschendorf, Esq., Legal Counsel

LANPHERE REPORTING SERVICE
P.O. BOX 449
58 SOUTH FEDERAL PLACE
SANTA FE, NEW MEXICO 87501

FOR AMOCO PRODUCTION COMPANY:

GORDON B. RYAN
Attorney at Law
Denver, Colorado
BY: GORDON RYAN., ESQ.

ATWOOD & MALONE
Attorneys at Law
Roswell, New Mexico 88201
BY: CHARLES MALONE, ESQ.

MR. STAMETS: We'll call next case, 6233.

MS. TESCHENDORF: Case 6233. Application of Amoco Production Company for salt water disposal, San Juan County, New Mexico.

MR. STAMETS: I'd like to have the witnesses stand and be sworn, please.

(WHEREUPON, the witnesses were sworn.)

MR. RYAN: Gordon D. Ryan, R-Y-A-N, Denver, Colorado appearing on behalf of the Applicant, Amoco Production Company. Your file, Mr. Examiner, should reflect a letter from the firm of Atwood and Malone of Roswell, New Mexico from Charles Malone who's appearing in association with me in this case.

MR. STAMETS: The file has that letter.

MR. RYAN: Just the application of Amoco for salt water disposal and two wells in San Juan County, New Mexico.

R. B. GILES

the witness herein, having been first duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. RYAN:

Q I'd like to call my first witness. I'll ask him to state his name and by whom he's employed and in what

capacity.

A R. B. Giles, G-I-L-E-S, with Amoco Production Company in an engineering capacity in its Denver division office.

Q Mr. Giles, have you previously testified before this commission and had your qualifications submitted as an expert witness in the field of engineering?

A Yes, a number of times.

MR. RYAN: Is there any question about Mr. Giles' qualifications?

MR. STAMETS: No, he's considered qualified.

Q (Mr. Ryan) Have you prepared certain exhibits in preparation for this hearing?

A Yes, sir, I have.

Q Would you first of all refer to Exhibit 1, and I'll ask you to identify that exhibit and explain it.

A Yes, this is a plat of land ownership and shows the wells in the Cedar Hill area of San Juan County. It shows the existing Fruitland Gas wells and shows with triangles that are colored in dark the wells on each side of the Animas River that we which to dispose of produce Fruitland water into those wells at the Ojo Alamo level and use those triangular shaped wells as salt water disposal

wells. On the east side of the river in the southwest quarter of Section 27 is the Keys F-1 that is an abandoned hole we would reenter and complete through 4-1/2 inch pipe perforations in the Keys F-1 as an Old Alamo disposal well.

On the west side of the river we would need to drill a Cahn No. 3 well for water disposal into the Ojo Alamo.

The water would be produced from the Fruitland along with gas from the Cahn No. 1 in the northwest quarter of Section 33. This is the present Fruitland completion that is shut-in, waiting on sales line connection. The last test had 375 Mcfd and 225 barrels of water per day.

On the east side of the river we have the Leeper B-1 which made a small amount of gas in the Fruitland and 40 barrels of water per day. We frac the Fruitland and we damaged the formation. The well is temporarily abandoned. So our plans would be to drill a twin as a replacement well called the Leeper B-2 in the northwest quarter of Section 34.

Again, we'd like approval of disposal wells on each side of the Animas River. Now, we submitted with our initial application for this examiner hearing on October

12, 1977 a number of attachments to that letter application. We submitted completed forms C108 for each of the two disposal well candidates. We submitted a tabular summary of all the wells within a half mile of each disposal wells which penetrate the injection zone, the Ojo Alamo, showing all casings, rings, setting depths, cement use, cement tops, TDs and so forth. We also submitted as an attachment to that letter of application a downhole schematic diagram of the Holmberg Gas Cash B No. 1 which is a dry hole in the southeast quarter of Section 28 which is the only plugged and abandoned well within 1/2 mile of either disposal well candidate.

We also submitted log sections of the Ojo Alamo zone in the Keys F-1. This is one of our disposal wells. And the Schneider Gas Cahn B-1 which is in the southwest quarter of Section28, 32 North, 10 West which is a direct north offset to the Cahn No. 3 that we would drill as a disposal well.

We also submitted an analysis of the Cahn No. 1 produced water from the Fruitland, and we offer today as Exhibit No. 2 that analysis which shows that the total dissolved solids of the Fruitland water is 13,350 parts per million, certainly not useable water. We also show

Exhibit No. 3 entered today a sample of the Ojo Alamo water from the Leeper B No. well before we fraced and kind of damaged the Fruitland formation down below. We had perforated the Ojo Alamo and acidized the formation with 50 gallons of 15% hydro chloric acid and after swabbing for one hour, we took this sample which shows 17,634 parts per million total dissolved solids. About a half an hour later we took another sample which is shown or tendered as Exhibit No. 4 by Amoco for this hearing which supported the previous sample by showing 17,634 parts per million total dissolved solids. These two analyses of the Ojo Alamo water clearly indicate to us that this not useable water.

We also found that there's a water flow encounter in a newly drilled Cedar Hill well, the Usselman Gas Com No. 1A at a depth of 1190 feet and we offer Amoco Exhibit No. 5, that water analysis which showed the Ojo Alamo there has 10,778 parts per million.

What we're really saying is that we have bracketed say between 11,000 parts per million and over 17,600 parts per million, the Ojo Alamo chemistry of its water; and the water that we produced from the Fruitland would fall between in the middle of that bracket, 13,550 parts per million. So in our view, these waters are certainly not

useable.

We would have a distinct problem of having to dispose of water by any other means in this area. To us the Ojo Alamo offers the only plausible option available to us for subsurface disposal. As far as surface options that may be available, there really are none. There are no water disposable possibilities nearby, and therefore to truck the water, produce water out of the area really can't be considered.

Q Mr. Giles, what about the way that the new well is going to be drilled and the old well is going to be used as far as protecting the fresh water is concerned and the way that with the cement and the--

A Yes, our form C-108 indicates that we are for instance in the gas, Keys Com F-1 that we would reenter there's an 8-5/8 inch surface pipe set in 250 in depth cemented in the surface. There's a 4-1/2 inch intermediate string set at 2886 and cemented to the surface, and so the Ojo Alamo is completely cemented across its interval, and we would simply go in and perforate the Ojo Alamo and run the 2-3/8 inch tubing on a packer set above. The packer would be set above the Ojo Alamo and then inject the water into the Ojo Alamo through perfs. And we would complete

the new well, the Cahn gas Com well No. 3 in a very similar manner. We would set 4-1/2 inch through the Ojo Alamo perforate and running tubing on the packer and inject.

Q In your opinion that's certainly sufficient to protect the fresh water in this area?

A Yes, sir. And there would seem to be a reasonable presidence for using the Ojo Alamo. We find that there was an Administrative Order issued by Mr. Ramey, SWD-186 for El Paso's application to dispose of salt water into the Ojo Alamo at the Atlantic State well No. 6 in Section 16, 30 North, 10 West that was issued by the Commission on the 2nd day of August, 1977. This is a well about 10 miles to the south of this area.

Q Were exhibits 1 through 5 prepared by you or under your supervision?

A They were.

MR. RYAN: Mr. Examiner, that's all the testimony I have from this witness. We do have a geologist here that will give us a little bit of information of the structure in this area.

MR. STAMETS: Okay.

EXAMINATION

BY MR. STAMETS:

Q Mr. Giles, has Amoco considered putting this water back in the Fruitland?

A No really, no. No, we've got quite a bit of water coming with the gas and we'd really rather get rid of it somewhere else.

Q What volumes of water are we talking about here?

A Well, I gave you the test on the, the last test on the Cahn No. 1 I believe I said was 225 barrels of water a day. I would say, after we redrilled the twin well, the Leeper B-2 on the other side of the river, we may have 5-- or 600 barrels of water a day total for disposal. It's a nuisance and we'd like to get rid of it.

Q What about the Fruitland in itself, is that an active water drive formation?

A I think you have lenticular series of sand in the Fruitland, several members, some are reasonably dry, some are wet, produce quite a bit of water with the gas.

Q What you're getting at is if you put the water back in the Fruitland are you really changing anything, are you changing the situation?

A Yeah, I think you might. You might just drown

it out to where we would not be able to produce the gas effectively.

Q Okay. Have you done any research in the area, perhaps your other witness will know the answer to this, to determine if there are any water wells completed in the Ojo Alamo and the vicinity?

A Yes, we have.

Q Okay, we'll let your next witness discuss that then.

Any other questions of this witness?

You may be excused.

MR. RYAN: I'd like to call my next witness.

GARY C. HARRISON

the witness herein, having been previously duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. RYAN:

Q Would you please state your name, by whom you're employed and what capacity?

A I'm Gary Harrison, employed by Amoco Production Company as a Petroleum Geologist, Senior Grade in Denver.

Q Mr. Harrison, have you ever testified before this Commission or had your qualifications submitted?

A No, sir.

Q Would you state your qualifications first as to education, where to went to school, what degrees you achieved and when.

A I received a Bachelors of Science in Geology from Memphis State University in 1973, received a Masters of Science in Geology from Northern Arizona University at Flagstaff in 1975.

Q And since your graduation, what has been your employment?

A I've been employed by Amoco Production as a Petroleum Geologist for three years.

Q Have you been located in the Denver Division for those three years?

A Yes, sir.

Q Currently as part of your jurisdiction in your field in the State of New Mexico?

A I've worked in this particular basin for one year.

Q In the past year, do you belong to any professional societies?

A Yes, sir.

Q What?

A Geological Society of America, New Mexico

Geological Association.

Q And have you-- You have been working in the San Juan area for the past year?

A Yes, sir.

MR. RYAN: I offer Mr. Harrison as an expert witness in the field of geology at this time.

MR. STAMETS: The witness is considered qualified.

Q (Mr. Ryan) Mr. Harrison, in preparation for this hearing and in the study that you have conducted in the past year, have you prepared an exhibit in preparation for this hearing?

A Yes, sir.

Q Would you refer to what the Reporter has marked as Exhibit No. 6 and I ask that you identify that exhibit and what its purpose is?

A Exhibit No. 6 is a generalized structure of the San Juan Basin showing the disposal location, the Ojo Alamo Outcrop, the district areas of discharge and recharge. In general Outcrops of recharge, where the outcrops are the highest, the discharge water where the outcrops are the lowest. Recharge water from direct infiltration at the outcrop is of low salinity when it begins to move

underground, but the salinity increases progressively with movement through the formation to the places of discharge. The recharge of the Ojo Alamo occurs in the eastern and southern portion of the basin at altitudes of approximately 7-- to 8,000 feet. The water than moves northwestward and westward becoming progressively more saline from the recharge areas across the basin to discharge points along the Animas and San Juan River at altitudes of approximately 5500 feet.

The Ojo Alamo sandstone is 100 miles removed from the areas of recharge consequently has very poor water quality, produces no oil and gas anywhere in the San Juan Basin, therefore, Amoco Production Company believes the Ojo Alamo offers the only prudent and plausible option for water disposal.

Q And that can be done without injuring either fresh water or any hydrocarbons in there to be injured either, is that right?

A Right.

Q Anything else on Exhibit 6?

A No, sir.

MR. RYAN: That's all I have. Mr. Examiner, do you have some questions?

EXAMINATION

BY MR. STAMETS:

Q Just the same one I had of the previous witness. Have you all made any effort to determine if there are any water wells in the vicinity of the proposed disposal?

A There are no water wells in the, what I should say is potable water wells, in the vicinity of the discharge, of the disposal location. The only place in the basin where the Ojo Alamo is used for drinking water is by the Jicarilla Apache Indians along the southern and eastern edge, just down there from the recharge area.

Q How far removed is that from your proposed disposal?

A Apprxoimately 100 miles.

MR. STAMETS: Any other questions of this witness?

We have one.

Would you identify yourself for the record?

MR. McGRATH: P. T. McGrath of the U. S. Geological Survey, District Engineer, Farmington, New Mexico.

CROSS-EXAMINATION

BY MR. McGRATH:

Q And I'd like to ask this witness-- The outcrop

that the water goes in the southeastern part of Ojo Outcrop, now, it outcrops I would say within a short distance of this well to the northwest. What about the infiltration in that end of the field of the outcrop--

A The water--

Q --the fresh water coming into it.

A In the basin, the water movement is from the point of outcrop, the highest point of outcrop towards the point of the lowest outcrop so that the water, the discharge area would not be an area of recharge, significant recharge.

Q To me, I think it's-- I know the Ojo water, Ojo Alamo water, it's used throughout the basin and there's a lot closer, it's used a lot closer than the Jicarilla Reservation, and it's used all around the area for stock water, and I just don't believe this.

A I have no documentation that it's used as a potable water supply other than by the Jicarilla Apaches near the recharge area.

Q Mr. Arnold of this Commission started this protecting Ojo years ago because there was fresh water and useable and that's the way we've been protecting ever since from other waters, other contaminations; and I just don't

think that-- We have federal land all around it and I think they're going to object to it.

MR. STAMETS: Mr. McGrath, you're not sworn at this stage, let me ask you and we may want to swear you in.

Do you have any personal knowledge of any wells close to the applicant's proposed disposal area out of the Ojo Alamo?

MR. McGRATH: What do you mean, "close to"?

MR. STAMETS: Oh, within a mile or two.

MR. McGRATH: No, not within a mile or two, but within 10 to 15 miles, a lot closer than 100 miles.

REDIRECT EXAMINATION

BY MR. RYAN:

Q Mr. Harrison, in your opinion that the disposal of salt water as proposed by Amoco in these two wells, would harm the fresh water, any fresh water in this zone?

A No, sir, not at all. I think we've shown that the present salinities in the Ojo Alamo bracket the salinities of the disposal water. So I think we have no problem contaminating any fresh water supply at all.

MR. STAMETS: Mr. McGrath?

MR. McGRATH: Even if this saves the Ojo Alamo

more water at this disposal location, say it is 17,000 parts per million; but what is the extent of that? If they start putting more salt water into it, it's going to spread out and contaminate the fresh water zone. If they could get some samples around this area of the Ojo Alamo and have it analyzed to show that, to say that 2 or 3 miles it's still that bad, I don't think it will hurt it. But I do know that we use the Ojo Alamo water all around the Basin not necessarily for human consumption, but in some cases they do, but the stock use it all the time.

MR. STAMETS: Are there any other questions of either of the witnesses?

They may be excused.

Does anybody have anything they wish to add?

MR. RYAN: I'd like to offer Exhibits 1 through 6 into evidence.

MR. STAMETS: Okay. Exhibits 1 through 6 will be admitted.

Bart, before you get going I got one more question to ask you here.

FURTHER EXAMINATION

BY MR. STAMETS:

Q On the attachment to your original application

in this case, it shows the wells within a 1/2 mile and the Cahn No. 5 well shows the cement top at 2400 feet on the 7 inch casing, and then we drop down to the Hillum Gas Com No. 1 it shows a cement top of 3585 feet and there are a couple of others there where the intermediate casing was not circulated. Do these wells serve as a potential for movement of injected water or brackish water that's in the Ojo Alamo up the hole into other formations?

A In those particular wells, I presume that this could happen; but the way we intend to complete our well in our two wells, disposal wells in the Ojo Alamo, I would think that we certainly would not have a problem at those disposal points.

Q And this could represent flow channels where water could migrate up the hole.

A Yes, it's possible.

MR. STAMETS: Any other questions of the witness?

MR. RYAN: At this time I would request-- This application was first filed in October and it's now May, through no fault of anybody's, but we are anxious if this would be approved to get this projectgoing and we would, if it's at all possible, request that it perhaps be expedited or that we may proceed on oral approval if

that's possible.

MR. STAMETS: We will handle this matter as expeditiously as possible.

(WHEREUPON, this hearing on this case was concluded.)

LANPHERE REPORTING SERVICE
P.O. BOX 449
58 SOUTH FEDERAL PLACE
SANTA FE, NEW MEXICO 87501

REPORTER'S CERTIFICATE

I, BETTY J. LANPHERE, a Court Reporter with offices in Santa Fe, New Mexico, do hereby certify that the foregoing transcript is a complete and accurate record of said proceedings as the same were recorded by me stenographically and reduced to typewritten transcript by me or under my supervision.

DATED at Santa Fe, New Mexico, this _____ day of _____, 1978.

BETTY J. LANPHERE, Court Reporter

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 6233, heard by me on 5-12 1978.

Richard L. Stamets, Examiner
Oil Conservation Division

LANPHERE REPORTING SERVICE
P.O. BOX 449
58 SOUTH FEDERAL PLACE
SANTA FE, NEW MEXICO 87501

I N D E X

E X H I B I T S

BEFORE THE
NEW MEXICO OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO

MAY 17, 1978

COMMISSION HEARING

IN THE MATTER OF:

Application of Amoco Production Company for salt water disposal, San Juan County, New Mexico.

CASE 6233

BEFORE: Richard L. Stamets, Examiner

TRANSCRIPT OF HEARING

A P P E A R A N C E S

FOR THE NEW MEXICO OIL CONSERVATION COMMISSION:

Joe Ramey, Chairman
Emery Arnold, Commissioner
Phil Lucero, Commissioner
Richard L. Stamets, Staff Member

Lynn Teschendorf, Esq., Legal Counsel

LANPHERE REPORTING SERVICE
P.O. BOX 449
58 SOUTH FEDERAL PLACE
SANTA FE, NEW MEXICO 87501

FOR AMOCO PRODUCTION COMPANY:

GORDON B. RYAN
Attorney at Law
Denver, Colorado
BY: GORDON RYAN., ESQ.

ATWOOD & MALONE
Attorneys at Law
Roswell, New Mexico 88201
BY: CHARLES MALONE, ESQ.

MR. STAMETS: We'll call next case, 6233.

MS. TESCHENDORF: Case 6233. Application of Amoco Production Company for salt water disposal, San Juan County, New Mexico.

MR. STAMETS: I'd like to have the witnesses stand and be sworn, please.

(WHEREUPON, the witnesses were sworn.)

MR. RYAN: Gordon D. Ryan, R-Y-A-N, Denver, Colorado appearing on behalf of the Applicant, Amoco Production Company. Your file, Mr. Examiner, should reflect a letter from the firm of Atwood and Malone of Roswell, New Mexico from Charles Malone who's appearing in association with me in this case.

MR. STAMETS: The file has that letter.

MR. RYAN: Just the application of Amoco for salt water disposal and two wells in San Juan County, New Mexico.

R. B. GILES

the witness herein, having been first duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. RYAN:

Q I'd like to call my first witness. I'll ask him to state his name and by whom he's employed and in what

capacity.

A R. B. Giles, G-I-L-E-S, with Amoco Production Company in an engineering capacity in its Denver division office.

Q Mr. Giles, have you previously testified before this commission and had your qualifications submitted as an expert witness in the field of engineering?

A Yes, a number of times.

MR. RYAN: Is there any question about Mr. Giles' qualifications?

MR. STAMETS: No, he's considered qualified.

Q (Mr. Ryan) Have you prepared certain exhibits in preparation for this hearing?

A Yes, sir, I have.

Q Would you first of all refer to Exhibit 1, and I'll ask you to identify that exhibit and explain it.

A Yes, this is a plat of land ownership and shows the wells in the Cedar Hill area of San Juan County. It shows the existing Fruitland Gas wells and shows with triangles that are colored in dark the wells on each side of the Animas River that we which to dispose of produce Fruitland water into those wells at the Ojo Alamo level and use those triangular shaped wells as salt water disposal

wells. On the east side of the river in the south west quarter of Section 27 is the Keys F-1 that is an abandoned hole we would reenter and complete through 4-1/2 inch pipe perforations in the Keys F-1 as an Old Alamo disposal well.

On the west side of the river we would need to drill a Cahn No. 3 well for water disposal into the Ojo Alamo.

The water would be produced from the Fruitland along with gas from the Cahn No. 1 in the northwest quarter of Section 33. This is the present Fruitland completion that is shut-in, waiting on sales line connection. The last test had 375 Mcfd and 225 barrels of water per day.

On the east side of the river we have the Leeper B-1 which made a small amount of gas in the Fruitland and 40 barrels of water per day. We frac the Fruitland and we damaged the formation. The well is temporarily abandoned. So our plans would be to drill a twin as a replacement well called the Leeper B-2 in the northwest quarter of Section 34.

Again, we'd like approval of disposal wells on each side of the Animas River. Now, we submitted with our initial application for this examiner hearing on October

12, 1977 a number of attachments to that letter application. We submitted completed forms C108 for each of the two disposal well candidates. We submitted a tabular summary of all the wells within a half mile of each disposal wells which penetrate the injection zone, the Ojo Alamo, showing all casings, rings, setting depths, cement use, cement tops, TDs and so forth. We also submitted as an attachment to that letter of application a downhole schematic diagram of the Holmberg Gas Cash B No. 1 which is a dry hole in the southeast quarter of Section 28 which is the only plugged and abandoned well within 1/2 mile of either disposal well candidate.

We also submitted log sections of the Ojo Alamo zone in the Keys F-1. This is one of our disposal wells. And the Schneider Gas Cahn B-1 which is in the southwest quarter of Section28, 32 North, 10 West which is a direct north offset to the Cahn No. 3 that we would drill as a disposal well.

We also submitted an analysis of the Cahn No. 1 produced water from the Fruitland, and we offer today as Exhibit No. 2 that analysis which shows that the total dissolved solids of the Fruitland water is 13,350 parts per million, certainly not useable water. We also show

Exhibit No. 3 entered today a sample of the Ojo Alamo water from the Leeper B No. well before we fraced and kind of damaged the Fruitland formation down below. We had perforated the Ojo Alamo and acidized the formation with 50 gallons of 15% hydro chloric acid and after swabbing for one hour, we took this sample which shows 17,634 parts per million total dissolved solids. About a half an hour later we took another sample which is shown or tendered as Exhibit No. 4 by Amoco for this hearing which supported the previous sample by showing 17,634 parts per million total dissolved solids. These two analyses of the Ojo Alamo water clearly indicate to us that this not useable water.

We also found that there's a water flow encounter in a newly drilled Cedar Hill well, the Usselman Gas Com No. 1A at a depth of 1190 feet and we offer Amoco Exhibit No. 5, that water analysis which showed the Ojo Alamo there has 10,778 parts per million.

What we're really saying is that we have bracketed say between 11,000 parts per million and over 17,600 parts per million, the Ojo Alamo chemistry of its water; and the water that we produced from the Fruitland would fall between in the middle of that bracket, 13,550 parts per million. So in our view, these waters are certainly not

useable.

We would have a distinct problem of having to dispose of water by any other means in this area. To us the Ojo Alamo offers the only plausible option available to us for subsurface disposal. As far as surface options that may be available, there really are none. There are no water disposable possibilities nearby, and therefore to truck the water, produce water out of the area really can't be considered.

Q Mr. Giles, what about the way that the new well is going to be drilled and the old well is going to be used as far as protecting the fresh water is concerned and the way that with the cement and the--

A Yes, our form C-108 indicates that we are for instance in the gas, Keys Com F-1 that we would reenter there's an 8-5/8 inch surface pipe set in 250 in depth cemented in the surface. There's a 4-1/2 inch intermediate string set at 2886 and cemented to the surface, and so the Ojo Alamo is completely cemented across its interval, and we would simply go in and perforate the Ojo Alamo and run the 2-3/8 inch tubing on a packer set above. The packer would be set above the Ojo Alamo and then inject the water into the Ojo Alamo through perfs. And we would complete

the new well, the Cahn gas Com well No. 3 in a very similar manner. We would set 4-1/2 inch through the Ojo Alamo perforate and running tubing on the packer and inject.

Q In your opinion that's certainly sufficient to protect the fresh water in this area?

A Yes, sir. And there would seem to be a reasonable presidence for using the Ojo Alamo. We find that there was an Administrative Order issued by Mr. Ramey, SWD-186 for El Paso's application to dispose of salt water into the Ojo Alamo at the Atlantic State well No. 6 in Section 16, 30 North, 10 West that was issued by the Commission on the 2nd day of August, 1977. This is a well about 10 miles to the south of this area.

Q Were exhibits 1 through 5 prepared by you or under your supervision?

A They were.

MR. RYAN: Mr. Examiner, that's all the testimony I have from this witness. We do have a geologist here that will give us a little bit of information of the structure in this area.

MR. STAMETS: Okay.

EXAMINATION

BY MR. STAMETS:

Q. Mr. Giles, has Amoco considered putting this water back in the Fruitland?

A No really, no. No, we've got quite a bit of water coming with the gas and we'd really rather get rid of it somewhere else.

Q What volumes of water are we talking about here?

A Well, I gave you the test on the, the last test on the Cahn No. 1 I believe I said was 225 barrels of water a day. I would say, after we redrilled the twin well, the Leeper B-2 on the other side of the river, we may have 5-- or 600 barrels of water a day total for disposal. It's a nuisance and we'd like to get rid of it.

Q What about the Fruitland in itself, is that an active water drive formation?

A I think you have lenticular series of sand in the Fruitland, several members, some are reasonably dry, some are wet, produce quite a bit of water with the gas.

Q What you're getting at is if you put the water back in the Fruitland are you really changing anything, are you changing the situation?

A Yeah, I think you might. You might just drown

it out to where we would not be able to produce the gas effectively.

Q Okay. Have you done any research in the area, perhaps your other witness will know the answer to this, to determine if there are any water wells completed in the Ojo Alamo and the vicinity?

A Yes, we have.

Q Okay, we'll let your next witness discuss that then.

Any other questions of this witness?

You may be excused.

MR. RYAN: I'd like to call my next witness.

GARY C. HARRISON

the witness herein, having been previously duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. RYAN:

Q Would you please state your name, by whom you're employed and what capacity?

A I'm Gary Harrison, employed by Amoco Production Company as a Petroleum Geologist, Senior Grade in Denver.

Q Mr. Harrison, have you ever testified before this Commission or had your qualifications submitted?

A No, sir.

Q Would you state your qualifications first as to education, where to went to school, what degrees you achieved and when.

A I received a Bachelors of Science in Geology from Memphis State University in 1973, received a Masters of Science in Geology from Northern Arizona University at Flagstaff in 1975.

Q And since your graduation, what has been your employment?

A I've been employed by Amoco Production as a Petroleum Geologist for three years.

Q Have you been located in the Denver Division for those three years?

A Yes, sir.

Q Currently as part of your jurisdiction in your field in the State of New Mexico?

A I've worked in this particular basin for one year.

Q In the past year, do you belong to any professional societies?

A Yes, sir.

Q What?

A Geological Society of America, New Mexico

Geological Association.

Q And have you-- You have been working in the San Juan area for the past year?

A Yes, sir.

MR. RYAN: I offer Mr. Harrison as an expert witness in the field of geology at this time.

MR. STAMETS: The witness is considered qualified.

Q (Mr. Ryan) Mr. Harrison, in preparation for this hearing and in the study that you have conducted in the past year, have you prepared an exhibit in preparation for this hearing?

A Yes, sir.

Q Would you refer to what the Reporter has marked as Exhibit No. 6 and I ask that you identify that exhibit and what its purpose is?

A Exhibit No. 6 is a generalized structure of the San Juan Basin showing the disposal location, the Ojo Alamo Outcrop, the district areas of discharge and recharge. In general Outcrops of recharge, where the outcrops are the highest, the discharge water where the outcrops are the lowest. Recharge water from direct infiltration at the outcrop is of low salinity when it begins to move

underground, but the salinity increases progressively with movement through the formation to the places of discharge. The recharge of the Ojo Alamo occurs in the eastern and southern portion of the basin at altitudes of approximately 7--- to 8,000 feet. The water than moves northwestward and westward becoming progressively more saline from the recharge areas across the basin to discharge points along the Animas and San Juan River at altitudes of approximately 5500 feet.

The Ojo Alamo sandstone is 100 miles removed from the areas of recharge consequently has very poor water quality, produces no oil and gas anywhere in the San Juan Basin, therefore, Amoco Production Company believes the Ojo Alamo offers the only prudent and plausible option for water disposal.

Q And that can be done without injuring either fresh water or any hydrocarbons in there to be injured either, is that right?

A Right.

Q Anything else on Exhibit 6?

A No, sir.

MR. RYAN: That's all I have. Mr. Examiner, do you have some questions?

EXAMINATION

BY MR. STAMETS:

Q Just the same one I had of the previous witness. Have you all made any effort to determine if there are any water wells in the vicinity of the proposed disposal?

A There are no water wells in the, what I should say is potable water wells, in the vicinity of the discharge, of the disposal location. The only place in the basin where the Ojo Alamo is used for drinking water is by the Jicarilla Apache Indians along the southern and eastern edge, just down there from the recharge area.

Q How far removed is that from your proposed disposal?

A Apprxoimately 100 miles.

MR. STAMETS: Any other questions of this witness?

We have one.

Would you identify yourself for the record?

MR. McGRATH: P. T. McGrath of the U. S. Geological Survey, District Engineer, Farmington, New Mexico.

CROSS-EXAMINATION

BY MR. McGRATH:

Q And I'd like to ask this witness-- The outcrop

that the water goes in the southeastern part of Ojo Outcrop, now, it outcrops I would say within a short distance of this well to the northwest. What about the infiltration in that end of the field of the outcrop---

A The water--

Q --the fresh water coming into it.

A In the basin, the water movement is from the point of outcrop, the highest point of outcrop towards the point of the lowest outcrop so that the water, the discharge area would not be an area of recharge, significant recharge.

Q To me, I think it's-- I know the Ojo water, Ojo Alamo water, it's used throughout the basin and there's a lot closer, it's used a lot closer than the Jicarilla Reservation, and it's used all around the area for stock water, and I just don't believe this.

A I have no documentation that it's used as a potable water supply other than by the Jicarilla Apaches near the recharge area.

Q Mr. Arnold of this Commission started this protecting Ojo years ago because there was fresh water and useable and that's the way we've been protecting ever since from other waters, other contaminations; and I just don't

think that-- We have federal land all around it and I think they're going to object to it.

MR. STAMETS: Mr. McGrath, you're not sworn at this stage, let me ask you and we may want to swear you in.

Do you have any personal knowledge of any wells close to the applicant's proposed disposal area out of the Ojo Alamo?

MR. McGRATH: What do you mean, "close to"?

MR. STAMETS: Oh, within a mile or two.

MR. McGRATH: No, not within a mile or two, but within 10 to 15 miles, a lot closer than 100 miles.

REDIRECT EXAMINATION

BY MR. RYAN:

Q Mr. Harrison, in your opinion that the disposal of salt water as proposed by Amoco in these two wells, would harm the fresh water, any fresh water in this zone?

A No, sir, not at all. I think we've shown that the present salinities in the Ojo Alamo bracket the salinities of the disposal water. So I think we have no problem contaminating any fresh water supply at all.

MR. STAMETS: Mr. McGrath?

MR. McGRATH: Even if this saves the Ojo Alamo

more water at this disposal location, say it is 17,000 parts per million; but what is the extent of that? If they start putting more salt water into it, it's going to spread out and contaminate the fresh water zone. If they could get some samples around this area of the Ojo Alamo and have it analyzed to show that, to say that 2 or 3 miles it's still that bad, I don't think it will hurt it. But I do know that we use the Ojo Alamo water all around the Basin not necessarily for human consumption, but in some cases they do, but the stock use it all the time.

MR. STAMETS: Are there any other questions of either of the witnesses?

They may be excused.

Does anybody have anything they wish to add?

MR. RYAN: I'd like to offer Exhibits 1 through 6 into evidence.

MR. STAMETS: Okay. Exhibits 1 through 6 will be admitted.

Bart, before you get going I got one more question to ask you here.

FURTHER EXAMINATION

BY MR. STAMETS:

Q On the attachment to your original application

in this case, it shows the wells within a 1/2 mile and the Cahn No. 5 well shows the cement top at 2400 feet on the 7 inch casing, and then we drop down to the Hillum Gas Com No. 1 it shows a cement top of 3585 feet and there are a couple of others there where the intermediate casing was not circulated. Do these wells serve as a potential for movement of injected water or brackish water that's in the Ojo Alamo up the hole into other formations?

A In those particular wells, I presume that this could happen; but the way we intend to complete our well in our two wells, disposal wells in the Ojo Alamo, I would think that we certainly would not have a problem at those disposal points.

Q And this could represent flow channels where water could migrate up the hole.

A Yes, it's possible.

MR. STAMETS: Any other questions of the witness?

MR. RYAN: At this time I would request-- This application was first filed in October and it's now May, through no fault of anybody's, but we are anxious if this would be approved to get this projectgoing and we would, if it's at all possible, request that it perhaps be expedited or that we may proceed on oral approval if

that's possible.

MR. STAMETS: We will handle this matter as expeditiously as possible.

(WHEREUPON, this hearing on this case was concluded.)

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SANTA FE, NEW MEXICO 87501

REPORTER'S CERTIFICATE

I, BETTY J. LANPHERE, a Court Reporter with offices in Santa Fe, New Mexico, do hereby certify that the foregoing transcript is a complete and accurate record of said proceedings as the same were recorded by me stenographically and reduced to typewritten transcript by me or under my supervision.

DATED at Santa Fe, New Mexico, this 23rd day of October, 1978.

Betty J. Lanphere
BETTY J. LANPHERE, Court Reporter

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 6233, heard by me on 5-17 1978.

Richard L. Stamets, Examiner
Oil Conservation Division

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Memo

From

LYNN
TESCHENDORF

To Cook —

Amoco Production called about that injection well north of Aztec. They'll apply for hearing sometime after the first of the year.

L

10-18

Dan:

What do you think of this one? They would put Fruitland water (from gas production) into the Ojo Alamo which is used for domestic water source by Indians. They also say in letter that injection would be 0.2 psi/ft depth or less, but on C-108 say it will be 1200 psi. which is 5 times the 0.2 psi we usually require.

Amoco Production Company

ENGINEERING CHART

Case 6233

SHEET NO. OF

FILE Attachment 1

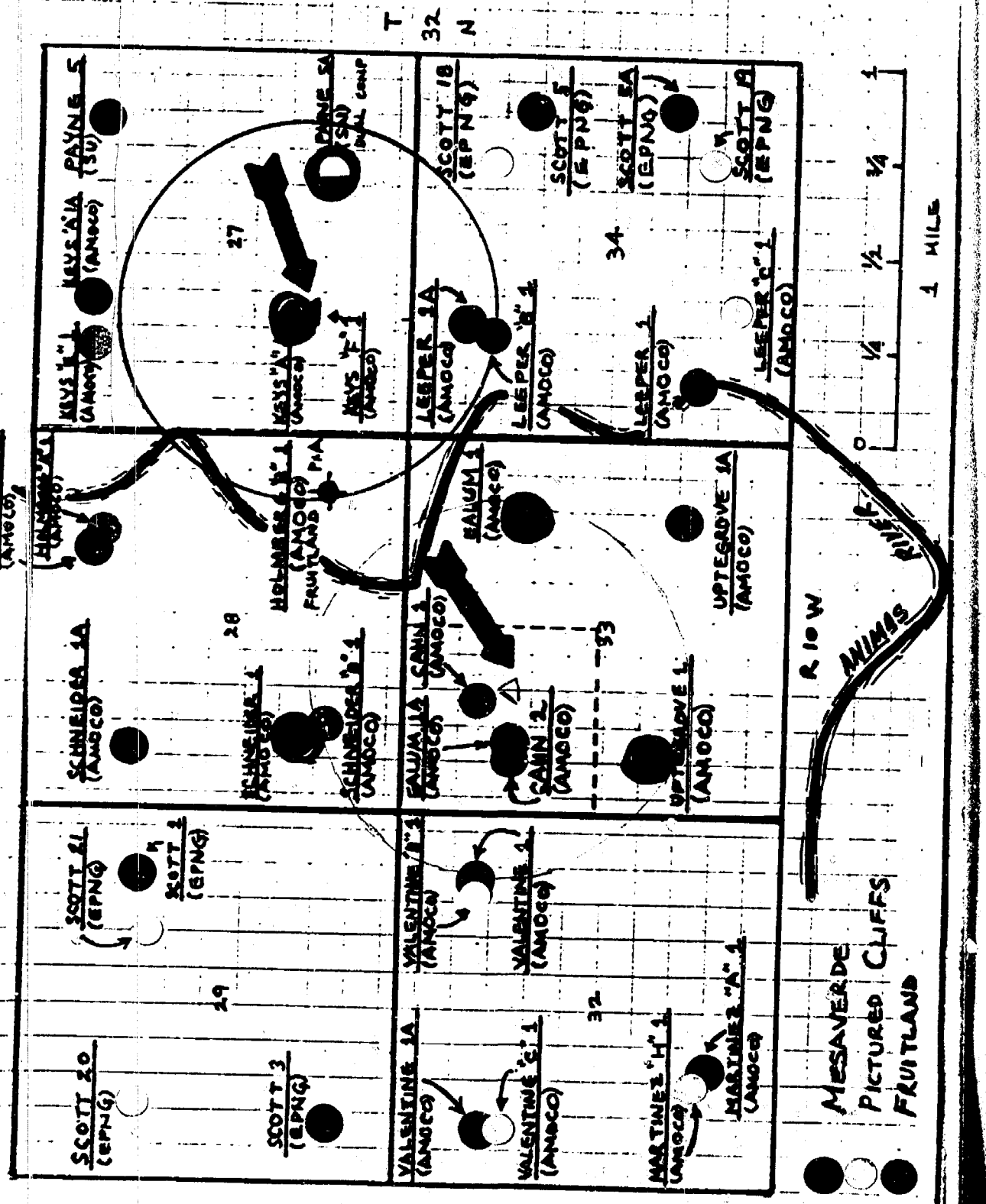
APPN

DATE 9-12-77

BY WRC

SUBJECT CEDAR HILL AREA

SAN JUAN COUNTY, NEW MEXICO



Case 6233

11/9/77

Amoco Production Company
Security Life Building
Denver, Colorado 80202

Carl Amoco advised Amoco that this would require a hearing. They said they will let us know when they want to go on it.

October 12, 1977

Joe D. Ramey (3)
Secretary-Director
New Mexico Oil Conservation Commission
P.O. Box 2088
Santa Fe, New Mexico 87501

File: VDP-1382-986.511

Application for Water Disposal, Mt. Nebo Fruitland Field Extension,
San Juan County, New Mexico

Amoco respectfully requests your administrative approval without a hearing, if you have no objection and the owners herein notified offer no objection, of its application to dispose of Fruitland water, that is produced with the gas from its Cahn No. 1 and Leeper Gas Com "B" Fruitland No. 1 wells in Sections 33 and 34, T32N-R10W, by injection into the Ojo Alamo formation. Upon your approval, Amoco would drill a water disposal well, its Cahn No. 3 in NW/4 Section 33, T32N-R10W and would re-enter and complete as a water disposal well its abandoned 100% WI Keys Gas Com "F" No. 1 in SW/4 Section 27, T32N-R10W. This would provide disposal wells at the Ojo Alamo level on both sides of the Animas River to handle the volumes of water that are produced from the Fruitland on each side of the river.

There is precedence for such a water disposal plan. El Paso obtained your administrative approval without a hearing to dispose of produced water into the Ojo Alamo at the Atlantic State No. 6 well in Section 16, T30N-R10W, approximately 10 miles to the south of the area involved with this application.

While the Ojo Alamo, where it's shallow, is used by the Indians as a potable water supply, the nearest Indian lands are more than 30 miles away. The Ojo Alamo under the lands involved with this application lies at a depth in excess of 1,000 feet and consequently is not used as a water supply by the fee owners. Also, there is no oil or gas production from the Ojo Alamo anywhere in the San Juan Basin. Therefore, the requirement of Rule 701 for Applicant to include a plat showing all leases and wells within a two-mile radius of the disposal wells would be inappropriate and needlessly burdensome.

Amoco encloses the following to support its water disposal application:

Case 6233

Attachment 1, a plat showing all wells and lessees in the vicinity of Amoco's two proposed water disposal candidates, Cahn No. 3 and Keys Gas Com "F" No. 1.

Completed Form C-108's for each of the two disposal well candidates.

Attachment 3 is a tabular summary of all wells, within one-half mile of the disposal wells, which penetrate the injection zone showing all casing strings, setting depths, sacks of cement used, cement tops, total depth, producing interval, well identification, and location.

Attachment 4, a downhole schematic of the Holmberg Gas Com "B" No. 1 in Section 28, which is the only plugged and abandoned well within one-half mile of either disposal candidate.

Attachments 5 and 6 are log sections of the Ojo Alamo zone in the Keys "F" No. 1 and the Schneider Gas Com "B" No. 1 which is located in the SW/4 Section 28, T32N-R10W, a direct north offset to the Cahn No. 3.

Attachments 7 a-c are water analyses of bradenhead samples taken from producing Mesaverde gas wells in the area of the two water disposal candidates.

Attachment 8 is an analysis of Cahn No. 1 produced water.

Both the Cahn Gas Com No. 1 and the Leeper Gas Com "B" No. 1 are awaiting a gas sales line connection. However, in our view, it would not be possible to produce these Fruitland wells without our recommended water disposal system. The Ojo Alamo offers the only plausible option available to us for subsurface water disposal. As for surface options available, there are none. There are no water disposal possibilities nearby, thus, trucking the produced water out of the area has to be eliminated from consideration.

If approval is granted for this water disposal system, Amoco, pursuant to Memo No. 3-77 from your office dated August 24, 1977, will not inject water into either disposal well using a surface injection pressure greater than 0.2 psi per foot of depth to the top of the Ojo Alamo, unless we find the Ojo Alamo has a fracture gradient which would support a higher pressure.

The attached Verification and Affidavit, a part of this application, demonstrates that a copy of this application was sent by certified mail to all offset owners, other than Amoco, and the surface owner of the land upon which each of the two disposal candidates is located.

RBG Giles

RBG:ks
Attachments

Case 6233

cc: A.R. Kendrick, Supervisor
District No. 3
New Mexico Oil Conservation Commission
1000 Rio Brazos Road
Aztec, New Mexico 87410

P.T. McGrath
United States Geological Survey
Box 959
Farmington, New Mexico 87401

Case 6253

VERIFICATION AND AFFIDAVIT

STATE OF COLORADO)
: ss
COUNTY OF DENVER)

R. B. Giles, of lawful age, being first duly sworn on his oath, deposes and says:

That he is employed in an engineering capacity by Amoco Production Company in its Denver, Colorado office; that Amoco's application for approval to dispose of Fruitland produced water by injection into the Ojo Alamo horizon at Cahn No. 3 in NW/4 Section 33 and Keys Gas Com "F" No. 1 in SW/4 Section 27, both in T32N, R10W in San Juan County, New Mexico, was prepared under his direction and supervision; that the matters and things therein set forth are true and correct to the best of his knowledge and beliefs; and that a copy thereof was sent by certified mail from Applicant's Denver, Colorado office on October 12, 1977 to the following parties, at the addresses shown herein, to wit:

Offset Operator	Surface Owners
Supron Energy Corporation 400 S. Lorena Ave. Farmington, New Mexico 87401	Henry Knowlton Rt. 1, Box 65-E Aztec, New Mexico 87410
	Katie Cahn 3703 Sequoia St. Coral Gables, Florida 33134

and to the best of his information, knowledge and belief, the above named are the only parties to whom notice of such application is required to be given in accordance with Rule 701 of the New Mexico Oil Conservation Commission's Rules and Regulations.

R. B. Giles
R. B. GILES

Subscribed and sworn to before me this 12th day of October, 1977.

STATE OF COLORADO * SYLVIA L. SEAMANS * NOTARY PUBLIC

Sylvia L. Seamans
NOTARY PUBLIC

My Commission expires:
My Commission Expires Aug. 15, 1980

ATTACHMENT 3

CEDAR HILL WELLS WITHIN 1/2 MILE OF POTENTIAL WATER DISPOSAL WELLS

WELL NAME / OPERATOR	WELL LOCATION	HOLE SIZE	CASING SIZE AND WT.	SETTING DEPTH (FT)	CEMENT	CEMENT TOPS	TD	PRODUCING INTERVAL
Payne No. 5A Southern Union Supron Energy Corp	1140' FSL x 1725' FEL Sec. 27, T-32-N, R-10-W	13-3/4" 8-3/4" 6-1/4"	10-3/4" 30# 7" 23# 4-1/2" 10.5#	346' 3443' 3323-5690'	350 sx 230 sx 310 sx	CIRC 2400' ✓ 4600'	5770'	Pictured Cliff Mesaverde
Cahn Gas Com No. 1 Amoco	1030' FNL x 1600' FWL Sec. 33, T-32-N, R-10-W	12-1/4" 8-3/4"	9-5/8" 32.3# 7" 20#	253' 2795'	250 sx 600 sx	CIRC. * 100-200'	2812'	Fruitland
Cahn Gas Com No. 2 Amoco	1510' FNL x 800' FWL Sec. 33, T-32-N, R-10-W	12-1/4" 7-7/8"	8-5/8" 24# 4-1/2" 11#	276' 2957'	250 sx 680 sx	CIRC * 100-200'	2946'	Fruitland
Kalum Gas Com No. 1 Amoco	1650' FNL x 1140' FEL Sec. 33, T-32-N, R-10-W	12-1/4" 8-3/4" 6-1/4"	9-5/8" 32.3# 7" 20# x 23# 5" 15# 5-1/2" 14#	256' 4642' 4346-5320'	200 sx 438ft^3 190 sx	CIRC 3585' ✓ * 4300'	5320'	Mesaverde
Kalum Gas Com No. 1A Amoco	1450' FNL x 1030' FWL Sec. 33, T-32-N, R-10-W	12-1/4" 8-3/4" 6-1/4"	9-5/8" 32.3# 7" 23# 4-1/2" 10.5#	259' 3200' 3018-5400'	280 sx 775 sx 375 sx	CIRC CIRC CIRC	5400'	Mesaverde
Schneider Gas Com No. 1 Amoco	1450' FSL x 990' FWL Sec. 28, T-32-N, R-10-W	12-1/4" 8-3/4" 6-1/4"	9-5/8" 32.3# 7" 20# x 23# 5-1/2" 14#	255' 4646' 4570-5144'	275 sx 428ft^3 122 sx	CIRC 4020' ✓ 4700'	5410'	Mesaverde
Schneider Gas Com No. 1A Amoco	1460' FNL x 810' FWL Sec. 28, T-32-N, R-10-W	12-1/4" 8-3/4" 6-1/4"	9-5/8" 36# 7" 23# 4-1/2" 10.5#	270' 3349' 3159-5514'	280 sx 685 sx 280 sx	CIRC CIRC 4796'	5525'	Mesaverde
Schneider Gas Com "B" No. 1 Amoco	1110' FSL x 1185' FWL Sec. 28, T-32-N, R-10-W	12-1/4" 7-7/8"	8-5/8" 24# 4-1/2" 10.5#	258' 3050'	200 sx 930 sx	CIRC CIRC	3050'	Fruitland
Stegrove Gas Com No. 1 Amoco	1850' FSL x 790' FWL Sec. 33, T-32-N, R-10-W	12-1/4" 8-3/4" 6-1/4"	9-5/8" 32.3# 7" 20# 5" 15#	279' 4579' 4445-5261'	190 sx 438ft^3 285 sx	CIRC 3210' ✓ CIRC	5270'	Mesaverde
Stegrove Gas Com No. 1A Amoco	1470' FSL x 1190' FEL Sec. 33, T-32-N, R-10-W	12-1/4" 8-3/4" 6-1/4"	9-5/8" 36# 7" 23# 4-1/2" 10.5#	267' 3075' 2868-5250'	280 sx 635 sx 280 sx	CIRC CIRC CIRC	5250'	Mesaverde

CALCULATED CEMENT TOPS

Case 6233

WELL NAME OPERATOR	WELL LOCATION	HOLE SIZE	CASING SIZE AND WT.	SETTING DEPTH (FT)	CEMENT	CEMENT TOPS	TD	PRODUCING INTERVAL
Leeper Gas Com No. 1A Amoco	800' FNL x 1590' FWL Sec. 34, T-32-N, R-10-W	12-1/4" 8-3/4" 6-1/4"	9-5/8" 32.3# 7" 23# 4-1/2" 10.5#	254' 3149' 2962-5305'	280 sx 775 sx 375 sx	CIRC *100-200' CIRC	5305'	Mesaverde
Leeper Gas Com "B" No. 1 Amoco	1110' FNL x 1450' FWL Sec. 34, T-32-N, R-10-W	12-1/4" 7-7/8"	8-5/8" 24# 4-1/2" 10.5# x 11#	258' 2851'	200 sx 870 sx	CIRC CIRC	2851'	Fruitland
Valentine Gas Com No. 1 Amoco	990' FNL x 990' FEL Sec. 32, T-32-N, R-10-W	12-1/4" 8-3/4" 4-3/4"	9-5/8" 32.3# 7" 20# 4" 11.34#	261' 4570' 4196-5289'	250 sx 800 sx 225 sx	CIRC CIRC CIRC	5289'	Mesaverde
Valentine Gas Com "B" No.1 Amoco	1140' FNL x 1140' FEL Sec. 32, T-32-N, R-10-W	12-1/4" 7-7/8"	8-5/8" 24# 4-1/2" 10.5# x 11#	261' 2960'	275 sx 640 sx	CIRC *100-200'	2960'	Pictured Cliff
Keys Gas Com "A" No. 1 Amoco	1650' FSL x 1650' FWL Sec. 27, T-32-N, R-10-W	12-1/4" 8-3/4" 6-1/4"	9-5/8" 32.3# 7" 20# x 23# 5" 15#	250' 4551' 4405-5243'	225 sx 438ft^3 100 sx	CIRC 2490' ✓ *CIRC	5243'	Mesaverde

* Calculated cement tops

Cas 6233

Amoco Production Company

ENGINEERING CHART

Case 6233

SHEET NO. OF

FILE ATTACHMENT 4

AREA

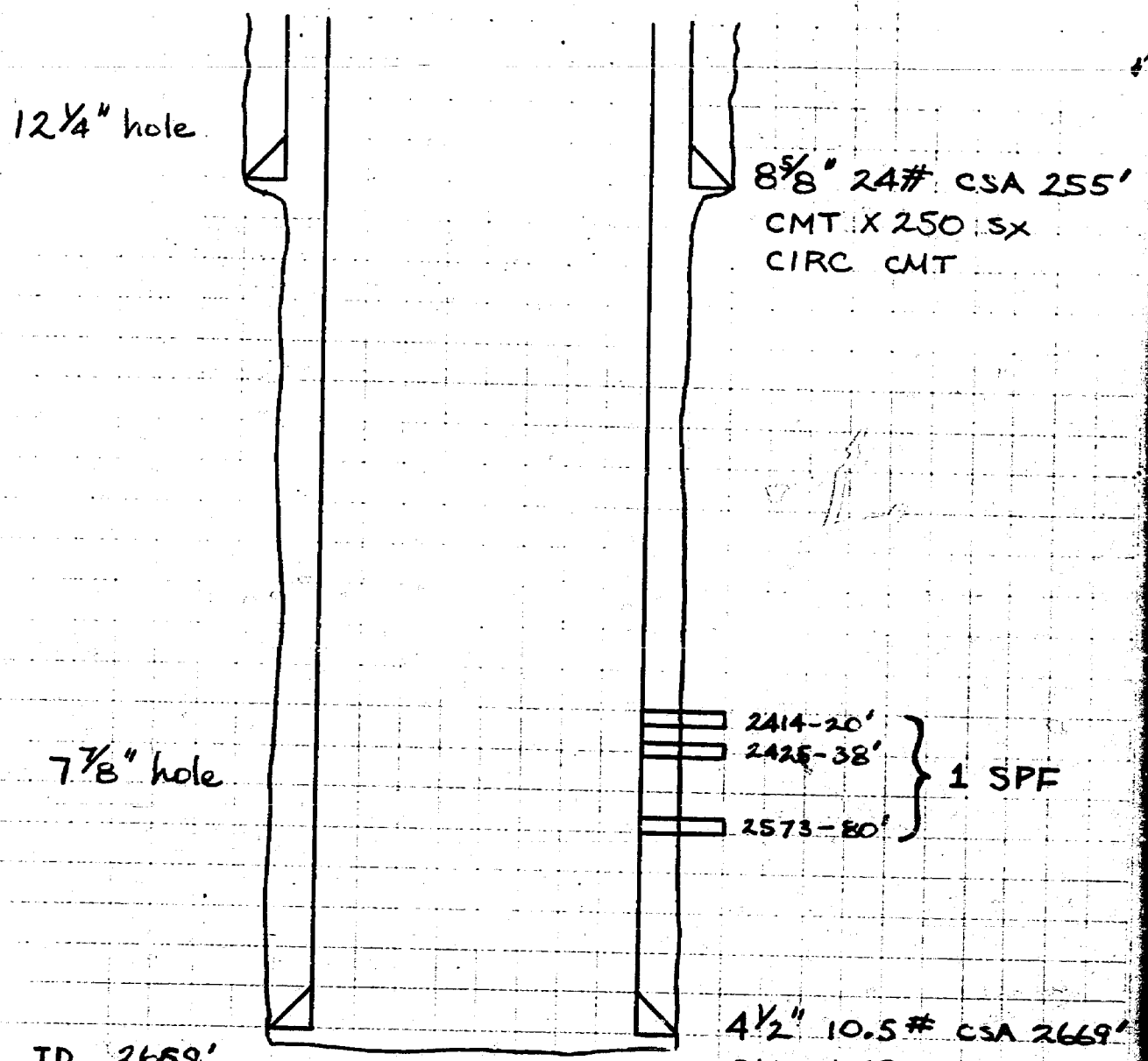
DATE 9-14-77

BY WRC

SUBJECT HOLMBERG GAS COM "B" No. 1

1190' FSL X 810' FEL, SEC 28 32-10

SAN JUAN COUNTY, NEW MEXICO

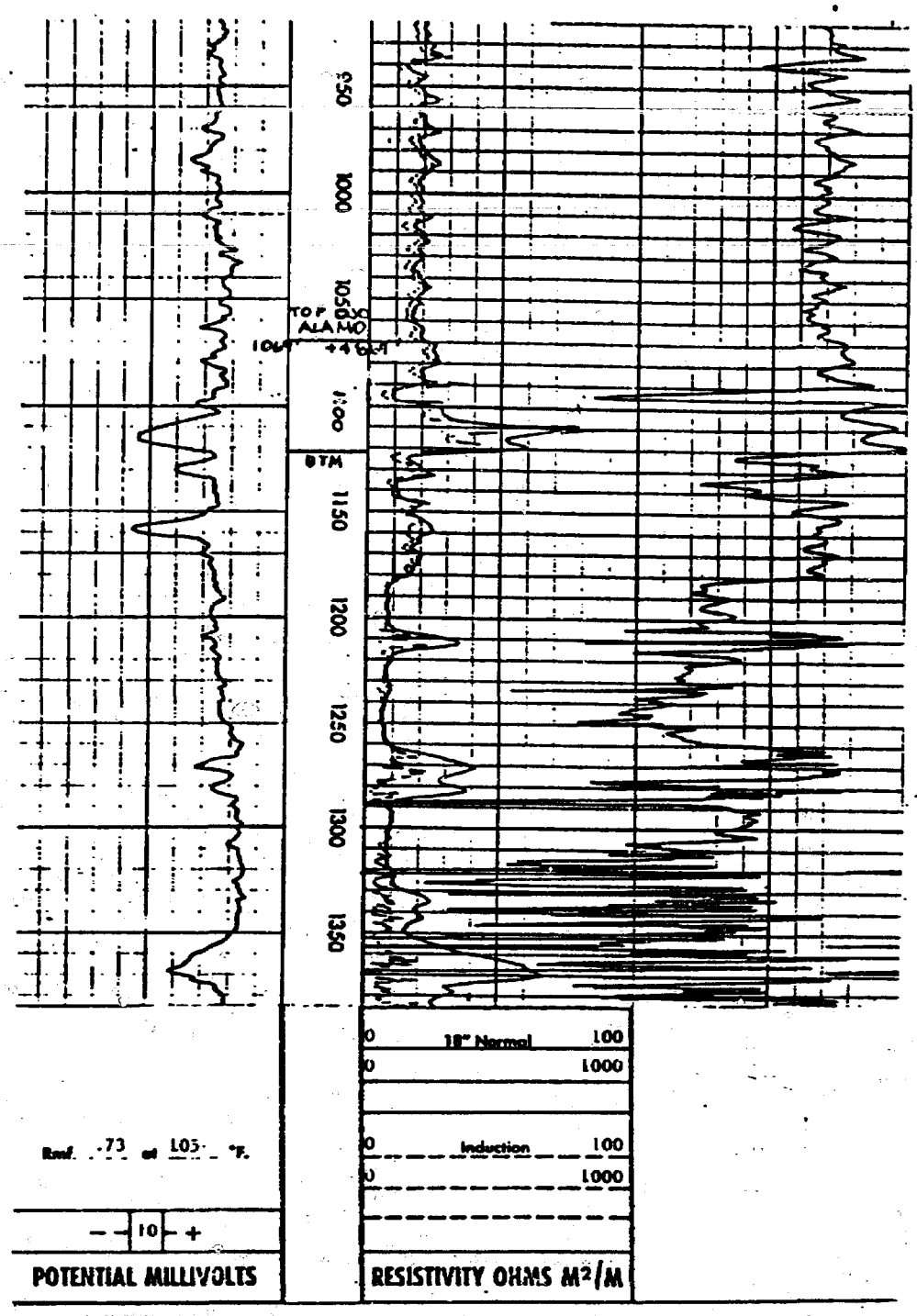


Cement retainer set at 2200'
Perfs squeezed with X 50 sx Class "A" cement
Plugs spotted from cement retainer - 2170',
1220-1100', 325-205', and 2 sx at surface.

WELL PLUGGED X ABANDONED 12-04-73.

Form 3-71 2-71

Case 6233

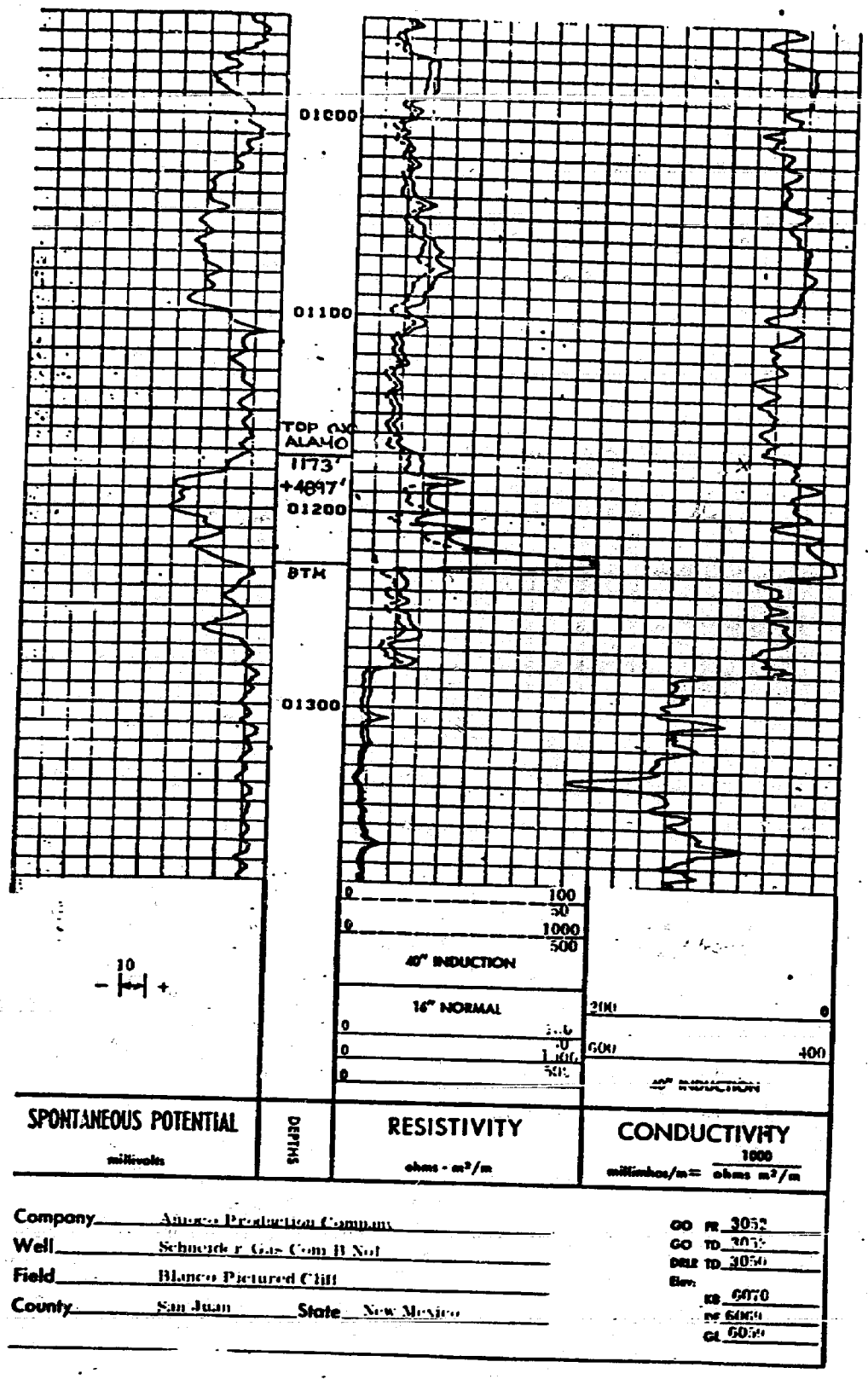


AMOCO PRODUCTION COMPANY
KEYS GAS COM. "F" NO. 1
UNDESIGNATED FRUITLAND
SAN JUAN COUNTY, NEW MEXICO
SEC. 27-32N-10W

T.D. LOGGED 2896'
T.D. DRILLER 2900'
T.D. WELEX 2902'
K.B. ELEV. 5935'
G.L. ELEV. 5926'

Case 6233

ATTACHMENT 6



RECEIVED Case 6633
NOV 5 1976
FARMINGTON, NEW MEXICO

CHEM LAB

WATER ANALYSIS EXCHANGE REPORT
ATTACHMENT 7a

AREA
1 AL
2 AL
3 AL
4 AMOCO RD

MEMBER Amoco Production Company
OPERATOR Amoco Production Company
WELL NO. Ealum Gas Com. No. 1
FIELD Blanco-Mesaverde
COUNTY San Juan
STATE New Mexico

LAB NO. 21618-5 REPORT NO.
LOCATION
FORMATION Mesaverde
INTERVAL
SAMPLE FROM Bradenhead (10-20-76)
DATE November 2, 1976

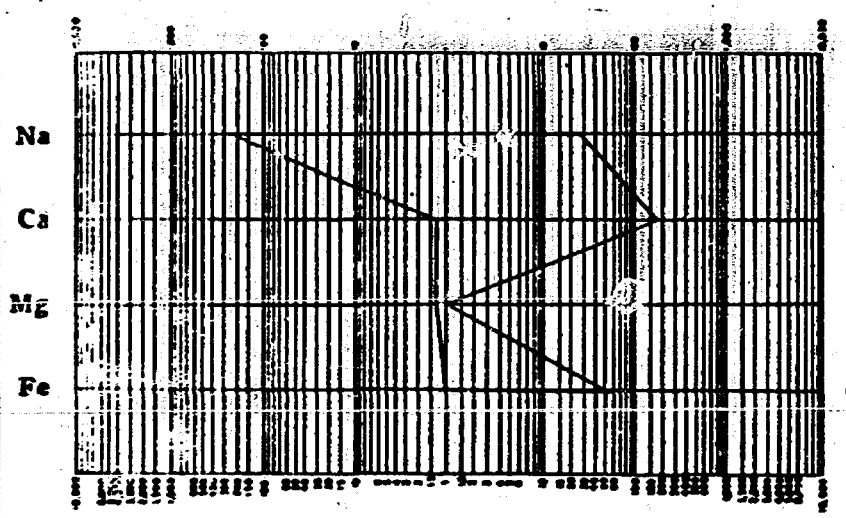
REMARKS & CONCLUSIONS:

Cations	mg/l	meq/l	Anions	mg/l	meq/l
Sodium	5812	252.84	Sulfate	7	0.15
Potassium	41	1.05	Chloride	1010	28.48
Lithium			Carbonate	1680	55.94
Calcium	27	1.35	Bicarbonate	10492	172.07
Magnesium	17	1.40	Hydroxide		
Iron	-		Hydrogen sulfide	-	
Total Cations		256.64	Total Anions		256.64

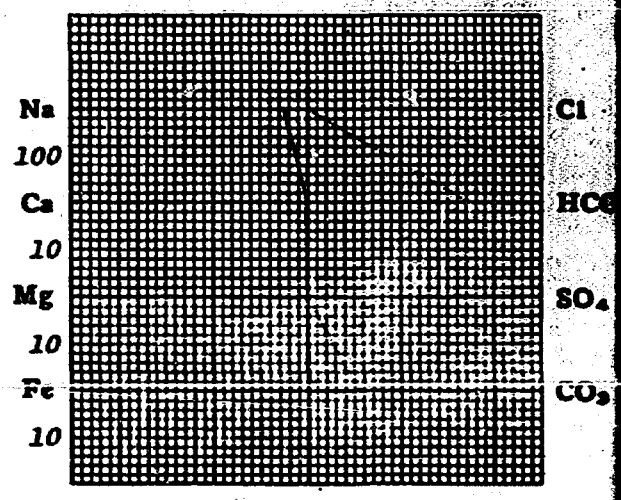
Total dissolved solids, mg/l	13761	Specific resistance @ 68° F.:	
NaCl equivalent, mg/l	11876	Observed	0.60 ohm-meters
Observed pH	9.0	Calculated	0.56 ohm-meters

WATER ANALYSIS PATTERNS
MEQ per unit

LOGARITHMIC



STANDARD



(Na value in above graphs includes Na, K, and Li)
NOTE: Mg/l=Milligrams per liter. Meq/l=Milligram equivalents per liter
Sodium chloride equivalent=by Dunlap & Hawthorne calculation from components

CL-31 (REV. 1966)

Case 6233

CHEM LAB NOV 5 1976

FARMINGTON AREA

1	AS	
	AAS	
2	AE	
	AA	
3		
4		

WATER ANALYSIS EXCHANGE REPORT

ATTACHMENT 7b

MEMBER Amoco Production Company — LAB NO. 21618-1 — REPORT NO.

OPERATOR Amoco Production Company — LOCATION

WELL NO. Keys Gas Com. No. 1 — FORMATION Mesaverde

FIELD Blanco-Mesaverde — INTERVAL

COUNTY San Juan — SAMPLE FROM Bradenhead (10-18-76)

STATE New Mexico — DATE November 2, 1976

REMARKS & CONCLUSIONS:

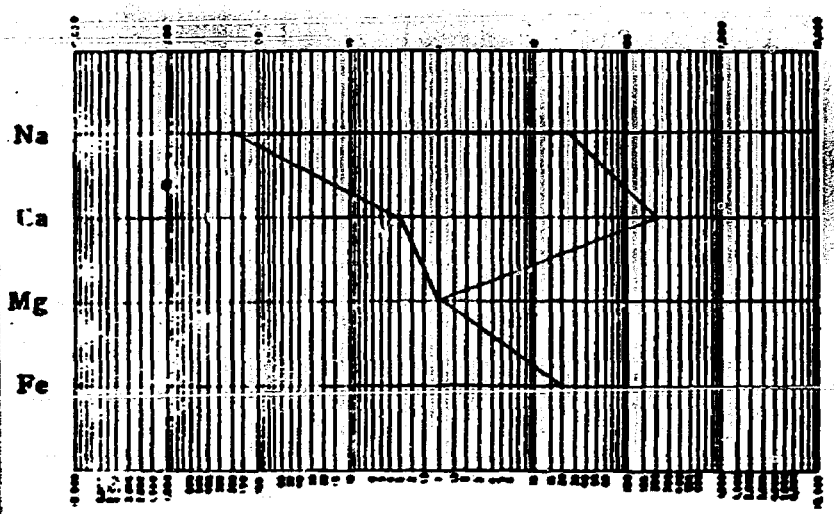
Cations	mg/l	meq/l	Anions	mg/l	meq/l
Sodium	5251	228.40	Sulfate	5	0.10
Potassium	31	0.79	Chloride	820	23.12
Lithium			Carbonate	576	19.18
Calcium	64	3.19	Bicarbonate	11614	190.47
Magnesium	6	0.49	Hydroxide		
Iron	-		Hydrogen sulfide	-	
Total Cations		232.87	Total Anions		232.87

Total dissolved solids, mg/l	12473	Specific resistance @ 68° F.:	
NaCl equivalent, mg/l	10039	Observed	0.72 ohm-meters
Observed pH	8.5	Calculated	0.66 ohm-meters

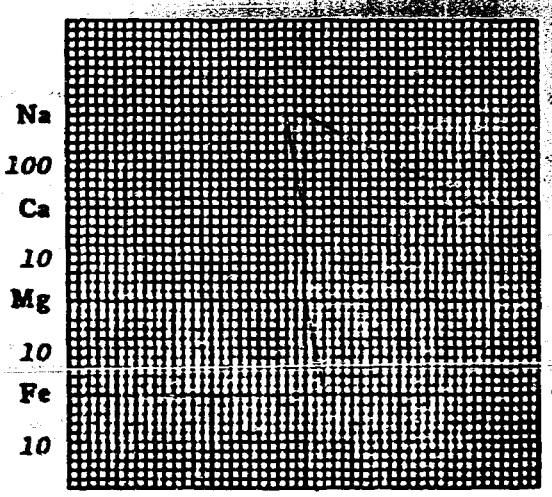
WATER ANALYSIS PATTERNS

MEQ per unit

LOGARITHMIC



STANDARD



(Na value in above graphs includes Na, K, and Li)

NOTE: Mg/l=Milligrams per liter. Meq/l=Milligram equivalents per liter

Sodium chloride equivalent=by Dunlap & Hawthorne calculation from components

CL1.5I (REV. 1966)

RECEIVED
NOV 5 1976
FARMINGTON AREA

CHEM LAB 6233

WATER ANALYSIS EXCHANGE REPORT

ATTACHMENT 7c

MEMBER	Amoco Production Company	LAB NO.	21618-3
OPERATOR	Amoco Production Company	LOCATION	
WELL NO.	Schneider Gas Com. No. 1	FORMATION	Mesaverde
FIELD	Blanco-Mesaverde	INTERVAL	
COUNTY	San Juan	SAMPLE FROM	Bradenhead (10-20-76)
STATE	New Mexico	DATE	November 2, 1976

REMARKS & CONCLUSIONS:

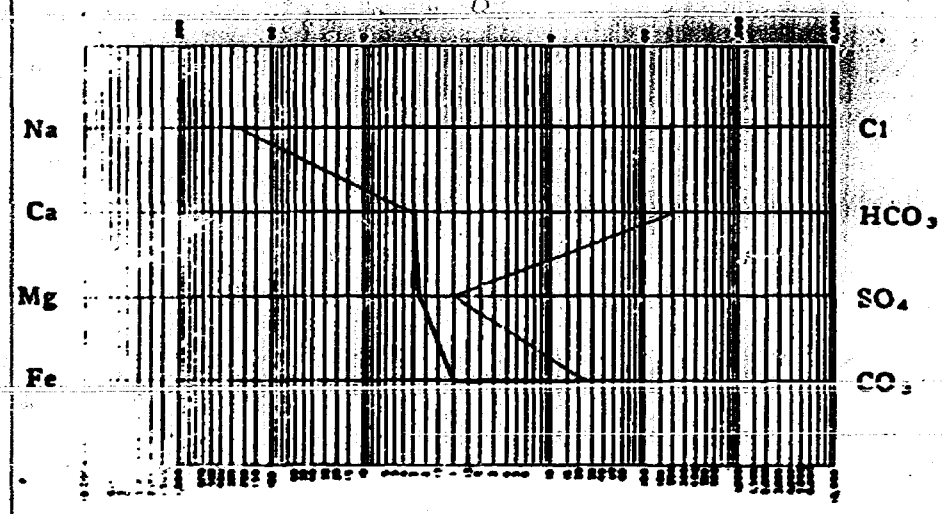
Cations	mg/l	meq/l	Anions	mg/l	meq/l
Sodium	5903	256.79	Sulfate	2	0.04
Potassium	40	1.02	Chloride	840	23.69
Lithium			Carbonate	720	23.98
Calcium	69	3.44	Bicarbonate	13176	216.09
Magnesium	31	2.55	Hydroxide		
Iron	-		Hydrogen sulfide	-	
Total Cations		263.80	Total Anions		263.80

Total dissolved solids, mg/l	14094	Specific resistance @ 68° F.:	
NaCl equivalent, mg/l	11376	Observed	0.64 ohm-meters
Observed pH	8.6	Calculated	0.58 ohm-meters

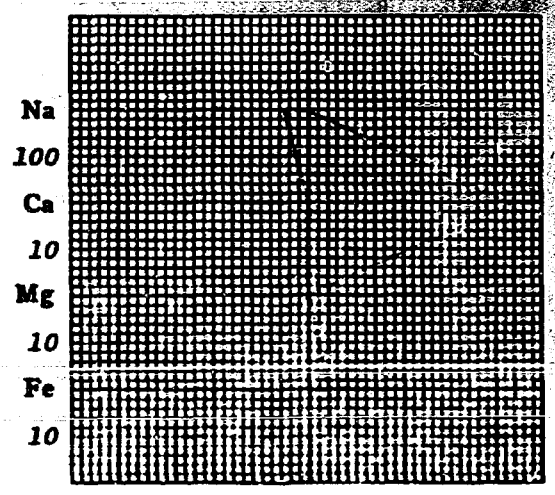
WATER ANALYSIS PATTERNS

MEQ per unit

LOGARITHMIC



STANDARD



(Na value in above graphs includes Na, K, and Li)

NOTE: Mg/l = Milligrams per liter. Meq/l = Milligram equivalents per liter

Sodium chloride equivalent = by Dunlap & Hawthorne calculation from components

ATTACHMENT 8

Amoco Production Company
RESEARCH CENTER
WATER ANALYSIS

Case 6233
T.S. or File No.
Lab. No. T-23,207
Field No.
API Well No.

LOCATION SAMPLED: Division Denver | District South | Area Farmington
Operator (Plant) Amoco | Well No. 1 | Lease Cahn Gas Com.
State (Province) New Mexico | County (Parish) San Juan
Twp. Rng. Sec. | Quarter (Lsd.) | Other (Meridian)
Wildcat ( ) Field Well ( ) Field name
Sample collected from Wellhead | Date 3/25/77 | Sample collected by Inskeep
Interval sampled to | Interval name
Recovery

Form 97 transmitted by H.Montgomery | Date 3/25/77 | Authorized by

ORGANIC CONSTITUENTS in mg/l

	BOTTOM	MIDDLE	TOP	MUD	
Benzene					
Toluene					
HC Gases					

DESCRIPTION OF SAMPLE

Sample used for detailed analyses
Date received
Condition as received
Color
Odor
Suspended solids
Bottom sediment
Oil or fluorescence

QUALITY OF SAMPLE

	BOTTOM	MIDDLE	TOP
Chloride ion mg/l:			

COMMENTS:

CONVENTIONAL MAJOR ION ANALYSIS

			Major Ions mg/l	% of Total Major Ions	Reaction Value meq/l	% of Total Reaction Value
CATIONS	Sodium	Na^+	5,791	27.97	251.91	49.37
	Calcium	Ca^{++}	40	.19	2.00	.39
	Magnesium	Mg^{++}	15	.07	1.23	.24
	Potassium	K^+				
ANIONS	Chloride	Cl^-	964	4.65	27.18	5.33
	Bicarbonate	HCO_3^-	13,900	67.12	227.96	44.67
	Sulfate	SO_4^{--}	0	0	0	0
	Carbonate	CO_3^{--}	0	0	0	0
	TOTAL		20,710			

Total solids by evaporation 13,350 mg/l
NaCl resistivity equivalent (Dunlap) 10,576 mg/l
Resistivity .539 ohm-meters at 77 °F
pH 8.1 Specific gravity 1.015 at 72 °F
Ryznar stability index (2pHs-pH) at °F

OTHER IONS AND DISSOLVED SOLIDS

CATIONS	mg/l	ANIONS	mg/l	OTHERS	mg/l

REMARKS AND CONCLUSIONS:

MAY 2 1977
FARMINGTON AREA
AS
AAS
AE
AA

wren 535.11

CC: Bob Reed
G. W. Schmidt

Analyst Bruce Barnes Date 4/15/77
jh
Water charts on back ( )

Form AA 4-71

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION

JERRY APODACA
GOVERNOR

NICK FRANKLIN
SECRETARY

POST OFFICE BOX 2088
STATE LAND OFFICE BUILDING
SANTA FE, NEW MEXICO 87501
(505) 827-2434

August 8, 1979

Re: CASE NO. 6233
ORDER NO. R-5780

Mr. Gordon Ryan
Attorney
Amoco Production Company
Security Life Building
Denver, Colorado 80202

Applicant:

Amoco Production Company

Dear Sir:

Enclosed herewith are two copies of the above-referenced Division order recently entered in the subject case.

Yours very truly,

JOE D. RAMEY
Director

JDR/fd

Copy of order also sent to:

Hobbs OCC x
Artesia OCC x
Aztec OCC x

Other P. T. McGrath, Charles Malone

Dockets Nos. 19-78 and 20-78 are tentatively set for hearing on June 7 and 21, 1978. Applications for hearing must be filed at least 22 days in advance of hearing date.

DOCKET: EXAMINER HEARING - WEDNESDAY - MAY 17, 1978

9 A.M. - OIL CONSERVATION DIVISION CONFERENCE ROOM, STATE LAND OFFICE BUILDING, SANTA FE, NEW MEXICO

The following cases will be heard before Richard L. Stamets, Examiner, or Daniel S. Nutter, Alternate Examiner:

CASE 6225: Application of Petroleum Development Corporation for a dual completion, Lea County, New Mexico. Applicant, in the above-styled cause, seeks approval for the dual completion (conventional) of its Sun McKay Federal Well No. 2 located in Unit G of Section 10, Township 19 South, Range 32 East, Lea County, New Mexico, in such a manner as to produce oil from the Wolfcamp formation thru tubing and gas from the Morrow formation thru the casing tubing annulus by means of a cross-over assembly.

CASE 6226: Application of Barber Oil, Inc. for a waterflood project, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks authority to institute a waterflood project on its Saladar Unit, by the injection of water into the Yates formation through five wells located in Units K, L, N and O of Section 33, Township 20 South, Range 28 East, Saladar-Yates Pool, Eddy County, New Mexico.

CASE 6227: Application of Union Texas Petroleum for a non-standard proration unit, San Juan County, New Mexico. Applicant, in the above-styled cause, seeks approval of a 209.5-acre non-standard gas proration unit comprising the W/2 of Section 7, Township 31 North, Range 9 West, Blanco Pictured Cliffs Pool, San Juan County, New Mexico, to be dedicated to a well drilled at a standard location thereon.

CASE 6228: Application of Depco, Inc., for an unorthodox location, Chaves County, New Mexico. Applicant, in the above-styled cause, seeks approval for the unorthodox location of its R&S Federal Com Well No. 1 to be located 1980 feet from the South line and 990 feet from the West line of Section 17, Township 15 South, Range 28 East, Buffalo Valley-Pennsylvanian Gas Pool, Chaves County, New Mexico, the S/2 of said Section 17 to be dedicated to the well.

CASE 6229: Application of Texas Oil & Gas Corporation for a unit agreement, Lea County, New Mexico. Applicant, in the above-styled cause, seeks approval for its South Wilson State Unit Area comprising 3,200 acres, more or less, of State land in Township 21 South, Range 34 East, Lea County, New Mexico.

CASE 6230: Application of Texas Oil & Gas Corporation for an unorthodox gas well location, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks approval of an unorthodox location for its Duffield Fed. Com Well No. 1, a Wolfcamp-Pennsylvanian test to be located 1980 feet from the South line and 660 feet from the West line of Section 28, Township 16 South, Range 27 East, Eddy County, New Mexico, the S/2 of said Section 28 to be dedicated to the well.

CASE 6215: (Continued from May 3, 1978, Examiner Hearing)

Application of Texas Oil & Gas Corporation for a non-standard unit and an unorthodox gas well location, Lea County, New Mexico. Applicant, in the above-styled cause, seeks approval for a 320-acre non-standard proration unit comprising the N/2 of Section 29, Township 20 South, Range 36 East, North Osudo-Morrow Gas Pool, Lea County, New Mexico, to be dedicated to a well to be located at an unorthodox location 660 feet from the North and West lines of said Section 29.

CASE 6231: Application of Yates Petroleum Corporation for an unorthodox gas well location, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks approval for the unorthodox location of its State "JM" Well No. 1, a Morrow test to be located 660 feet from the North and East lines of Section 25, Township 18 South, Range 24 East, Eddy County, New Mexico, the N/2 of said Section 25 to be dedicated to the well.

CASE 6232: Application of Yates Petroleum Corporation for an unorthodox location, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks approval for the unorthodox location of its Cities "JG" Well No. 1 to be located 660 feet from the South and East lines of Section 13, Township 18 South, Range 24 East, Fordinkus Field, Eddy County, New Mexico, the E/2 of said Section 13 to be dedicated to the well.

CASE 6233: Application of Amoco Production Company for salt water disposal, San Juan County, New Mexico. Applicant, in the above-styled cause, seeks authority to dispose of produced salt water into the Ojo Alamo formation through the perforated interval from 1175 feet to 1230 feet in its Cahn Gas Com Well No. 3 located in Unit F of Section 33, and from 1104 feet to 1122 feet in its Keys Gas Com "F" Well No. 1, located in Unit K of Section 27, all in Township 32 North, Range 10 West, Mt. Nebo-Fruitland Pool, San Juan County, New Mexico.

Form C-108
Revised 1-1-65

Case 6233

NEW MEXICO OIL CONSERVATION COMMISSION

APPLICATION TO DISPOSE OF SALT WATER BY INJECTION INTO A POROUS FORMATION

OPERATOR		ADDRESS	
AMOCO PRODUCTION COMPANY		501 AIRPORT DRIVE, FARMINGTON, NM 87401	
LEASE NAME	**WELL NO.**	**FIELD**	**COUNTY**
Cahn Gas Com	3	Undesignated Ojo Alamo	San Juan

LOCATION Not yet drilled. Proposed location: NW/4 Sec. 33, T-32-N, R-10-W

UNIT LETTER _____; WELL IS LOCATED _____ FEET FROM THE _____ LINE AND _____ FEET FROM THE

LINE, SECTION TOWNSHIP RANGE NMPM.

CASING AND TUBING DATA

NAME OF STRING	SIZE	SETTING DEPTH	SACKS CEMENT	TOP OF CEMENT	TOP DETERMINED BY
SURFACE CASING	8-5/8" 24#	250'	250	Circulate	
INTERMEDIATE	4-1/2" 9.5#	1400'	500	Circulate	
LONG STRING					
TUBING	2-3/8" 4.7#	1150'	NAME, MODEL AND DEPTH OF TUBING PACKER: Baker Model "N" set at 1150'		

NAME OF PROPOSED INJECTION FORMATION	TOP OF FORMATION	BOTTOM OF FORMATION
Ojo Alamo	1175'	1230'

IS INJECTION THROUGH TULING, CASING, OR ANNULUS?	PERFORATIONS OR OPEN HOLE?	PROPOSED INTERVAL(S) OF INJECTION
Tubing	Perf	1175-1230'

IS THIS A NEW WELL DRILLED FOR DISPOSAL?	IF ANSWER IS NO, FOR WHAT PURPOSE WAS WELL ORIGINALLY DRILLED?	HAS WELL EVER BEEN PERFORATED IN ANY ZONE OTHER THAN THE PROPOSED INJECTION ZONE?
Yes	-	-

LIST ALL SUCH PERFORATED INTERVALS AND SACKS OF CEMENT USED TO SEAL OFF OR SQUEEZE EACH

-

DEPTH OF BOTTOM OF DEEPEST FRESH WATER ZONE IN THIS AREA	DEPTH OF BOTTOM OF NEXT HIGHER OIL OR GAS ZONE IN THIS AREA	DEPTH OF TOP OF NEXT LOWER OIL OR GAS ZONE IN THIS AREA
Approximately 100 ft.	NONE	2800'

ANTICIPATED DAILY INJECTION VOLUME (BBLS.) MINIMUM	MAXIMUM	OPEN OR CLOSED TYPE SYSTEM	IS INJECTION TO BE BY GRAVITY OR PRESSURE?	APPROX. PRESSURE (PSI)
200	600	Closed	Pressure	*1200 Max

ANSWER YES OR NO WHETHER THE FOLLOWING WATERS ARE MINERALIZED TO SUCH A DEGREE AS TO BE UNFIT FOR DOMESTIC, STOCK, IRRIGATION, OR OTHER GENERAL USE —	WATER TO BE DISPOSED OF	NATURAL WATER IN DISPOSAL ZONE	ARE WATER ANALYSES ATTACHED?
	Yes	Yes	Yes

NAME AND ADDRESS OF SURFACE OWNER (OR LESSEE, IF STATE OR FEDERAL LAND)

Katie Cahn, 3703 Sequoia St., Coral Gables, Florida 33134

LIST NAMES AND ADDRESSES OF ALL OPERATORS WITHIN ONE-HALF (½) MILE OF THIS INJECTION WELL

No other operators.

HAVE COPIES OF THIS APPLICATION BEEN SENT TO EACH OF THE FOLLOWING?	SURFACE OWNER	EACH OPERATOR WITHIN ONE-HALF MILE OF THIS WELL	THE NEW MEXICO STATE ENGINEER
ARE THE FOLLOWING ITEMS ATTACHED TO THIS APPLICATION (SEE RULE 701-B)	PLAT OF AREA	ELECTRICAL LOG	DIAGRAMMATIC SKETCH OF WELL

I hereby certify that the information above is true and complete to the best of my knowledge and belief.

R B Miles — (Signature)

Sr. Staff Engineer — (Title)

10/12/77 — (Date)

NOTE: Should waivers from the State Engineer, the surface owner, and all operators within one-half mile of the proposed injection well, not accompany this application, the New Mexico Oil Conservation Commission will hold the application for a period of 15 days from the date of receipt by the Commission's Santa Fe office. If at the end of the 15-day waiting period no protest has been received by the Santa Fe office, the application will be processed. If a protest is received, the application will be set for hearing, if the applicant so requests. SEE RULE 701.

*Based on Pictured Cliffs-Fruitland frac gradient of 1 psi/ft (avg)

Form C-108
Revised 1-1-65

Case 6233

NEW MEXICO OIL CONSERVATION COMMISSION

APPLICATION TO DISPOSE OF SALT WATER BY INJECTION INTO A POROUS FORMATION

OPERATOR		ADDRESS	
AMOCO PRODUCTION COMPANY		501 AIRPORT DRIVE, FARMINGTON, NM 87401	
LEASE NAME	**WELL NO.**	**FIELD**	**COUNTY**
Keys Gas Com "F"	1	Mt. Nebo Fruitland	San Juan

LOCATION

UNIT LETTER K ; WELL IS LOCATED 1510 FEET FROM THE South LINE AND 1685 FEET FROM THE West LINE, SECTION 27 TOWNSHIP 32-N RANGE 10-W NMPM.

CASING AND TUBING DATA

NAME OF STRING	SIZE	SETTING DEPTH	SACKS CEMENT	TOP OF CEMENT	TOP DETERMINED BY
SURFACE CASING	8-5/8" 24#	250'	200	G.L.	Circ to surface
INTERMEDIATE	4-1/2" 9.5#	2886'	750	G.L.	Circ to surface
LONG STRING					
TUBING	2-3/8" 4.7#	1050'	NAME, MODEL AND DEPTH OF TUBING PACKER: Baker Model "N" set at 1050'		

NAME OF PROPOSED INJECTION FORMATION	TOP OF FORMATION	BOTTOM OF FORMATION
Ojo Alamo	1069'	1122'

IS INJECTION THROUGH TUBING, CASING, OR ANNULUS?	PERFORATIONS OR OPEN HOLE?	PROPOSED INTERVAL(S) OF INJECTION
Tubing	Perf	1104-22'

IS THIS A NEW WELL DRILLED FOR DISPOSAL?	IF ANSWER IS NO, FOR WHAT PURPOSE WAS WELL ORIGINALLY DRILLED?	HAS WELL EVER BEEN PERFORATED IN ANY ZONE OTHER THAN THE PROPOSED INJECTION ZONE?
NO	Gas Production	Yes

LIST ALL SUCH PERFORATED INTERVALS AND SACKS OF CEMENT USED TO SEAL OFF OR SQUEEZE EACH
2780-84', 2794-98', 2804-08', 2820-24', 2832-36', x 2 SPF (Sqz. with 100 sx); 2451-59', 2600-08', and 2668-76' x 2 SPF. Cmt well x 200 sx.

DEPTH OF BOTTOM OF DEEPEST FRESH WATER ZONE IN THIS AREA	DEPTH OF BOTTOM OF NEXT HIGHER OIL OR GAS ZONE IN THIS AREA	DEPTH OF TOP OF NEXT LOWER OIL OR GAS ZONE IN THIS AREA
Approximately 100 ft.	None	2450'

ANTICIPATED DAILY INJECTION VOLUME (BBLS.) MINIMUM	MAXIMUM	OPEN OR CLOSED TYPE SYSTEM	IS INJECTION TO BE BY GRAVITY OR PRESSURE?	APPROX. PRESSURE (PSI)
200	600	Closed	Pressure	*1200 MAX

ANSWER YES OR NO WHETHER THE FOLLOWING WATERS ARE MINERALIZED TO SUCH A DEGREE AS TO BE UNFIT FOR DOMESTIC, STOCK, IRRIGATION, OR OTHER GENERAL USE —	WATER TO BE DISPOSED OF	NATURAL WATER IN DISPOSAL ZONE	ARE WATER ANALYSES ATTACHED?
	Yes	Yes	Yes

NAME AND ADDRESS OF SURFACE OWNER (OR LESSEE, IF STATE OR FEDERAL LAND)
Henry Knowlton, Rt. 1, Box 65-E, Aztec, New Mexico 87410

LIST NAMES AND ADDRESSES OF ALL OPERATORS WITHIN ONE-HALF (½) MILE OF THIS INJECTION WELL
Supron Energy Corporation, 400 S. Lorena Ave., Farmington, NM 87401

HAVE COPIES OF THIS APPLICATION BEEN SENT TO EACH OF THE FOLLOWING?	SURFACE OWNER	EACH OPERATOR WITHIN ONE-HALF MILE OF THIS WELL	THE NEW MEXICO STATE ENGINEER
ARE THE FOLLOWING ITEMS ATTACHED TO THIS APPLICATION (SEE RULE 701-B)	PLAT OF AREA	ELECTRICAL LOG	DIAGRAMMATIC SKETCH OF WELL

I hereby certify that the information above is true and complete to the best of my knowledge and belief.

R B Tiles — (Signature)
Sr. Staff Engineer — (Title)
10/12/77 — (Date)

NOTE: Should waivers from the State Engineer, the surface owner, and all operators within one-half mile of the proposed injection well not accompany this application, the New Mexico Oil Conservation Commission will hold the application for a period of 15 days from the date of receipt by the Commission's Santa Fe office. If at the end of the 15-day waiting period no protest has been received by the Santa Fe office, the application will be processed. If a protest is received, the application will be set for hearing, if the applicant so requests. SEE RULE 701.

*Based on Pictured Cliffs-Fruitland frac gradient of 1 psi/ft (avg)

Case 6233

AMOCO

Amoco Production Company
Security Life Building
Denver, Colorado 80202

April 21, 1978

Joe D. Ramey (3)
Secretary-Director
New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, NM 87501

File: RAS-410-986.511

Application for Water Disposal, Mt Nebo
Fruitland Field Extension
San Juan County, New Mexico

Pursuant to my telephone conversation with Dick Stamets, we ask that our captioned application filed with you by letter dated October 12, 1977 and supplemented by information contained in our letter dated February 15, 1978 be set for examiner hearing on Wednesday, May 17, 1978. The facts and statements in those two letters are correct except for one minor change. We can no longer use the Leeper Gas Com "B" Fruitland No. 1 well in NW/4 of Section 34, T32N-R10W as a Fruitland gas producing well because of damage to the formation. We have temporarily abandoned the well. We plan to drill a replacement Fruitland gas producing well as a twin to Leeper Gas Com "B" Fruitland No. 1 in the NW/4 of Section 34.

RBG/as
cc:
A. R. Kendrick, Supervisor
District No. 3
New Mexico Oil Conservation Commission
1000 Rio Brazos Road
Aztec, NM 87410

P. T. McGrath
United States Geological Survey
Box 959
Farmington, NM 87401

Case 6233

VERIFICATION AND AFFIDAVIT

STATE OF COLORADO)
: ss
COUNTY OF DENVER)

R. B. Giles of lawful age, being first duly sworn on his oath, deposes and says:

That he is employed in an engineering capacity by Amoco Production Company in its Denver, Colorado office; that Amoco's application for approval to dispose of Fruitland produced water by injection into the Ojo Alamo horizon at Cahn No. 3 in NW/4 Section 33 and Keys Gas Com "F" No. 1 in SW/4 Section 27, both in T32N, R10W in San Juan County, New Mexico, was prepared under his direction and supervision; that the matters and things therein set forth are true and correct to the best of his knowledge and beliefs; and that a copy thereof was sent by certified mail from Applicant's Denver, Colorado office on April 21, 1978 to the following parties, at the addresses shown herein, to wit:

Offset Operator

Supron Energy Corporation
400 S. Lorena Ave.
Farmington, New Mexico 87401

Surface Owners

Henry Knowlton
Rt. 1, Box 65-E
Aztec, New Mexico 87410

Katie Cahn
3703 Sequoia St.
Coral Gables, Florida 33134

and to the best of his information, knowledge and belief, the above named are the only parties to whom notice of such application is required to be given in accordance with Rule 701 of the New Mexico Oil Conservation Commission's Rules and Regulations.

R B Giles
R. B. Giles

Subscribed and sworn to before me this 21st day of April, 1978.

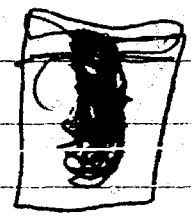
Sylvia J. Seamons
Notary Public

My Commission expires:

NOTARY PUBLIC STATE OF COLORADO
My Commission Expires Aug. 15, 1980

Application of Conoco Production Company for salt water disposal, San Juan County, New Mexico

Applicant in the above-styled cause, seeks authority to dispose of produced salt water in the Ojo Alamo formation through the ~~open hole~~ perforated interval from 1175 feet to 1230 feet in its Cahn Gas Com Well No. 3 located in Unit F of Section 33, and from 1104 feet to 1122 feet in its Keya Gas Com ~~Well~~ "F" Well No 1, located in Unit K of Section 27, all in Township 32 North, Range 10 West, Mt. Nebo Fruitland Pool, San Juan County, N.M.



Form C-108
Revised 1-1-65

NEW MEXICO OIL CONSERVATION COMMISSION

APPLICATION TO DISPOSE OF SALT WATER BY INJECTION INTO A POROUS FORMATION

OPERATOR		ADDRESS	
AMOCO PRODUCTION COMPANY		501 AIRPORT DRIVE, FARMINGTON, NM 87401	
LEASE NAME	**WELL NO.**	**FIELD**	**COUNTY**
Cahn Gas Com	3	Undesignated Ojo Alamo	San Juan

LOCATION Not yet drilled. Proposed location: NW/4 Sec. 33, T-32-N, R-10-W

UNIT LETTER _____ _____ WELL IS LOCATED _____ FEET FROM THE _____ LINE AND _____ FEET FROM THE

LINE, SECTION TOWNSHIP RANGE NMPM.

CASING AND TUBING DATA

NAME OF STRING	SIZE	SETTING DEPTH	SACKS CEMENT	TOP OF CEMENT	TOP DETERMINED BY
SURFACE CASING	8-5/8" 24#	250'	350	Circulate	
INTERMEDIATE	4-1/2" 9.5#	1400'	500	Circulate	
LONG STRING					
TUBING	2-3/8" 4.7#	1150'	NAME, MODEL AND DEPTH OF TUBING PACKER: Baker Model "N" set at 1150'		

NAME OF PROPOSED INJECTION FORMATION	TOP OF FORMATION	BOTTOM OF FORMATION
Ojo Alamo	1175'	1230'

IS INJECTION THROUGH TUBING, CASING, OR ANNULUS?	PERFORATIONS OR OPEN HOLE?	PROPOSED INTERVAL(S) OF INJECTION
Tubing	Perf	1175-1230'

IS THIS A NEW WELL DRILLED FOR DISPOSAL?	IF ANSWER IS NO, FOR WHAT PURPOSE WAS WELL ORIGINALLY DRILLED?	HAS WELL EVER BEEN PERFORATED IN ANY ZONE OTHER THAN THE PROPOSED INJECTION ZONE?
Yes	-	-

LIST ALL SUCH PERFORATED INTERVALS AND SACKS OF CEMENT USED TO SEAL OFF OR SQUEEZE EACH

-

DEPTH OF BOTTOM OF DEEPEST FRESH WATER ZONE IN THIS AREA	DEPTH OF BOTTOM OF NEXT HIGHER OIL OR GAS ZONE IN THIS AREA	DEPTH OF TOP OF NEXT LOWER OIL OR GAS ZONE IN THIS AREA
Approximately 100 ft.	NONE	2800'

ANTICIPATED DAILY INJECTION VOLUME (BBLS.) MINIMUM	MAXIMUM	OPEN OR CLOSED TYPE SYSTEM	IS INJECTION TO BE BY GRAVITY OR PRESSURE?	APPROX. PRESSURE (PSI)
200	600	Closed	Pressure	*1200 Max (65)

ANSWER YES OR NO WHETHER THE FOLLOWING WATERS ARE MINERALIZED TO SUCH A DEGREE AS TO BE UNFIT FOR DOMESTIC, STOCK, IRRIGATION, OR OTHER GENERAL USE —	WATER TO BE DISPOSED OF	NATURAL WATER IN DISPOSAL ZONE	ARE WATER ANALYSES ATTACHED?
	Yes	Yes	Yes

NAME AND ADDRESS OF SURFACE OWNER (OR LESSEE, IF STATE OR FEDERAL LAND)

Katie Cahn, 3703 Sequoia St., Coral Gables, Florida 33134

LIST NAMES AND ADDRESSES OF ALL OPERATORS WITHIN ONE-HALF (½) MILE OF THIS INJECTION WELL

No other operators.

658 based on spec grav of 1.015 and 1175' of hydrostatic head

HAVE COPIES OF THIS APPLICATION BEEN SENT TO EACH OF THE FOLLOWING?	SURFACE OWNER	EACH OPERATOR WITHIN ONE-HALF MILE OF THIS WELL	THE NEW MEXICO STATE ENGINEER
ARE THE FOLLOWING ITEMS ATTACHED TO THIS APPLICATION (SEE RULE 701-B)	PLAT OF AREA	ELECTRICAL LOG	DIAGRAMMATIC SKETCH OF WELL

I hereby certify that the information above is true and complete to the best of my knowledge and belief.

R B Miles — (Signature)

Sr. Staff Engineer — (Title)

10/12/77 — (Date)

NOTE: Should waivers from the State Engineer, the surface owner, and all operators within one-half mile of the proposed injection well not accompany this application, the New Mexico Oil Conservation Commission will hold the application for a period of 15 days from the date of receipt by the Commission's Santa Fe office. If at the end of the 15-day waiting period no protest has been received by the Santa Fe office, the application will be processed. If a protest is received, the application will be set for hearing, if the applicant so requests. SEE RULE 701.

*Based on Pictured Cliffs-Fruitland frac gradient of 1 psi/ft (avg)

Form C-108
Revised 1-1-65

NEW MEXICO OIL CONSERVATION COMMISSION

APPLICATION TO DISPOSE OF SALT WATER BY INJECTION INTO A POROUS FORMATION

OPERATOR		ADDRESS	
AMOCO PRODUCTION COMPANY		501 AIRPORT DRIVE, FARMINGTON, NM 87401	
LEASE NAME	**WELL NO.**	**FIELD**	**COUNTY**
Keys Gas Com "F"	1	Mt. Nebo Fruitland	San Juan

LOCATION

UNIT LETTER K ; WELL IS LOCATED 1510 FEET FROM THE South LINE AND 1685 FEET FROM THE West LINE, SECTION 27 TOWNSHIP 32-N RANGE 10-W NMPM.

CASING AND TUBING DATA

NAME OF STRING	SIZE	SETTING DEPTH	SACKS CEMENT	TOP OF CEMENT	TOP DETERMINED BY
SURFACE CASING	8-5/8" 24#	250'	200	G.L.	Circ to surface
INTERMEDIATE	4-1/2" 9.5#	2886'	750	G.L.	Circ to surface
LONG STRING					
TUBING	2-3/8" 4.7#	1050'	NAME, MODEL AND DEPTH OF TUBING PACKER: Baker Model "N" set at 1050'		

NAME OF PROPOSED INJECTION FORMATION	TOP OF FORMATION	BOTTOM OF FORMATION
Ojo Alamo	1069'	1122'

IS INJECTION THROUGH TUBING, CASING, OR ANNULUS?	PERFORATIONS OR OPEN HOLE?	PROPOSED INTERVAL(S) OF INJECTION
Tubing	Perf	1104-22'

IS THIS A NEW WELL DRILLED FOR DISPOSAL?	IF ANSWER IS NO, FOR WHAT PURPOSE WAS WELL ORIGINALLY DRILLED?	HAS WELL EVER BEEN PERFORATED IN ANY ZONE OTHER THAN THE PROPOSED INJECTION ZONE?
NO	Gas Production	Yes

LIST ALL SUCH PERFORATED INTERVALS AND SACKS OF CEMENT USED TO SEAL OFF OR SQUEEZE EACH
2780-84', 2794-98', 2804-08', 2820-24', 2832-36', x 2 SPF (Sqz. with 100 sx); 2451-59', 2600-08', and 2668-76' x 2 SPF. Cmt well x 200 sx.

DEPTH OF BOTTOM OF DEEPEST FRESH WATER ZONE IN THIS AREA	DEPTH OF BOTTOM OF NEXT HIGHER OIL OR GAS ZONE IN THIS AREA	DEPTH OF TOP OF NEXT LOWER OIL OR GAS ZONE IN THIS AREA
Approximately 100 ft.	None	2450'

ANTICIPATED DAILY INJECTION VOLUME (BBLS.) MINIMUM	MAXIMUM	OPEN OR CLOSED TYPE SYSTEM	IS INJECTION TO BE BY GRAVITY OR PRESSURE?	APPROX. PRESSURE (PSI)
200	600	Closed	Pressure	*1200 MAX 618

ANSWER YES OR NO WHETHER THE FOLLOWING WATERS ARE MINERALIZED TO SUCH A DEGREE AS TO BE UNFIT FOR DOMESTIC, STOCK, IRRIGATION, OR OTHER GENERAL USE — WATER TO BE DISPOSED OF	NATURAL WATER IN DISPOSAL ZONE	ARE WATER ANALYSES ATTACHED?
Yes	Yes	Yes

NAME AND ADDRESS OF SURFACE OWNER (OR LESSEE, IF STATE OR FEDERAL LAND)
Henry Knowlton, Rt. 1, Box 65-E, Aztec, New Mexico 87410

LIST NAMES AND ADDRESSES OF ALL OPERATORS WITHIN ONE-HALF (½) MILE OF THIS INJECTION WELL
Supron Energy Corporation, 400 S. Lorena Ave., Farmington, NM 87401

618 psi surf press
based on gradient
of 1.015 x 1104'
by hydrostatic head

HAVE COPIES OF THIS APPLICATION BEEN SENT TO EACH OF THE FOLLOWING? SURFACE OWNER	EACH OPERATOR WITHIN ONE-HALF MILE OF THIS WELL	THE NEW MEXICO STATE ENGINEER
ARE THE FOLLOWING ITEMS ATTACHED TO THIS APPLICATION (SEE RULE 701-B) PLAT OF AREA	ELECTRICAL LOG	DIAGRAMMATIC SKETCH OF WELL

I hereby certify that the information above is true and complete to the best of my knowledge and belief.

R. B. Miller — (Signature)
Sr. Staff Engineer — (Title)
10/12/77 — (Date)

NOTE: Should waivers from the State Engineer, the surface owner, and all operators within one-half mile of the proposed injection well, not accompany this application, the New Mexico Oil Conservation Commission will hold the application for a period of 15 days from the date of receipt by the Commission's Santa Fe office. If at the end of the 15-day waiting period no protest has been received by the Santa Fe office, the application will be processed. If a protest is received, the application will be set for hearing, if the applicant so requests. SEE RULE 701.

*Based on Pictured Cliffs-Fruitland frac gradient of 1 psi/ft (avg)

1

CEDAR HILL WELLS WITHIN 1/2 MILE OF POTENTIAL WATER DISPOSAL WELLS

WELL NAME OPERATOR	WELL LOCATION	HOLE SIZE	CASING SIZE AND WT.	SETTING DEPTH (FT)	CEMENT	CEMENT TOPS	TD	PRODUCING INTERVAL
'ayne No. 5A Southern Union	1140' FSL x 1725' FEL Sec. 27, T-32-N, R-10-W	13-3/4" 8-3/4" 6-1/4"	10-3/4" 30# 7" 23# 4-1/2" 10.5#	546' 3443' 3323-5690'	350 sx 230 sx 310 sx	CIRC 2400' 4600'	5770'	Pictured Cli Mesaverde
'ahn Gas Com No. 1 Amoco	1030' FNL x 1600' FWL Sec. 33, T-32-N, R-10-W	12-1/4" 8-3/4"	9-5/8" 32.3# 7" 20#	253' 2795'	250 sx 600 sx	CIRC. * 100-200'	2812'	Fruitland
'ahn Gas Com No. 2 Amoco	1510' FNL x 800' FWL Sec. 33, T-32-N, R-10-W	12-1/4" 7-7/8"	8-5/8" 24# 4-1/2" 11#	276' 2957'	250 sx 680 sx	CIRC * 100-200'	2946'	Fruitland
alum Gas Com No. 1 Amoco	1650' FNL x 1140' FEL Sec. 33, T-32-N, R-10-W	12-1/4" 8-3/4" 6-1/4"	9-5/8" 32.3# 7" 20# x 23# 5" 15# 5-1/2" 14#	256' 4642' 4346-5320'	200 sx 438ft^3 190 sx	CIRC 3585' * 4300'	5320'	Mesaverde
alum Gas Com No. 1A Amoco	1450' FNL x 1030' FWL Sec. 33, T-32-N, R-10-W	12-1/4" 8-3/4" 6-1/4"	9-5/8" 32.3# 7" 23# 4-1/2" 10.5#	259' 3200' 3018-5400'	280 sx 775 sx 375 sx	CIRC CIRC CIRC	5400'	Mesaverde
hneider Gas Com No. 1 Amoco	1450' FSL x 990' FWL Sec. 28, T-32-N, R-10-W	12-1/4" 8-3/4" 6-1/4"	9-5/8" 32.3# 7" 20# x 23# 5-1/2" 14#	255' 4646' 4570-5144'	275 sx 428ft^3 122 sx	CIRC 4020' 4700'	5410'	Mesaverde
hneider Gas Com No. 1A Amoco	1460' FNL x 810' FWL Sec. 28, T-32-N, R-10-W	12-1/4" 8-3/4" 6-1/4"	9-5/8" 36# 7" 23# 4-1/2" 10.5#	270' 3349' 3159-5514'	280 sx 685 sx 280 sx	CIRC CIRC 4796'	5525'	Mesaverde
hneider Gas Com "B" No. 1 Amoco	1110' FSL x 1185' FWL Sec. 28, T-32-N, R-10-W	12-1/4" 7-7/8"	8-5/8" 24# 4-1/2" 10.5#	258' 3050'	200 sx 930 sx	CIRC CIRC	3050'	Fruitland
tegrove Gas Com No. 1 Amoco	1850' FSL x 790' FWL Sec. 33, T-32-N, R-10-W	12-1/4" 8-3/4" 6-1/4"	9-5/8" 32.3# 7" 20# 5" 15#	279' 4579' 4445-5261'	190 sx 438ft^3 285 sx	CIRC 3210' CIRC	5270'	Mesaverde
tegrove Gas Com No. 1A Amoco	1470' FSL x 1190' FEL Sec. 33, T-32-N, R-10-W	12-1/4" 8-3/4" 6-1/4"	9-5/8" 36# 7" 23# 4-1/2" 10.5#	267' 3075' 2868-5250'	280 sx 635 sx 280 sx	CIRC CIRC CIRC	5250'	Mesaverde

CALCULATED CEMENT TOPS

WELL NAME OPERATOR	WELL LOCATION	HOLE SIZE	CASING SIZE AND WT.	SETTING DEPTH (FT)	CEMENT	CEMENT TOPS	TD	PRODUCING INTERVAL
eper Gas Com No. 1A	990' FNL x 1590' FWL	12-1/4"	9-5/8" 32.3#	254'	280 sx	CIRC	5305'	Mesaverde
Amoco	Sec. 34, T-32-N, R-10-W	8-3/4"	7" 23#	3149'	775 sx	*100-200'		
		6-1/4"	4-1/2" 10.5#	2962-5305'	375 sx	CIRC		
eper Gas Com "B" No. 1	1110' FNL x 1450' FWL	12-1/4"	8-5/8" 24#	258'	200 sx	CIRC	2851'	Fruitland
Amoco	Sec. 34, T-32-N, R-10-W	7-7/8"	4-1/2" 10.5# x 11#	2851'	870 sx	CIRC		
lentine Gas Com No. 1	990' FNL x 990' FEL	12-1/4"	9-5/8" 32.3#	261'	250 sx	CIRC	5289'	Mesaverde
Amoco	Sec. 32, T-32-N, R-10-W	8-3/4"	7" 20#	4570'	800 sx	CIRC		
		4-3/4"	4" 11.34#	4196-5289'	225 sx	CIRC		
lentine Gas Com "B" No.1	1140' FNL x 1140' FEL	12-1/4"	8-5/8" 24#	261'	275 sx	CIRC	2960'	Pictured Cliff
Amoco	Sec. 32, T-32-N, R-10-W	7-7/8"	4-1/2" 10.5# x 11#	2960'	640 sx	*100-200'		
ys Gas Com "A" No. 1	1650' FSL x 1650' FWL	12-1/4"	9-5/8" 32.3#	250'	225 sx	CIRC	5243'	Mesaverde
Amoco	Sec. 27, T-32-N, R-10-W	8-3/4"	7" 20# x 23#	4551'	438ft^3	2490'		
		6-1/4"	5" 15#	4405-5243'	100 sx	*CIRC		

Calculated cement tops

Amoco Production Company

ENGINEERING CHART

SHEET NO. OF

FILE ATTACHMENT 1

APPN

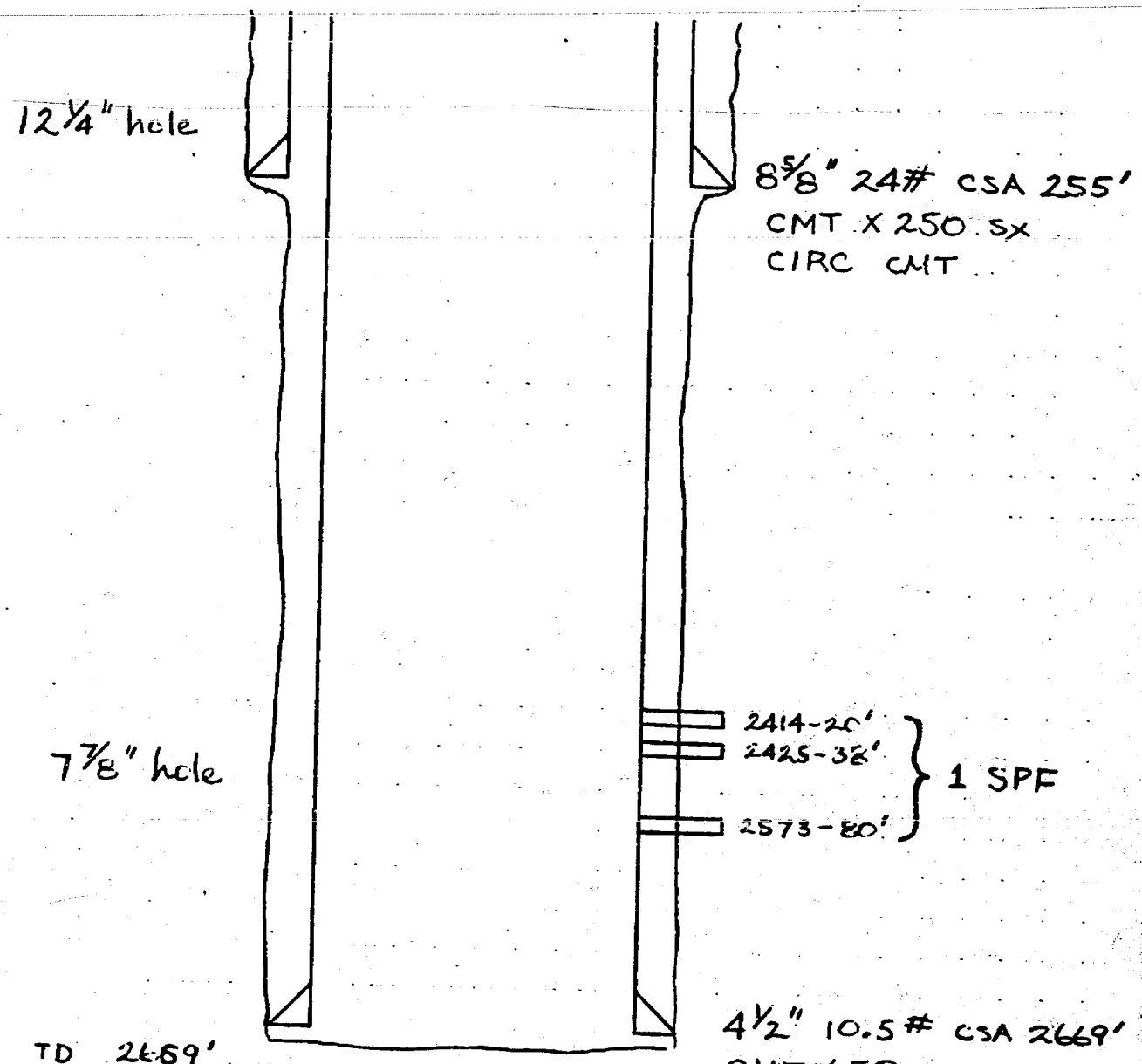
DATE 9-14-71

BY WRC

SUBJECT HOLMBERG GAS COM "B" No. 1

1110' FSL X 810' FEL, SEC 28 32-10

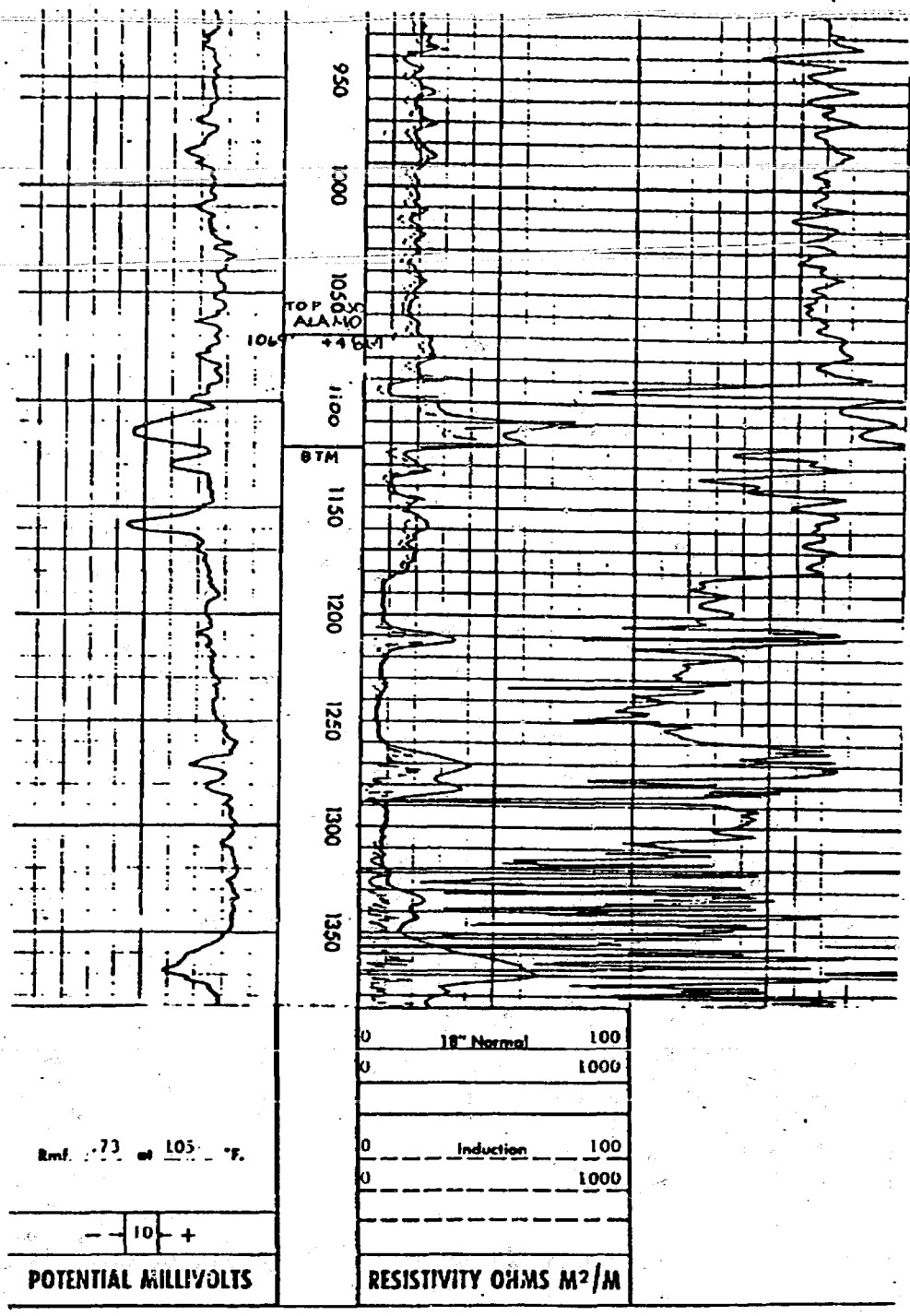
SAN JUAN COUNTY, NEW MEXICO



Cement retainer set at 2200'
Perfs squeezed with X 50 sx Class "A" cement
Plugs spotted from cement retainer - 2170', 1220-1100', 325-205', and 2 sx at surface.

WELL PLUGGED X ABANDONED 12-04-73.

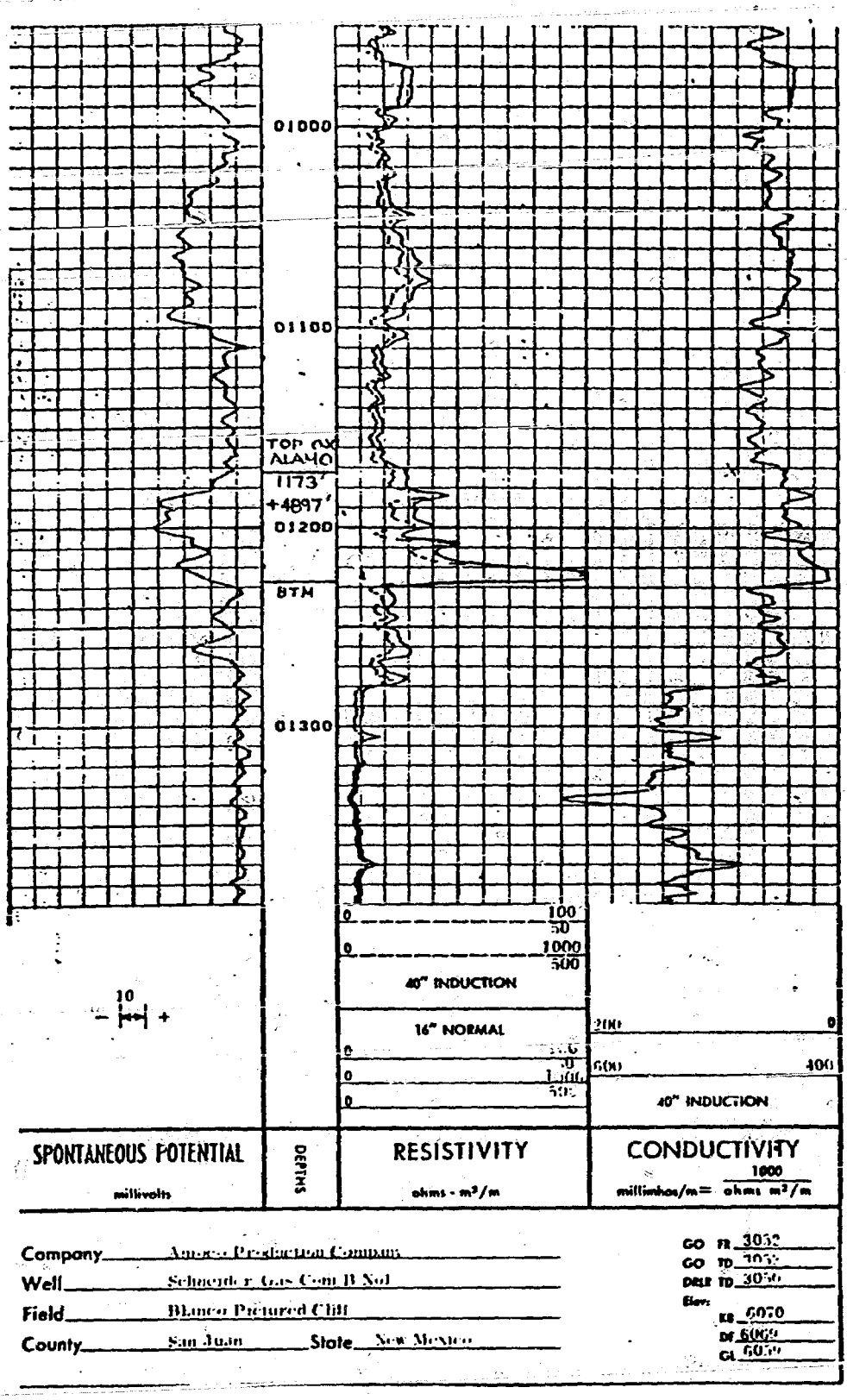
ATTACHMENT 5



AMOCO PRODUCTION COMPANY
KEYS GAS COM. "F" NO. 1
UNDESIGNATED FRUITLAND
SAN JUAN COUNTY, NEW MEXICO
SEC. 27-32N-10W

T.D. LOGGED 2896'
T.D. DRILLER 2900'
T.D. WELEX [illegible]
K.B. ELEV. [illegible]
G.L. ELEV. 5926'

ATTACHMENT 6



OIL CONSERVATION COMMISSION
Aztec DISTRICT

OIL CONSERVATION COMMISSION
BOX 2088
SANTA FE, NEW MEXICO

DATE 10-17-77

RE: Proposed MC _____
Proposed DHC _____
Proposed NSL _____
Proposed SWD ✓
Proposed WFX _____
Proposed PMX _____

OCT 20 1977

Gentlemen:

I have examined the application dated 10-12-77

for the Amoco Prod. Co.
Operator Lease and Well No. Unit, S-T-R

and my recommendations are as follows:

Cahn #3, NW/4 33-32N-10W
Keys Gas Com F #1, K-27-32N-10W

Approve

Yours very truly,

A R Kendrick

New Mexico Bureau of Mines & Mineral Resources
Socorro, NM 87801

A DIVISION OF
NEW MEXICO INSTITUTE OF MINING & TECHNOLOGY

Information 505/835-5420
Publications 505/835-5410
After hours 505/835-5011

November 16, 1977

Mr. Carl G. Ulvog
Oil Conservation Commission
Land Office Building
Santa Fe, NM

Dear Carl:

Am finally able to finish this response to your Nov. 10 call concerning disposal of Fruitland water in the Ojo Alamo in northeastern San Juan County! Although we have made no pumping tests in conjunction with our study, some hydrologic characteristics of the Ojo Alamo Sandstone are available in the literature. Please find attached a summary of these.

Specific capacities and transmissivities for the Ojo Alamo are generally low as shown on the attached table. The Ojo Alamo is artesian in all the cases extracted from Brimhall's article. The magnitude of S values for artesian aquifers normally ranges from 0.00001 to 0.001. The S values reported for the Ojo Alamo are thus moderate to high, falling in the middle or upper part of this range.

As regards quality of water, the main control of quality seems to be merely distance from outcrop. However, our preliminary compilation of data suggests that the total dissolved solids content of ground water from Tertiary aquifers as a group is generally greater than 1,000 mg/l in the area roughly north of T28N, regardless of distance from outcrop. This deviation from the rule may be explained in two ways.

First, the distance-from-outcrop control applies best to aquifers that are exposed only in a narrow band owing to basinward dips beneath overlying strata. Most of the Tertiary section crops out not in a single narrow band but rather over a broad area because of badlands topography that has evolved through dissection of these nearly horizontal and soft deposits. As dissection has rarely penetrated as deep as the Ojo Alamo, its water quality may be controlled by the distance-from-outcrop rule. We just don't have enough information at present to say for sure and I would be cautious in applying the greater-than-1,000 mg/l-north-of-T28N generalization until further data are compiled.

The second possible explanation for the apparent concentration of poor quality water north of T28N is that the Tertiary deposits seem to constitute a shallow ground water flow system that discharges more

or less directly to the San Juan River and its tributaries. After only brief contact with the shaly Tertiary strata, ground water emerges in discharge areas with considerably elevated salinity. As there are more tributaries in the northern area, more discharge (of slightly saline ground water) occurs there; quality may be affected more by this than distance from outcrop.

Hope this information will be useful. If I can be of further help don't hesitate to call.

Sincerely yours,

Bill

William J. Stone
Hydrogeologist

WJS/krb
Enclosure

Summary of Hydrologic Characteristics of Ojo Alamo Sandstone

San Juan Basin, New Mexico

Well No. (T.R. Sec.¼'s)	Pumping Rate (gpm)	Specific** Capacity (gpm/ft)	Pump Time (hours)	T** (gpd/ft)	S**	Total Diss. Solids (ppm)	Source (see below)
21.1W.28.143	13.4	0.82	?	--	--	1,030	(1)
23.1W.27.233	25.0*	6.25	?	--	--	1,510	(1)
20.3W.6.444	39.0	0.28	7	430	0.0005	360	(2)
20.3W.7.444	80.0	0.93	6	1,230	0.0067	403	(2)
20.3W.8.424	35.4	0.27	12	425	0.0002	402	(2)
25.9W.19.114	80.0	0.68	12	800	0.0030	--	(2)
27.12W.13.142	180.0	1.02	12	1,160	0.0009	--	(2)
27.12W.13.222	40.0	0.20	12	660	0.0007	824	(2)
30.12.22	--	--	--	--	--	3,290	(3)

Sources

(1) Baltz, E. H., and West, S. W., 1967, Ground-water resources of the southern part of Jicarilla Apache Indian Reservation and adjacent areas, New Mexico: U.S. Geol. Survey Water Supply Paper 1576 - H, p. 19 and 83.

(2) Brimhall, R. M., 1973, Ground water hydrology of Tertiary rocks of the San Juan Basin, New Mexico, in Cretaceous and Teritary rocks of the southern Colorado Plateau, a memoir: Four Corners Geol. Soc., p. 206.

(3) Rapp, J. R. 1959, Reconnaissance of the geology and ground-water resources of the Farmington area, San Juan County, New Mexico: U.S. Geol. Survey, Open-File Rept., SJ-7, Table 2.

*(this yield includes water from overlying alluvium)

**Specific capacity = yield per foot of drawdown

T (Transmissivity) = volume of water moving through a section of aquifer of unit width under a unit gradient of head; T = Kb where K is hydraulic conductivity and b is aquifer thickness.

S (Storativity) = dimensionless measure of volume of water produced from (or injected into) storage per unit surface area of aquifer per unit change in head; S = v/ah where v is volume of water released from storage, a is cross sectional area of aquifer prism and h is change in head.

ROUGH

dr/

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION

IN THE MATTER OF THE HEARING
CALLED BY THE OIL CONSERVATION
DIVISION FOR THE PURPOSE OF
CONSIDERING:

CASE NO. 6233

Order No. R-5780

APPLICATION OF AMOCO PRODUCTION
COMPANY FOR SALT WATER DISPOSAL,
SAN JUAN COUNTY, NEW MEXICO.

ORDER OF THE DIVISION

BY THE DIVISION:

This cause came on for hearing at 9 a.m. on May 17, 1978, at Santa Fe, New Mexico, before Examiner Richard L. Stamets.

NOW, on this _____ day of May, 1978, the Division Director, having considered the testimony, the record, and the recommendations of the Examiner, and being fully advised in the premises,

FINDS:

(1) That due public notice having been given as required by law, the Division has jurisdiction of this cause and the subject matter thereof.

(2) That the applicant, Amoco Production Company, is the owner and operator of ~~the Cahn Gas Com Well No. 3 located in Unit F of Section 33 and~~ the Keys Gas Com "F" Well No. 1 located in Unit K of Section 27 and the Cahn Gas Com Well No. 3 to be drilled in Unit F of Section 33, ~~of Section 27,~~ both in Township 32 North, Range 10 West, NMPM, Mt. Nebo-Fruitland Pool, San Juan County, New Mexico.

(3) That the applicant proposes to utilize said wells to dispose of produced salt water into the Ojo Alamo formation, with injection into the perforated intervals from approximately ~~1175~~ 1122 feet to ~~1230~~ 1178 feet and ~~1104~~ 1230 feet to ~~1122~~ feet, respectively.

as shown on

(4) That there are ~~two~~ five wells, ~~located~~ one or the other of said proposed disposal wells and which are not cemented across the Ojo Alamo formation in such a manner as to contain the proposed waters to be injected within said formation.

Exhibit A attached to this order and made a part hereof, which wells are located within one half mile of

(5) That no disposal of salt water should be permitted into either of said wells until all five wells shown on said Exhibit A have been cemented across and above the Ojo Alamo formation in accordance with a program to be approved by the supervisor of the Division's district office at Aztec.

(6) That the injection should be accomplished through (into the aforesaid two wells) 2 3/8-inch plastic lined tubing installed in a packer set at approximately 1050 feet and at approximately 1150 feet, respectively; that the casing-tubing annulus in each well should be filled with an inert fluid; and that a pressure gauge or approved leak detection device should be attached to the annulus of each well in order to determine leakage in the casing, tubing, or packer.

(5) That the injection wells or system should be equipped with a ~~pop-off valve or acceptable substitute~~ pressure limiting switch or other acceptable device which will limit the wellhead pressure ~~on the~~ at each injection well to no more than ~~700 psi~~. 220 psi

(8) That the operator should notify the supervisor of the Aztec district office of the Division of the date and time of the installation of disposal equipment so that the same may be inspected.

(9) That the operator should take all steps necessary to ensure that the injected water enters only the proposed injection intervals and is not ~~permitted~~ permitted to escape to other formations or onto the surface.

(10) That approval of the subject application will prevent the drilling of unnecessary wells and otherwise prevent waste and protect correlative rights.

IT IS THEREFORE ORDERED:

(1) That the applicant, Amoco Production Company, is hereby authorized to utilize its Cahn Gas Com Well No. 3 ~~located~~ to be drilled in Unit F of Section 33 and its Keys Gas Com "F" Well No. 1 located in Unit K of Section 27, both in Township 32 North, Range 10 West, NMPM,

Mt. Nebo-Fruitland Pool, San Juan County, New Mexico, to dispose of produced salt water into the Ojo Alamo formation, injection to be accomplished through 2 3/8-inch tubing installed in a packers set at approximately 1150 feet and 1050 feet, respectively, with injection into the perforated interval from approximately 1175 feet to 1230 feet and 1104 feet to 1122 feet, respectively.

PROVIDED HOWEVER, that in each well the tubing shall be plastic-lined; that the casing-tubing annulus shall be filled with an inert fluid; and that a pressure gauge shall be attached to the annulus or the annulus shall be equipped with an approved leak detection device in order to determine leakage in the casing, tubing, or packer.

Provided Further, That no injection of salt water shall take place in either of said wells until ~~the casing~~ the intermediate casing in all ~~the~~ the wells shown on Exhibit A attached to this order and made a part hereof shall have been cemented across and above the Ojo Alamo formation in a manner prescribed by the supervisor of the Division's District office at Aztec.

(2) That the injection wells or system shall be equipped with a ~~pop-off valve or acceptable substitute~~ pressure limiting switch or other acceptable device which will limit the wellhead pressure on the injection wells to no more than ~~700 psi.~~ 220psi.

(3) That the operator shall notify the supervisor of the Aztec district office of the Division of the date and time of the installation of disposal equipment so that the same may be inspected.

(4) That the operator shall immediately notify the supervisor of the Division's Aztec district office of the failure of the tubing, casing, or packer, in said wells or the leakage of water from or around said wells and shall take such steps as may be timely and necessary to correct such failure or leakage.

(5) That the applicant shall submit monthly reports of its disposal operations in accordance with Rules 704 and 1120 of the Division Rules and Regulations.

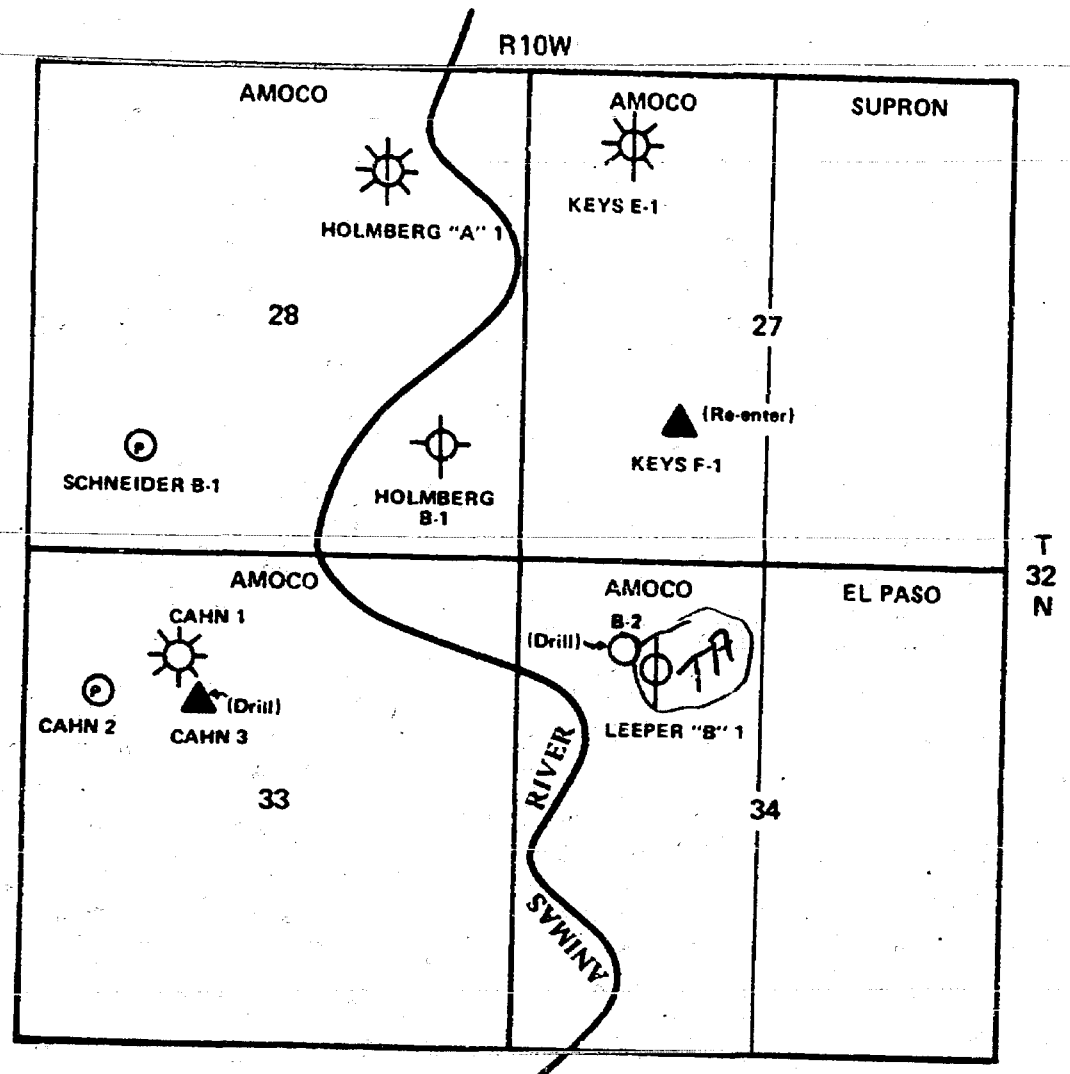
(6) That jurisdiction of this cause is retained for the entry of such further orders as the Division may deem necessary.

DONE at Santa Fe, New Mexico, on the day and year hereinabove designated.

Operator	Lease	Well No	Unit	Sec. T R
Supron Energy Corp	Payne	5 A	O	27-32N-10W
Amoco Production Co	Eaton Gas Com	1	H	33-32N-10W
"	Schneider Gas Com	1	L	28-32N-10W
"	Upton Grove Gas Com	1	L	33-32N-10W
"	Keys Gas Com "A"	1	K	27-32N-10W

Exhibit A
CASE No 6233
ORDER NO. R-

FRUITLAND GAS PLAY
CEDAR HILL AREA
SAN JUAN COUNTY, NEW MEXICO



○ PROPOSED FRUITLAND GAS WELL (TWIN TO LEEPER "B" 1 TEMPORARILY ABANDONED WELL)

✳ EXISTING FRUITLAND GAS WELL

Ⓟ FRUITLAND PRESSURE OBSERVATION WELL

▲ PROPOSED WELL FOR DISPOSAL OF PRODUCED FRUITLAND WATER INTO OJO ALAMO FORMATION

BEFORE EXAMINER STAMETS
OIL CONSERVATION COMMISSION
EXHIBIT NO. 1
CASE NO. 6233
Submitted by Amoco
Hearing Date 5-17-78

ATTACHMENT 8

Amoco Production Company

RESEARCH CENTER WATER ANALYSIS

T S or File No. _____
Lab. No. T-23,207
Field No. _____
API Well No. _____

LOCATION SAMPLED: Division Denver | District South | Area Farmington
Operator (Plant) Amoco | Well No. 1 | Lease Cahn Gas Com.
State (Province) New Mexico | County (Parish) San Juan
Twp. _____ Rng. _____ Sec. _____ | Quarter (Lsd.) _____ | Other (Meridian) _____
Sample collected from Wellhead | Wildcat ( ) Field Well ( ) | Field name _____
Interval sampled _____ to _____ | Date 3/25/77 | Sample collected by Inskeep
Recovery _____ | Interval name _____

Form 97 transmitted by B. Montgomery | Date 3/25/77 | Authorized by _____

ORGANIC CONSTITUENTS in mg/l

	BOTTOM	MIDDLE	TOP	MUD	
Benzene					
Toluene					
C. Gases					

DESCRIPTION OF SAMPLE

Sample used for detailed analyses _____
Date received _____
Condition as received _____
Color _____
Odor _____
Suspended solids _____
Bottom sediment _____
Oil or fluorescence _____

QUALITY OF SAMPLE

Chloride in mg/l:	BOTTOM	MIDDLE	TOP

COMMENTS:

CONVENTIONAL MAJOR ION ANALYSIS

			Major Ions mg/l	% of Total Major Ions	Reaction Value meq/l	% of Total Reaction Value
CATIONS	Sodium	Na^+	5,791	27.97	251.91	49.37
	Calcium	Ca^{++}	40	.19	2.00	.39
	Magnesium	Mg^{++}	15	.07	1.23	.24
	Potassium	K^+				
ANIONS	Chloride	Cl^-	964	4.65	27.18	5.33
	Bicarbonate	HCO_3^-	13,900	67.12	227.96	44.67
	Sulfate	SO_4^{--}	0	0	0	0
	Carbonate	CO_3^{--}	0	0	0	0
	TOTAL		20,710			

Total solids by evaporation 13,350 mg/l
NaCl resistivity equivalent (Dunlap) 10,576 mg/l
Resistivity .539 ohm-meters at 77 °F
pH 8.1 Specific gravity 1.015 at 72 °F
Ryznar stability index (2pHs-pH) _____ at _____ °F

OTHER IONS AND DISSOLVED SOLIDS

CATIONS	mg/l	ANIONS	mg/l	OTHERS	mg/l

REMARKS AND CONCLUSIONS:

MAY 2 1977
FARMINGTON AREA

1	AS	
	AAS	
2	AE	
	AA	
3		
4		
5		

wren 535.11

BEFORE EXAMINER STAMETS
OIL CONSERVATION COMMISSION
EXHIBIT NO. 2
CASE NO. 6233
Submitted by Amoco
Hearing Date 5-17-78

cc: Bob Reed
G. W. Schmidt

Analyst Bruce Barnes Date 4/15/77

jh

Water charts on back ( )

1

san juan testing laboratory, inc.

909 WEST APACHE • P.O. BOX 2079 • FARMINGTON, NEW MEXICO

PHONE:
327-9944

Date January 10, 1978

Report to AMOCO Production Company

Requested by Amoco Personnel Sampled by Amoco Personnel

Project Leeper B #1 Gas Well Location Cedar Hill Area

Source of Material Water Sample # 4 - Possibly from Ojo Alamo Formation 800' depth
1/9/78 1:00 p.m.

Lab No. 26906 Water Analysis for Petroleum Engineering

JAN 13 1978

TEST RESULTS

WATER ANALYSIS FOR PETROLEUM ENGINEERING

Constitutents	Test Results
Total Solids	17,664 mg/L
pH	6.95
Specific Gravity	1.012 at 64°F
Resistivity	0.362 ohms/meter @ 70°F
Conductivity	27,600 micromhos / cm @ 70°F

Comments

Essentially a 1.77% salt solution

Constitutents		
Cations	Meg/L	mg/L
Sodium	190.9	4,389
Calcium	103.0	2,060
Magnesium	2.0	24
Iron	Iron Sulfide as black prec.	
Barium	0	0
Anions		
Chloride	253.5	8,975
Bicarbonate	0.6	37
Carbonate	0	0
Hydroxide	0	0
Sulfate	41.7	2,000

BEFORE EXAMINER STAMETS
OIL CONSERVATION COMMISSION
EXHIBIT NO. 3
CASE NO. 6233
Submitted by Amoco
Hearing Date 5-17-78

Copies to AMOCO Production Company (3) ✓

TEST NO. 24484

Certified by

LAWRENCE A. BREWER REGISTERED PROFESSIONAL ENGINEER AND LAND SURVEYOR 3122 STATE OF NEW MEXICO

Form 360-7

san juan testing laboratory, inc.

909 WEST APACHE • P.O. BOX 2079 • FARMINGTON, NEW MEXICO

PHONE:
327-9944

Date January 10, 1978

Report to AMOCO Production Company

Requested by Amoco Personnel Sampled by Amoco Personnel

Project Leeper B #1 Gas Well Location Cedar Hill Area

Source of Material Water Sample #5 - Possibly from Ojo Alamo Formation 800' depth
1/9/78 shortly after 1:00 p.m.

Lab No. 26907 Water Analysis For Petroleum Engineering

RECEIVED
JAN 13 1978
FARMINGTON
AREA

AS
AAS
AC
AA
WAB

TEST RESULTS

File

WATER ANALYSIS FOR PETROLEUM ENGINEERING

Constitutents	Test Results
Total Solids	17,634 mg/L
pH	7.0
Specific Gravity	1.013 @ 64°F
Resistivity	0.365 ohms/meter @ 70°F
Conductivity	27,400 micromhos/cm @ 70°F

Comments

Essentially a 1.76% salt solution

Constitutents		
Cations	Meg/L	mg/L
Sodium	190.7	4,385
Calcium	101.5	2,030
Magnesium	3.2	39
Iron	Iron sulfate as black pre	
Barium	0	0
Anions		
Chloride	254.2	9,000
Bicarbonate	0.5	29
Carbonate	0	0
Hydroxide	0	0
Sulfate	40.6	1,950

BEFORE EXAMINER STAMETS
OIL CONSERVATION COMMISSION
EXHIBIT NO. 4
CASE NO. 6233
Submitted by Amoco
Hearing Date 5-17-78

Copies to AMOCO Production Company(3) ✓

TEST NO. 24485

Certified by:

LAWRENCE A. BREWER
REGISTERED
PROFESSIONAL ENGINEER AND LAND SURVEYOR
3122
STATE OF NEW MEXICO

CL1-12A (REV. 1964)

JAN 9 1978
FARMINGTON AREA

CHEMICAL & GEOLOGICAL LABORATORIES

P. O. Box 2794
Casper, Wyoming

WATER ANALYSIS REPORT

OPERATOR Amoco Production Co. DATE January 4, 1978 LAB NO. 26013
WELL NO. Usselman Gas Com No. 1A LOCATION Sec. 4-31N-10W
FIELD Blanco-Mesaverde FORMATION
COUNTY San Juan INTERVAL 1190
STATE New Mexico SAMPLE FROM Flow during drilling (12-29-77)

REMARKS & CONCLUSIONS: Suspect Ojo Alamo

cc: a.m. Roney
E.E. Fitzjarrald

Cations	mg/l	meq/l	Anions	mg/l	meq/l
Sodium	3195	139.00	Sulfate	4960	103.17
Potassium	14	0.36	Chloride	2000	56.40
Lithium			Carbonate	-	
Calcium	452	22.55	Bicarbonate	268	4.40
Magnesium	25	2.06	Hydroxide		
Iron	-		Hydrogen sulfide	-	
Total Cations		163.97	Total Anions		163.97

Total dissolved solids, mg/l 10778
NaCl equivalent, mg/l 8241
Observed pH 7.1

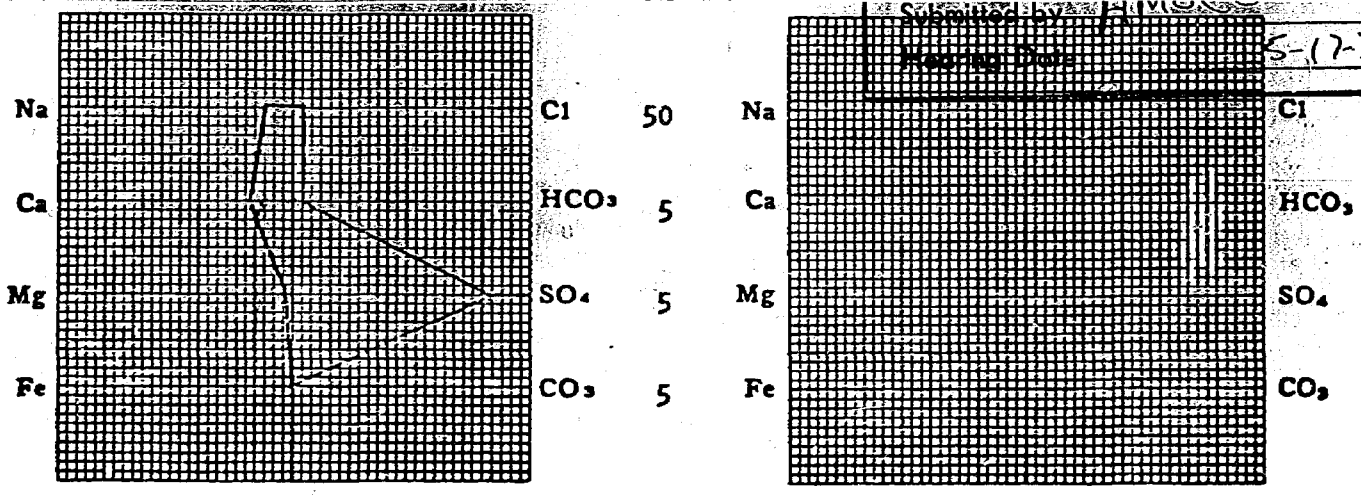
Specific resistance @ 68°F.:
Observed 0.88 ohm-meters
Calculated 0.80 ohm-meters

BEFORE EXAMINER STAMETS
OIL CONSERVATION COMMISSION
EXHIBIT NO. 5
CASE NO. 6233
Submitted by Amoco
Hearing Date 5-17-78

WATER ANALYSIS PATTERN

Sample above described

Scale
MEQ per Unit



(Na value in above graphs includes Na, K, and Li)
NOTE: Mg/l=Milligrams per liter Meq/l= Milligram equivalents per liter
Sodium chloride equivalent=by Dunlap & Hawthorne calculation from components

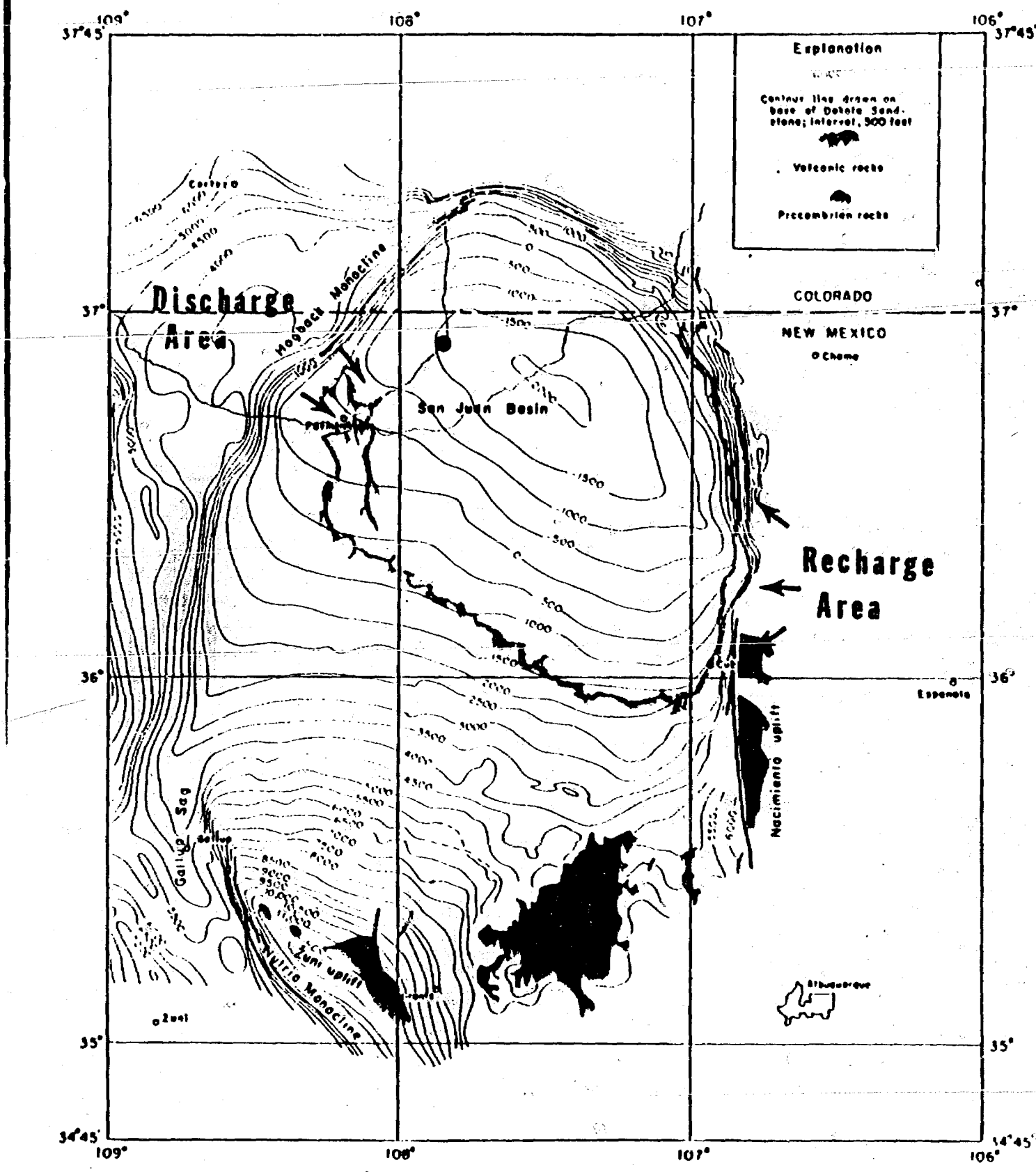


Figure 1.
Map showing structure of San Juan Basin. Modified from Silver (1950)

Gary C. Harrison