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

any

f.

CASE NO.

6233

APPlication, Transcripts, Small Exhibits,

ETC.



Amoco Production Company

Securify Life Building ປະເທດ 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

Oil Core Tryation Division SANTA FE

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 encounced 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

Joe D. Ramey Page 2 February 15, 1978

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. \(\begin{align*}\)

R. B. Giles

RBG/fet Encls.

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 STATE OF COLORADO

: 88

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,R1OW 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.

. B. GILES

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

My Commission expires:

Cammission Expires Aug. 15, 1980

san juan testing laboratory. inc.

Date January 10, 1978

Report to	AMOCO Production Company	
Requested by	Amoco Personnel Sompled by Amoco Personnel	JAN 13 1978
Project	Leeper B #1 Gas Well Locotion Cedar Hill Area	ACTA
Source of Material .	Water Sample # 4 - Possibly from Ojo Alamo Formation 8001 de	
<u> </u>	1/9/78 1:00 p.m.	- AA
Lab No	26906 Water Analysis for Petroleum Engineering	
	' TEST RESULTS	

Constitutents	Test Results	Constitutents		
Total Solids	17,664 mg/L	Cations	Meg/L	mg/L
рН	6.95	Sodium	190.9	4,389
Specific Gravity	1.012 at 64°F	Calcium	103.0	2,060
Resistivity	0.362 ohms/meter @ 70°F	Magnesium	2.0	24
Conductivity	27,600 micromhos / cm @ 70°F	Iron	Iron Sulfid	e as black p
	en e	Barium	0	0
Comments	• · · · · · · · · · · · · · · · · · · ·	Anions	en e	
Essentially a 1.77% s	alt solution	Chloride	253.5	8,975
er erre grand helder med der beginnt i der		Bicarbonate	0.6	37
		Carbonate	0	0
		Hydroxide	0	0
	and the second of the second o	Sulfate	41.7	2,000

AMOCO Production Company (3) TEST NO. 24484

san juan testing laboratory, inc.

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

327.9944

Date January 10, 1978 RECEIVED AMOCO Production Company Report to __ JAN 13 1978 Requested by Amoco Personnel _ Sampled by ____Amoco_Personnel Leeper B #1 Gas Well AREA Cedar Hill Area ___ Location Project _ Water Sample #5 - Possibly from Ojo Alamo Formation 800' Source of Material . 1/9/78 shortly after 1:00 p.m. 26907 Water Analysis For Petroleum Engineering Lab No. TEST RESULTS

				TW
Constitutents	Test Results	Constitutents	•	
Total Solids	17,634 mg/L	Cations	Meg/L	mg/L
pH	7.0	Sodium	190.7	4,385
Specific Gravity	1.013 @ 64°F	Calcium	101.5	2,030
Resistivity	0.365 ohms/meter @ 70°F	Magnesium	3.2	<u> </u>
Conductivity	27,400 micromhos/cm @ 70°F	Iron	Iron sulfat	te as black pro
		Barium	0	0
Comments		Antons		
Essentially a 1.76%	salt solution	Chloride	254.2	9,000
		Bicarbonate	0.5	29
		Carbonate	0	0
		Hydroxide	0,,	0
	<u>C</u>	Sulfate	40.6	1.950

WATER ANALYSIS FOR PETROLEUM ENGINEERING

Copies to AMOCO Production Company(3)

Certified by:

TEST NO. 24485

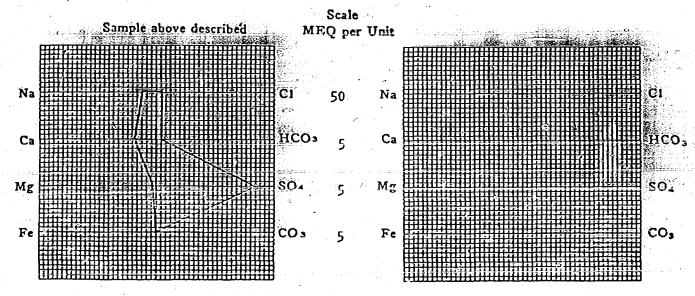
Certified by:

CHEMICAL & GEOLOGICAL LABORATORIES FARMINGTOR AREA P. O. Box 2794 AS. Casper, Wyoming AE -WATER ANALYSIS REPORT Amoco Production Co. OPERATOR ____ DATE January 4, 1978 LAB Usselman Gas Com No. 1A WELL NO. Sec. 4-31N-10W 4 LOCATION. Blanco-Mesaverde FORMATION. FIELD_ 5 WRB-US San Juan 1190 COUNTY! INTERVAL wii New Mexico Flow during drilling (12-29-77) STATE. SAMPLE FROM ca. a.m. Rosey Suspect Ojo Alamo REMARKS & CONCLUSIONS: Cationa meq/1 mg/1 meq/1 3195 139.00 4960 103:17 Sodium Sulfate 0.36 2000 Potassium Chloride 56.40 Lithium 22.55 268 Calcium Bicarbonate 4.40 2.06 Magnesium Hydroxide Hydrogen sulfide 163.97 Total Cations 163.97 Total Anions 10778 Total dissolved solids, mg/1 Specific resistance @ 68°F .: 8241 NaCl equivalent, mg/l - -0.88 Observed ohm-meters 7.7 0.80

WATER ANALYSIS PATTERN

Calculated

Observed pH - - -



(No value in above graphs includes No. R. and Li)

NOTE: Mg/1=Milligrams per liter Meq/1= Milligram equivalents per liter

Sodium chloride equivalent=by Dunlap & Hawthorne calculation from c

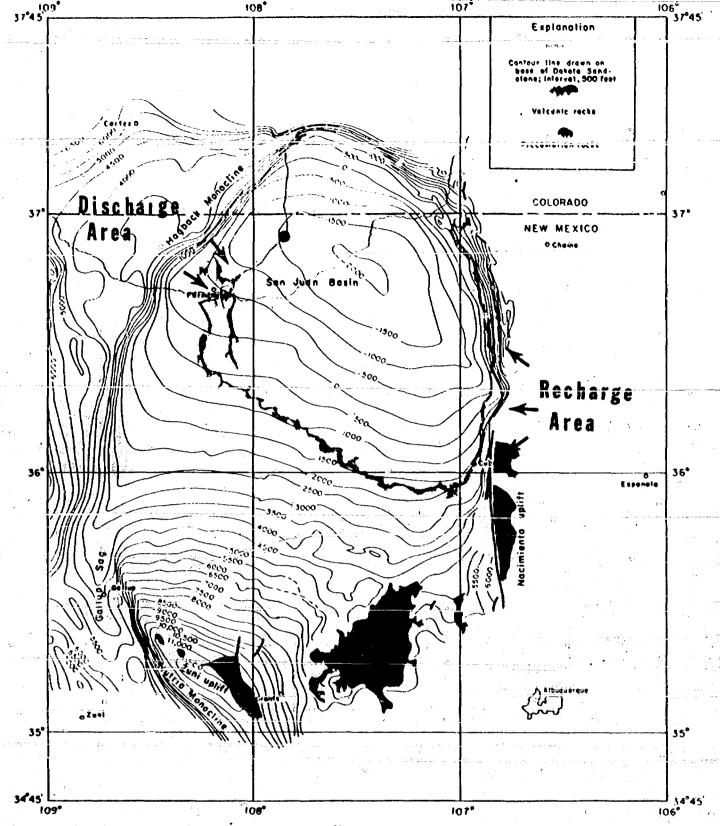


Figure 1.
Map showing structure of San Juan Basin. Modified from Silver (1950)

Ojo Alamo OutcropDisposal 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.

Case No. 6233 Order No. R-5780

- (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.

Case No. 6233 Order No. R-5780

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.

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

fd/

Case No. 6233 Order No. R-5780

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

Exhibit A

CASE NO. 6233 ORDER NO. R-5780



Amoo 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

Selfor liening on

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:

Joe D. Ramey (3) October 12, 1977 Page Two

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

Joe D. Ramey (3) Uctober 12, 19// Page Three

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

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

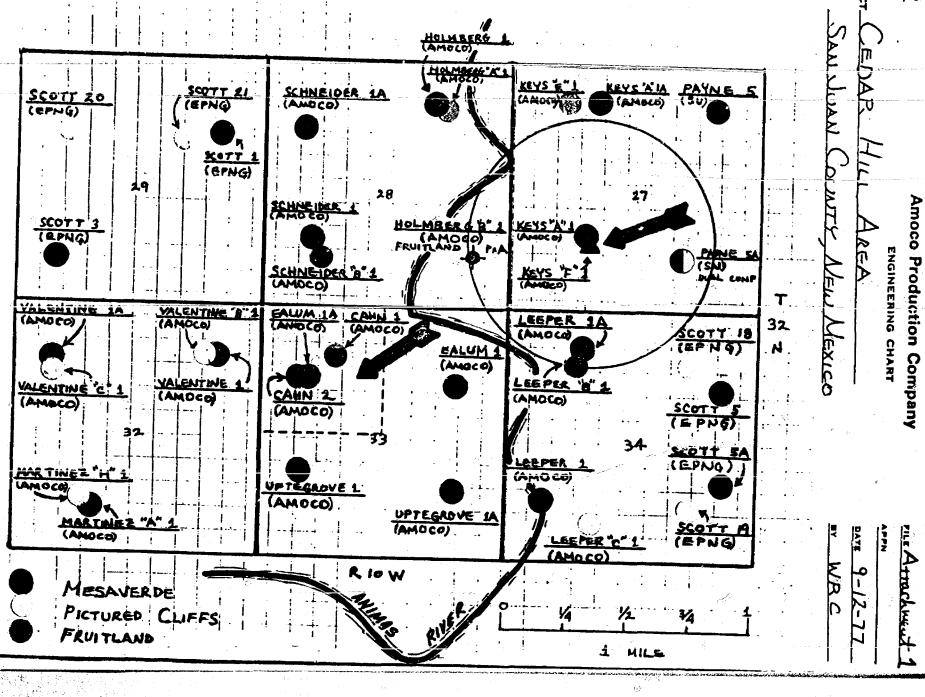
and to the best of his information, knowledge and belief, the above named are the only parties to whom notice of such application is required to be given in accordance with Rule 701 of the New Mexico 011 Conservation Commission's Rules and Regulations.

1

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

Commission expires:

COY My Commission Expires Aug. 15, 1980



NEW MEXICO OIL CONSERVATION COMMISSION

APPLICATION TO DISPOSE OF SALT-WATER BY INJECTION INTO A POROUS FURMATION

OPERATOR			ADDRESS			
AMOCO PRODUCTION C	OMPANY	TWELL NO.	501 AII	RPORT DRIVE,	FARMINGT	ON, NM 87401
			11.7		ta a company	
Cahn Gas Com LOCATION Not yet drill	ad Propos	l 3		gnated Ojo Al 33, T-32-N, R		San Juan
t de la Tallacia de la Calenda de la Cal		and the second s			#1. # #16. 1 #1. s	and the second of the second o
UNIT LETTER	i w	CLL IS LOCATED	FEET FR	OM THE	LINE AND_	FEET FROM TH
LINE, SECTION		TH3HIP	RANGE	NMPM.		es de
,		CASING	AND TUBING DAT	A		
NAME OF STRING	SIZE	SETTING DEPTH	SACKS CEME	NT TOP OF	CEMENT	TOP DETERMINED BY
SURFACE CASING			*		, ,	
INTERMEDIATE	8-5/8" 24#	250'	250	Circu	Tate	
	4-1/2" 9.5	1400'	500	Circu	ilate	
LONG STRING	4-1/2 3.5	1400	300		izacc,	The state of the s
<i>7</i>				1	1	
TUBING			NAME, MODEL AND D	EFTH OF TUBING PACKE	:R	·
	2-3/8" 4.7	1150'	Baker Mode	l "N" set at		<u></u>
NAME OF PROPOSED SHJECTION FORM	AATEON		TOP OF FORM		. [OF FORMATION
Ojo Alamo	INC. OB ANNUI 1182	TERROPATION		75 THE TOPOSED INTERVAL (S)		1230'
	indian manages:	1				en de la companya de La companya de la co
Tubing IS THE A NEW WELL DRILLED FOR DISPOSAL!	IF ANSWER IS	NO. FOR WHAT PURPO		1175-1230	<u> </u>	LL EVER BEEN PERFORATED IN A
Yes					ZONE D	THER THAN THE PROPOSED INJEC-
LIST ALL SUCH PERFORATED INTERV	ALS AND SACKS OF C	EMENT USED TO SEAL	OFF OR SQUEEZE EACH	н		
a de la companya de l	· · · -					
DEPTH OF BOTTOM OF DEEPEST FRESH WATER ZONE IN THIS AREA		DEPTH OF BOTTOM O	F NEXT HIGHER THIS AREA	DEPTH OIL OR	OF TOP OF NEX	T LOWER HIS AREA
Approximately 100	ft.	NON			2800	
ANTICIPATED DAILY MINIMUM INJECTION VOLUME (SELS.)	MAXIMUM	OPEN OR CLOS	SED TYPE SYSTEM	IS INJECTION TO BE	Y CRAVITY OR	APPROX. PRESSURE (PS)
1 200	600	Clos		Pressu		TER ANALYSES ATTACHED?
ANSWER YES ON NO WHETHER THE F ERALIZED TO SUCH A DEGREE AS TO STOCK, IRRIGATION, OR OTHER GENE	BE UNFIT FOR DOMES	itic,		SAL ZONE		
HAME AND ADDRESS OF SURFACE OW	HER (OR LESSEE, IF	STATE OR FEDERAL LA	Yes	, Yes_		Yes
Katie Cahn, 3703 S	Seguoia St.	Coral Gables	Florida 33	1134		e de la companya de
Katie Cahn, 3703 S	OPERATORS WITHIN	ONE HALF () MILE OF	THIS INJECTION WEL	L		
No other operators	3					
		÷, *	er e		**	
				e e e e e e e e e e e e e e e e e e e		
						**
					<u>.</u>	
HAVE COPIES OF THIS APPLICATION SENT TO EACH OF THE FOLLOWING?	SEEN SURFACE DW	NER	EACH OPERAT	OR WITHIN ONE-HALF A	ITHE NE	W MEXICO STATE ENGINEER
ARE THE FOLLOWING ITEMS ATTACH	(D 70 B) 47 '05 405		ELECTRICAL	1.06		MMATIC BRETCH OF WELL
THE APPLICATION (SEE RULE 701-E	1)		i i		I	MMATIC BRETCH OF WELL
<u> </u>	A	. 	. n			
4)()(4)	contity that the in	formation above is	True and complete	to the best of my	ruomieage at	id belief.
KISIL	Les	Ar	May	Charles-		10/12/17
(Signature)			(7)	1		(Date)
NOTE: Should waivers from	the State Engine	er, the surface of	wher, and all op-	erators within one	half mile of	the proposed intertion well
not accompany this	application, the	New Mexico Oil	Conservation Con	nmission will hold	the applica	ation for a period of 15 day
from the date of rec	eipt by the Com	mission's Santa I	Fe office. If at t	the end of the 15-d	ay waiting p	eriod no protest has been re

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

NEW MEXICO OIL CONSERVATION COMMISSION

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

OPERATOR			APPRESS		·
AMOCO PRODUCTION C	OMPANY	TWELL NO.	501 AI	RPORT DRIVE, FAI	RMINGTON, NM 87401
Keys Gas Com "F"	s .	1		o Fruitland	San Juan
LOCATION	-	_	•		1
	<u> </u>	el is coertes 4 1	510	South .	LINE AND 1685 PEET PROM THE
West LINE, SECTION	27 ron	INSHIP 32-N	MANGE 10-W	NMPM.	
			AND TUBING DAT		
NAME OF STRING	SIZE	SETTING DEPTH	SACKS CEMEN	TOP OF CEMI	ENT TOP DETERMINED BY
	8-5/8" 24#	2501	200	G.L.	Circ to surface
INTERMEDIATE	4-1/2" 9.5#	2886'	750	G.L.	Circ to surface
LONG ETRING		,	ž		· .
TUBING			NAME, MODEL AND DE	PTH OF TUBING PACKER	
	2-3/8" 4.7#	10501	Baker Mod	el "N" set at l	
NAME OF PROPOSED INJECTION FORMA	TION				BOTTOM OF FORMATION
Ojo Alamo IS INJECTION THROUGH TUBING, CASID	G, OR ANNULUS?	PERFORATIONS	106 OR OPEN HOLE? PR	9 . DPOSED INTERVAL(S) OF INJ	1122
Tubing		Per		1104-221	
IS THIS A NEW WELL ORILLED FOR DISPOSAL?	IF ANSWER IS	NO, FOR WHAT PURPO	SE WAS WELL ORIGINA	LLY PRILLED?	MAS WELL EVER BEEN PERFORATED IN AN ZONE OTHER THAN THE PROPOSED INJECTION ZONE?
NO LIST ALL SUCH PERFORATED INTERVA	Gas Pr	oduction	OFF OR SQUEEZE EACH		Yes
2780-84 , 2794-98 2600-08 and 2668	, 2804-08',	2820-24', 2	832-36', x 2	SPF (Sqz. with	100 sx); 2451-59',
PEPTH OF BOTTOM OF PEEPEST PRESH WATER ZONE IN THIS AREA	-10 8 2 31	DEPTH OF SOTTOM OF		DEPTH OF TO	OP OF NEXT LOWER
Approximately 100	ft.	None			2450'
ARTICIPATES DAILY MINIMUM INJECTION VOLUME (BBLS.)	1		ED TYPE SYSTEM	IS INJECTION TO BE BY GR	1 1100
ANSWER YES ON HO WHETHER THE PO	LLOWING WATERS AR	Close	Q TO SE DISPOSED OF	Pressure NATURAL WATER IN DISPO-	ARE WATER ANALYSES ATTACHED?
STOCK, MRIGATION, OR STUER SENER	AL USE -	1	Yes	Yes	Yes
NAME AND ADDRESS OF SURFACE OWN					
Henry Knowlton, Rt	. 1, Box 65	-E, Aztec, N	EW Mexico 6 8	7410	
Supron Energy Corp	e de la servició de la companya de l				
	•				
			 		
		international designation of the second seco		·	- 42
	4				
			- <u>- </u>		<u>in the state of t</u>
			<u> </u>		
MAYE COPIES OF THIS APPLICATION SENT TO EACH OF THE FOLLOWING	EEN THURFACE OWN	CR	FACH OPERATO	OR WITHIN ONE-HALF MILE	THE NEW MEXICO STATE ENGINEER
THE THE POLLOWING ITEMS ATTACHE THE APPLICATION (SEE RULE 701-8)	TO PLAT OF AREA	· ·	ELECTRICAL L	06	DIAGRAMMATIC SKETCH OF WELL
	tily that the inf	ormation share A	true and completo	to the best of my know	sladge and halief
7//21773	7	ormation apple	Y 1 A 1 1/	the nest of my know	$oldsymbol{I}_{m,m,oldsymbol{I}}$
K/12/du	lls.		r. staff	ingr	10/12/17
(Sfenature)			(Title)		(Date)
NOTE: Should waivers from t not accompany this a	he State Engine pplication, the 1	er, the surface ou Yew Mexico Oil (vher, and all ope Conservation Com	rators within one-half mission will hold the	mile of the proposed injection well application for a period of 15 day

NOTE: Should waivers from the State Engineer, the surface owher, 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	CASING SIZEAND WT.			CEMENT	•	PRODUCING
ayne No. 5A Southern Union	1140' FSL x 1725' FEL Sec. 27, T-32-N, R-10-W	13-3/4" 8-3/4"	10-3/4" 30# 7" 23#	DEPTH (FT) 546' 3443'	350 sx	CIRC	<u>TD</u> 5770'	Pictured Cli
Jahn Can Can May 1		6-1/4"	4-1/2" 10.5#	3323-5690	230 sx 4.5	2400 ' 4 600 '		Mesaverde
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#	253¹ 2795¹	250 sx 600 sx	CIRC.	2812	
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 ¹ 2957 ¹	250 sx	CIRC	2946'	7.41 fill 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"	9-5/8" 32.3#	256'	200 sx	* 100-200' CIRC	5320'	Mesaverde
		6-1/4"	7" 20# x 23# 5" 15# 5-1/2" 14#	4642 ' 4346–5320'	438ft3 2.4/	/ 35851 / 4300 ·	JJ20	uesavelde
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"	9-5/8" 32.3# 7" 23#	259 ' 3200 '	280 sx	CIRC	54001	Mesaverde
<u> </u>		6-1/4"	4-1/2" 10.5#	3018-5400'	775 sx /∤./ 375 sx	CIRC CIRC	· · · · · · · · · · · · · · · · · · ·	
	1 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 sg 428ft ³ /,46 122 sg	CIRC 4020	5410 '	Mesaverde
hneider Gas Com No.	1A 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 '	280 sx	4700' CIRC CIRC	5525'	Mesaverde
hneider Gas Com "B" Amoco	No. 1 1110' FSL x 1185' FWL Sec. 28, T-32-N, R-10-W	12-1/4"	8-5/8" 24# 4-1/2" 10.5#	258'	280 sx 200 sx	4796'	3050' 1	Fruitland
tégrove Gas Com No. 1 Amoco	1 10001 70*	12-1/4" 8-3/4"	9-5/8" 32.3# 7", 20#	3050 ' 279 ' 4579 '	930 sx 3,3 (CIRC CIRC 3210'	*	Mesaverde
	Sec. 33, T-32-N, R-10-W	12-1/4" 9 8-3/4"	9-5/8" 36# 7" 23#	3075'	280 sx C	CIRC	5250' M	Mesaverde
ALCULATED CEMENT TOP	28 - 12 - 12 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	0 1/4 .	+-1/2 10.5#	2868-5250	280 sx C	CIRC		. A

WELL NAME OPERATOR	WELL LOCATION	HOLE SIZE		SETTING SPTH (FT)	CEMENT	CEMENT TOPS	TD	PRODUCING INTERVAL
eper Cas Com No. 1A Amoco	Sec. 34, T-32-N, R-10-W	8-3/4" 6-1/4"	9-5/8" 32.3# 7" 23# 4-1/2" 10.5# 29	254' 3149' 962-5305'	280 sx 775 sx 375 sx	CIRC *100200' CIRC	5305'	Mesaverde
eper 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#	258' 2851'	200 sx 870 sx	CIRC	2851'	Fruitland
lentine 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"	2 11# 9-5/8" 32.3# 7" 20# 4" 11.34# 41	261' 4570' 96-5289'	250 sx 800 sx 225 sx	CIRC CIRC CIRC	5289'	Mésaverde
lentine Gas Com "B" No. Amoco	1 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# × 11#	261' 2960'	275 sx 640 sx	CIRC *100-200'	2960'	Pictured Clif
ys 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#	250' 4551' 05-5243'	225 sx 438ft ³ 100 sx	CIRC 2490' • *CIRC	5243'	Mesaverde

Calculated cement tops

Amoco Production Company ENCINEERING CHART

BHEET NO. FILE ATTACHUEUT

DATE 9-14-77 WRC WRC

SUBJECT / JULAUSEPO GAS CON 15 NO. 1 HIGE FSLX FIR FEL SEC 28 32-10 SAN JUAN COUNTY, NEW MEXICO

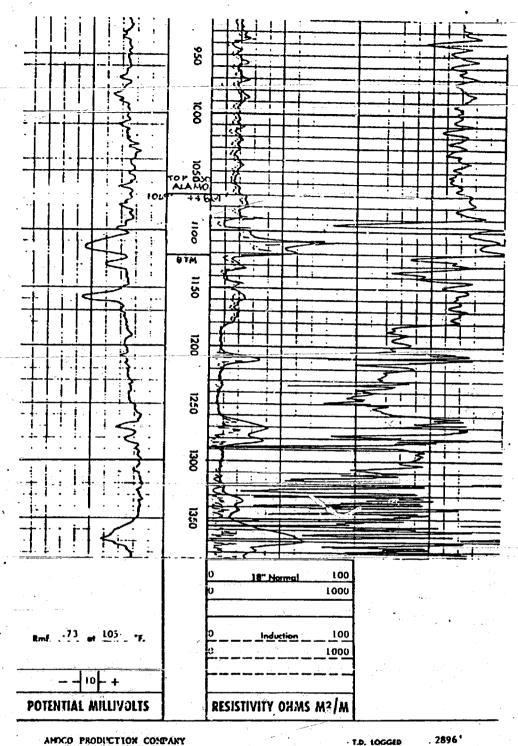
12/4" hole CMT X 250 Sx .. CIRC CMT. 7 % hole 41/2" 10.5# CSA 2669"

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

CMT 1650 SX

WELL PLUGGED × ABANDONED 12-04-73.

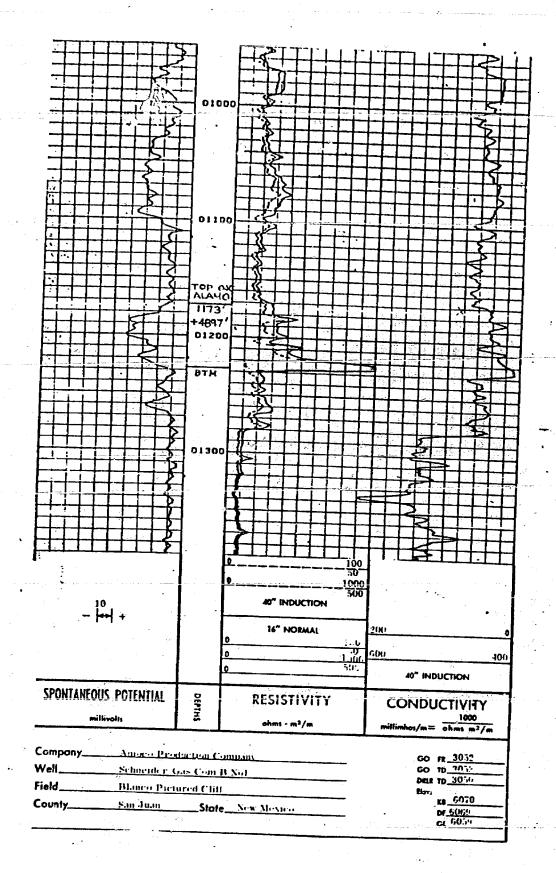
TD 2669'



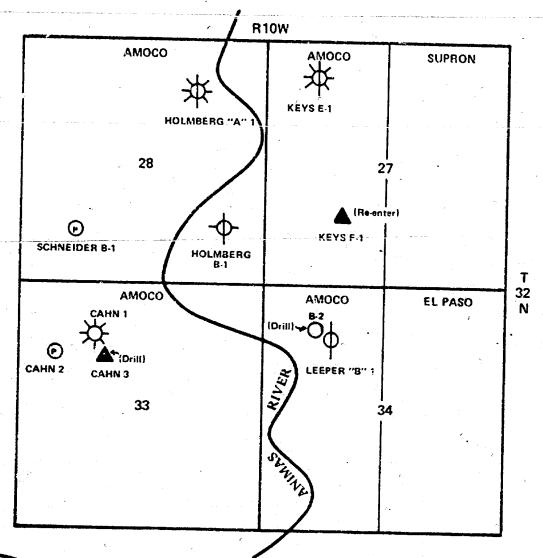
AMOCO PRODUCTION COMPANY KEYS GAS COM. "F" NO. I UNDESIGNATED FRUITLAND SAM JUAN COUNTY, NEW MEXICO SEC. 27-32N-LOW

T.D. LOGGED 2896 * 2900 *

. WEEK ... 240.2° ... ELEV. ... 3926'



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

P FRUITLAND PRESSURE OBSERVATION WELL

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

BEFORE EXAMINER STAMETS
OIL CONSERVATION COMMILSTON
_____EXHIBIT NO. /
CASE NO. 6233
Submitted by Pinoco
Hearing Date 5/17/78

ATTACHMENT	Amoco Production Company
ATTACHMENT 8	RESEARCH CENTER TS of File No
· • • • • • • • • • • • • • • • • • • •	140 No. 1-23, 207
	Field No
CATION SAMPLED: Division Denver	District South Area Farmington
perator (Plant) Amoco	Well No. 1 Lease Cahn Gas Com.
Prizator (Plant) Amoco New Mexico	County (Parish) San Juan
WD Rng Sec.	Outrier (Lsd.) Other (Meridian)
Hallboad	Wildcat () Field Well () Field name
mple collected from wellinead	Date Sample collected by Inskeep
nerval sampledtoto	Interval name
ccovety	
rm 97 transmitted by H. Montgomery	Date 3/25/77 Authorized by
ORGANIC CONSTITUENTS in mg/1	CONVENTIONAL MAJOR ION ANALYSIS
BOTTOM MIDDLE TOP MUD	
NACTA:	Major % of Total Reaction % of T lons Major Value React
plaene /	mg.1 lons meq.1 Value
Gases	Sadium Nat 5,791 27,97 251,91 40
	Ö Calcium Ci-1 40 19 2.00
	Magnesium Mg** 15 .07 1.23
	Potassium K4
DESCRIPTION OF SAMPLE	Chlorid: Cl 964 4.65 27.18 5.
imple used for detailed analyses	E Bicarbanate HCO3 13,900 67.12 227.96 44.
ne received	
indition as received	
plor	
dor	Total solids by evaporation 13,350 n
prom sediment	
il or fluorescence	Resistivity 539 ohm-meters at 77 PH 8.1 Specific gravity 1.015 at 72
ii oi neorexerre	Ryznar stability index (2pHs-pH) at
QUALITY OF SAMPLE	
	OTHER IONS AND DISSOLVED SOLIDS
hkride BOTTOM MIDDLE TOP	CATIONS mg/1 ANIONS mg/1 OTHERS mg
n mg/1:	
OMMENTS:	
	REMARKS AND CONCLUSIONS:
CTALIFTC	may 2 :977
BEFORE EXAMINER STAMETS	Final STUN
OIL CONSERVATION COMMISSION	ARFA
EXHIBIT NO. 2	/ IS CON
CASE NO. 6233	Z AE HODE
	M M
Submitted by HMOCO,	3 4 5 0 8
Hearing Date 5 / 17 / 78	4 OCE THE
Treating 5 on 5	- Sulliane H
The state of the s	
	wen 535.11
C: Bob Reed	0
G. W. Schmidt	— /X
	Analyst Dayle DAMON Date 4/15/77
	Date At 13/11

water personal and a

Water charts on back (

san juan testing laboratory, inc.

909 WEST APACHE L. P. O. BOX 2079 FARMINGTON, NEW MEHICO

P H D N E

Date January 10, 1978

		4	Dai	re			
Report to	AMOCO Production Company				i JA	N 13	1070
Requested by	Amoco Personnel	Sample	ed byAmoco_Pe	rsonnel			
. \	Leeper B #1 Gas Well					AREA :	
Project				•	death		
Source of Material _	1/9/78 1:00 p.m.	717.114	OJO ATOMO TOO	HE COMPANY		M	
				•		1	
Lab No	26906 Water Analysis	for Pe	troleum Enginee	ring			<u> </u>
	' TEST	RESULT	S				
	WATER ANALYSIS FOR	PETROLE	UM ENGINEERING				•
onstituten <u>ts</u>	Test Results_		Constitutents	. ••	1)		
otal Solids	17,664 mg/L	r ee	Cations	Meg/L	mg/L		•
H	6.95		Sodium	190.9	4,389	r	
pecific Gravity	1.012 at 64°F		Calcium	103.0	2,060		
-	0.362 ohms/meter @ 70°F		Magnesium	2.0	24		
onductivity	27,600 micromhos / cm @	70°F	Iron	Iron Sulfi	de as b	lack p	rec
1. The second of		4.7	Barium	0	0		
omments "		•	<u>Anions</u>		er Mariges er Till Str		
ssentially a 1.77	x salt solution		Ch:oride	253 [°] .5	8,975		
	• e		Bicarbonate	0.6	37		
BEFORE EXAM	NER STAMETS	· · · ·	Carbonate	0	0		
OIL CONSERVATI	ON COMMISSION		Hydrox	0	0		
EXHIB	IT NO. 3	*9	- (- <u>7</u>	41.7	2,000	,	- 149 •
CASE NO. 6.	233			•		().	
Submitted by	MDCO				** :	••	
Hearing Date	5/17/78		\mathcal{M}_{i}				•
Liennia	TO STATE OF THE PARTY OF THE PA	•	erio de la companya d	ENGE A. RO			
Copies to AMUCU	Production Company (3)			RETURN		212° 2	41+
Copies to				2100			
		Certif	fied by	3122			
	•	1	St. la	Xee S	Las		
TEST NO. 24484	· (Sul	OF NEW AND	- Car		_
			•		Forr	n 360-7	* 1

san juan testing laboratory, inc.

909 WEST APACHE . P.D. BOX 2079 . FARMINGTON, NEW MEXICO

P H D N E : 327-9944

Date January 10, 1978

Report to	AMOCO Production Company			RECEIVED	
•	Amoco Personnel Sor	and by Amoco	Parconnal	JAN 13 1	•
	Loopen D 40 Con Mail		Hill Area	AREA	1
Project	Local Company of the			AS AS	-
Source of Material _	1/9/78 shortly after 1:00 p.		illation bou	QEP LIN	-
Lob No	26007 Water Analysis For De		ing	was	
	TEST RESU	LTS			-
	WATER ANALYSIS FOR PETRO	LEUM ENGINEERING		7.le	•
Constitutents	Test Results	Constitutents			
Total Solids	17,634 mg/L	Cations	Meg/L	mg/L	
рН	7.0	Sodium	190.7	4,385	
Specific Gravity	1.013 @ 64°F	Calcium	101.5	2,030	
Resistivity	0.365 ohms/meter @ 70°F	Magnesium	3.2	39	
Conductivity	27,400 micromhos/cm @ 70°F	Iron	Iron sulfa	te as black	
		Barium	0	0	٠,
Comments		<u>Anions</u>			
Essentially a 1.76%	salt solution	Chloride	254.2	9,000	
		Bicarbonate	0.5	29	
BEFORE EXAMI	NER STAMETS	Carbonate	0	0 .	
OIL CONSERVATION	TNO. 4	Hydroxide	0	0 1 2 2 2 2 2	
FXM8I	122	Sulfate	40.6	1,950	
CASE NO. 6.	7 M 20 2		er e		
Submitted by	7MOCO				
Hearing Date	for the second s	e e e e e e e e e e e e e e e e e e e	,		
THE RESERVE OF THE PARTY OF THE			ENGEA	BREL	
Copies to	Production Company(3)	· · · · · · · · · · · · · · · · · · ·	AN SERVICE	151	
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OA AOE		1 /	to the		
TEST NO. 24485		va v	700		-
·			21 11		,

Cations

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mg/1

3195 -- 14

Sample above described

8.0458/2522 2005 FILTER OF THE TOTAL OF THE

CHEN_JAL & GEOLOGICAL LABO ATORIES

P. O. Box 2794 Casper, Wyoming

WATER ANALYSIS REPORT

OPERATOR	Amoco Production Co. Usselman Gas Com No. 1A Dlanco Mesaverde	DATE January LOCATION FORMATION	4, 1978 Sec. 4-31	LAB NO. 26013 N-104 4 77 E-175
COUNTY	San Juan	INTERVAL	1190	4: <u>en</u>
	New Mexico	SAMPLE FROM	Flow durin	ng drilling (12-29-77

REMARKS & CONCLUSIONS: Suspect 0 jo Alamo	ea. a.m. Rosey
	E. E. Tufage
	10

Sulfate

Total dissolved solids, mg/1 - 10778 NaC1 equivalent, mg/i - 8241 Observed pH - 7.7	Specific resistance @ 68°P.: Observed - 0.88 ohm-meters Calculated - 0.80 ohm-meters
Magnesium - 25 2.06 Iron	Hydroxide Hydrogen sulfide 163.97
Potassium	Chloride 2000 56.40 Carbonate 268 4.40

meq/1

139.00

0.36

WATER ANALYSIS PATTERN Scale

MEQ per Unit

	The state of the s
	BEFORE EXAMINER STAMETS
1 4	OIL CONSERVATION COMMISSION
TTERN	EXHIBIT NO. 5
. :-	CASE NO. 6233
	Submitted has famuco
	5/17/7
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mg/1 4960

JAN 9 1978

FARIBUGTON AREA

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200q/1

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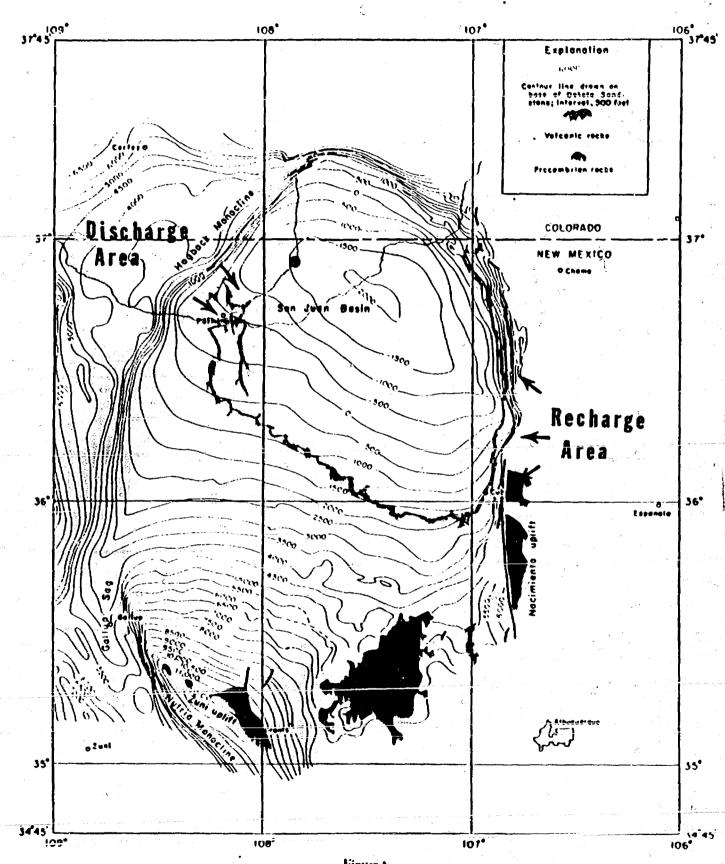


Figure 1.

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

→ Di	o Alamo Outeran
BEFORE EXAMINER STAMETS OIL CONSERVATION COMMISSION	enneal Location
OIL CONSERVATION COMMISSION	shasm racation
EXHIBIT NO. 6	en e
CASE NO. 6233	
Submitted by Aux o	
Hearing Date 5-17-78	

Gary C. Harrison



CHEM LAB NOV 5 1976

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WATER	ANALYSIS	EXCHANC	E REPORT	FAGE	ii. GŢ	Ch.
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	ATTACH	MENT 7b			AAS .	
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			<u>L</u> _		AA .	

MEMBER Amoco Production Company OPERATOR Amoco Production Company	LAB NO. 21618-1 REPORT NO.
WELL NO. Keys Gas Com. No. 1 FIELD Blanco-Mesaverde	PORMATION Mesaverde LILLA LILLA
COUNTY San Juan STATE New Mexico	DATE November 2, 1976

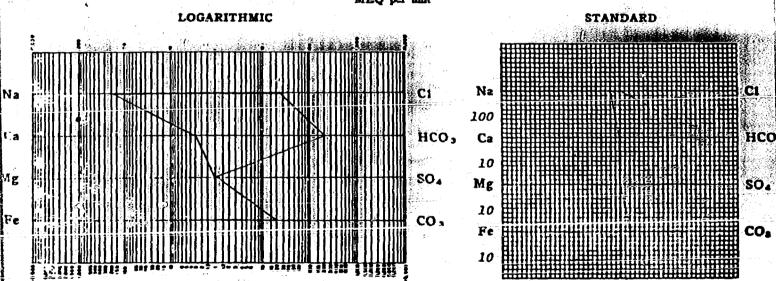
REMARKS & CONCLUSIONS:

Cations		mg/1	meq/1	Anions	mg/1	meq/1
Sodium		5251 31	228.40 0.79	Sulfate	<u>5</u>	<u>0.10</u> 23.12
Potassium				Carbonate	576	19.18
Calcium Magnesium -		64	3.19 0.49	Bicarbonate	11614	190.47
Iron				Hydrogen sulfide		
	Total Cation	ns	232.87	Total Ani	ons	232.87

Total Cations	TOTAL MINORS
Total dissolved solids, mg/l 12473 NaCl equivalent, mg/l 10039	Specific resistance @ 68° F.: Observed
Observed pH 8.5	Calculated <u>0.66</u> ohm-meters

WATER ANALYSIS PATTERNS

MEQ per un



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

NOTE: Mg/t=Milligrame per liter. Meq/t=Milligram equivalents per liter

Bodium chloride equivalent=by Dualap & Hawtherne calculation from compensate

AS SOL

WATER ANALYSIS EXCHANGE REPORTANTEL

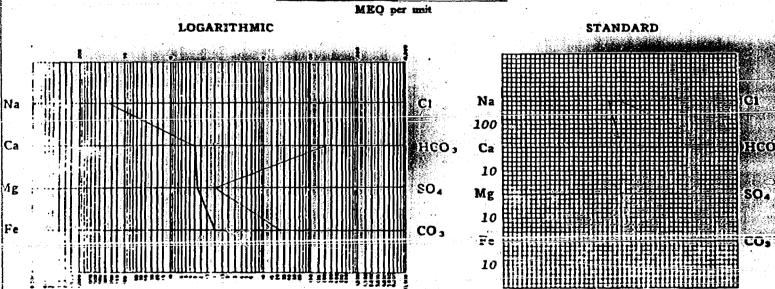
ATTACHMENT 7c

	NO. 21618-3 REPORT NO.
OPERATOR Amoco Froduction Company LOCA	ATION
WELL NO Schneider Gas Com. No. 1 FORM	MATION Mesaverde
FIELD Blanco-Mesaverde INTE	RVAL Wen
COUNTYSan Juan SAME	PLE FROM Bradenhead (10-20-76)
STATE New Mexico DATE	

REMARKS & CONCLUSIONS	: -
-----------------------	-----

Tota	l Cations	263.80	Total A	Anions	263.80
		263.80	•	•	
Iron	• •		Hydrogen sulfide	•	
Magnesium	31	2.55	Hydroxide		
Calcium	69	3.44	Bicarbonate	. 13176	216.09
Lithium	• •		Carbonate	<u> 720 </u>	23.98
Potassium	40	1.02	Chloride	<u>840</u>	23.69
Sodium		<u>256.79</u>	Sulfate	2	0.04
Cations	mg/1	meq/1	Anions	mg/1	meq/1

WATER ANALYSIS PATTERNS

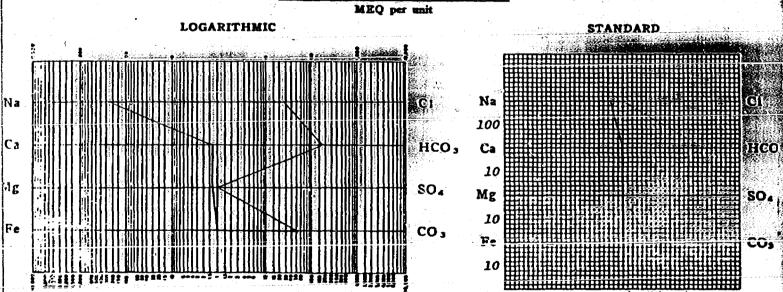


(No value in above graphs includes Na, K, and Li)
NOTE: Mg/I=Milligrams per liter. Meq/I=Milligram equivalents per
Sodium chloride equivalent=by Dunlap & Hawthorne calculation fro

WATER ANALYSIS EXCHANGE REPORT FARMING:

MEMBER Amoco Production Company OPERATOR Amoco Production Company		LAB NO		RT NO.		
WELL NO. Ealum Gas Com. No. 1						
	co-Mesaverde		INTERVAL			
COUNTY San Juan STATE New Mexico			SAMPLE PROM Bradenhead (10-			
TATE New	Mex1co		DATEN	<u>ovember 2, 197</u>		
OTHER A GAME					uren	
CEMARKS & CONC	LUSIONS:	**************************************				
	· · · · · · · · · · · · · · · · · · ·	 				
				:		
· · · · · · · · · · · · · · · · · · ·	4					
				·		
Cations	mg/l	meq/1	Anions	mg/1	meq/1	
Sodium	5812	252.84	Sulfate	7	0.15	
Potassium	41	1.05	Chloride	1010	28.48	
Lithium	•		Carbonate	1680	55.94	
Calcium		1.35	Bicarbonate	10492	172.07	
Magnesium	. 17	1.40	Hydroxide			
	•		Hydrogen sulfide	_		
ron			and a series			
ron		256.64				

WATER ANALYSIS PATTERNS



(No value in above graphs includes Na, K, and Li)

NOTE: Mg/1=Milligrams per liter. Meq/1=Milligram equivalents per liter

Sodium chloride equivalent=by Dunlap & Hawthorne calculation from component



Amoco Production Company

Security Life Building Denver, Colorado 89202

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

2 1978

CONSERVATION COMM.

Same Fr

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/\s

A. R. Kendrick, Supervisor District No. 3 New Mexico Oil Conservation

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 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

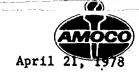
Katie Cahn 3703 Sequoia St. Coral Gables, Florida 33134

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 011 Conservation Commission's Rules and Regulations.

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

My Commission expires:

Commission Expires Aug. 15, 1980



Amoco Production Company Security Life Building
Denver, Colorado 80202

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

File: RAS-410-986,511

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cc:

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

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

My Commission expires:

Commission Expires Aug. 15, 1980

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. COUTER BOB F. TURNER ROBERT A. JOHNSON JOHN W. BASSETT ROBERT E. SABIN R. E. THOMPSON P. O. DRAWER 700 RANDAL W. HOBERTS

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 P. O. Drawer

Roswell, New Mexico 88201

Attorneys for Amoco Production Company

Dana	

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

APPEARANCES

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

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P.O. BOX 449 58 SOUTH FEDERAL PLACE SANTA FE, NEW MEXICO 67501

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Page	3
CAKE	

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, ECQ.

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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:

Market Market State of the Control o

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

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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

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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

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12. 1077 a number of attachments to that letter application.
We submitted completed forms Clo8 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 Section 28, 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

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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 1790 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

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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.

O 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--

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

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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 peroforate and running tubing on the packer and inject.

O 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.

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EXAMINATION

BY MR. STAMETS:

And the second of the second o

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.

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.

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

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58 SOUTH FEDERAL PLACE SANTA FE, NEW MEXICO 87501 it out to where we would not be able to produce the gas effectively.

- 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?

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- 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

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

A AGO, DAL.

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.

O (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.

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

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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?

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A No, sir.

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

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ÉXAMINATION

BY MR. STAMETS:

Ilave 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 Approximately 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:

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

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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 its 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

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P.O. BOX 449 58 SOUTH FEDERAL PLACE SANTA FE, NEW MEXICO 87501 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:

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

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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

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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

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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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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 here y cantify that the foregoing is a complete remove of the proceedings in the Examiner hearing of Case No. 6233 heard by me on 1977

Oil Conservation Division

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P.O. BOX 449 SE SOUTH FEDERAL PLACE SANTA FE, NEW MEXICO 87501

INDEX

	PAGE
1. Appearances	3
2. The Witness - R. B. GILES	
Direct Examination by Mr. Ryan	4
Examination by Mr. Stamets	11
Further Examination by Mr. Stamet	:s 19
3. The Witness - GARY C. HARRISON	
Direct Examination by Mr. Ryan	12
Examination by Mr. Stamets	16
Cross-Examination by Mr. McGrath	16
Redirect Examination by Mr. Ryan	18
4. Reporter's Certificate	22
<u>EXHIBITS</u>	IDENTIFIED
(APPLICANT'S EXHIBITS)	
Exhibit No. 1 (Plat of Land Ownership)	
Exhibit No. 2 (Water Analysis)	and the second of the second o
Exhibit No. 3 (Water Sample #4)	8
Exhibit No. 4 (Water Sample #5)	8
Exhibit No. 5 (Water Analysis Report)	8
Exhibit No. 6 (Generalized Structure) (San Juan Basin Disposal Lo	cation)
Applicant's Exhibits 1 thru 6 admitted	19 : 19 : 19 : 19 : 19 : 19 : 19 : 19 :

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P.O. BOX 449 SB SOUTH FEDERAL PLACE SANTA FE, NEW MEXICO 87501

BEFORE THE

NEW MUNICO OIL CONSERVATION COMMISSION SAUTA FE, NEW MEXICO

MAY 17, 1978

COMMISSION HEARING

IN THE MATTER OF:

· And Andrew Commence of the C

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

CASE 6233

BEFORE: Richard L. Stamets, Examiner

TRANSCRIPT OF HEARING

APPEARANCE

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

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FOR AMOCO PRODUCTION COMPANY:

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

ATWOOD & MALONE
Attorneys at Law
Roswell, New Mexico 83201
BY: CHARLES MALONE, ESQ.

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MR. STAMETS: Me'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

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capacity.

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

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.

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

A Yes, sir, I have.

 Ω 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

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wells. On the east side of the river in the soil west quarter of Section 27 is the Keys T-1 that is an abandoned hole we would reenter and complete through 4-1/2 inch pipe perforations in the Keys T-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.

O.

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

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12, 1977 a number of attachments to that letter application. We submitted completed forms Cl08 for each of the two dismosal wall gandidates, de submitted a tabular summit, 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

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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 Pruitland 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

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useable.

Company of the second s

Me 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.

O 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

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manner. We would set 4-1/2 inch through the Ojo Alamo peroforate and running tubing on the packer and inject.

O 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.

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EKAMINATION

BY MR. STAMETS:

O. 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.

O 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

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

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.
- Ω 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:

Ω 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?

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- A No, sir.
- O 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.
- O And since your graduation, what has been your employment?
- A I've been employed by Amoco Production as a Petroleum Geologist for three years.
- O 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

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Geological Association.

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

Λ Yes, sir.

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

MR. STAMETS: The witness is considered qualified.

(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.

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

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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.

- And that can be done without injuring either fresh water or any hydrocarbons in there to be injured either is that right?
 - A Right.

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- Q Anything else on Exhibit 6?
- A No, sir.

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

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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.

O 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

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P.O. BOX 449 58 SOUTH FEDERAL PLACE SANTA FE, NEW MEXICO 87501 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--

A STATE OF THE STA

9 -- 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 its used as a potable water supply other than by the Jicarilla Apaches near the recharge area.

O Mr. Arnold of this Commission started this protecting Cjo 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

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

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:

O 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?

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MR. McGRATH: Even if this saves the Ojo Alamo

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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:

On the attachment to your original application

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. . .

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.

- 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

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SA SOUTH FEDERAL PLACE SANTA FE, NEW MEXICO 87501 that's possible.

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

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

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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.

of ________, 1978.

BETTY J. LANPHERE, Court Reporter

do hereby certify that the foregoing in a complete renew of the proceedings in the Examiner hearing of Case No. 6233, heard by me on 5 -12 19 88.

Circuit Conservation Division

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(APPLICANT'S EXHÍBITS) Exhibit No. 1 (Plat of Land Ownership) Exhibit No. 2 (Water Analysis) Exhibit No. 3 (Water Sample #4) Exhibit No. 4 (Water Sample #5) Exhibit No. 5 (Water Analysis Report) Exhibit No. 6 (Generalized Structure)	PAGE
1. Appearances	3
2. The Witness - R. B. GILES	
Direct Examination by Mr. Ryan	4
Examination by Mr. Stamets	11
Further Examination by Mr. Stamets	19
3. The Witness - GARY C. HARRISON	
Direct Examination by Mr. Ryan	12
Examination by Mr. Stamets	6 16 is
Cross-Examination by Mr. McGrath	16
Redirect Examination by Mr. Ryan	18
4. Reporter's Certificate	22
<u>EXHIBITS</u>	IDENTIFIED
(APPLICANT'S EXHIBITS)	
Exhibit No. 1 (Plat of Land Ownership)	5
Exhibit No. 2 (Water Analysis)	7
Exhibit No. 3 (Water Sample #4)	8
Exhibit No. 4 (Water Sample #5)	
Exhibit No. 5 (Water Analysis Report)	8
	14
Applicant's Exhibits 1 thru 6 admitted	

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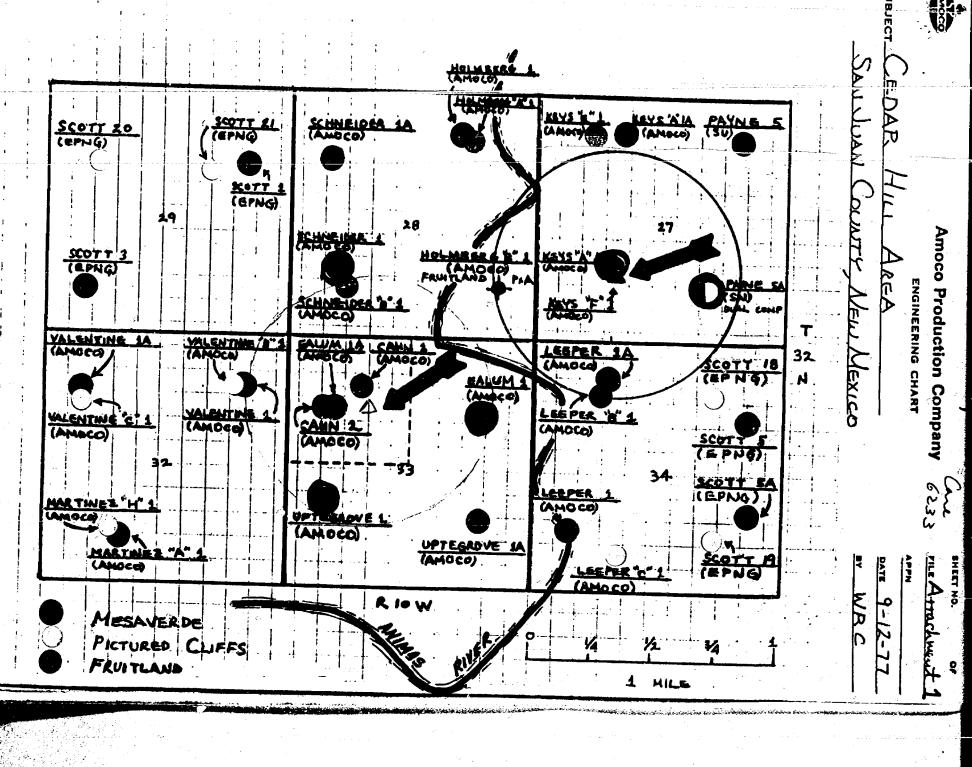
LYNN TESCHENDORF

To Cool Convex Production
Carled about that
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sometime often the
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Amoco Production Company

Security Life Building Denver, Colorado 80202

October 12, 1977

Joe D. Ramey (3) Secretary-Director New Mexico 011 Conservation Commission P.O. Box 2068 Santa Fe, New Mexico 87501

File: VDP-1382-986.511

advised his work wing a war when when year paid xur when the government. It field Extension 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:

Joe D. Ramey (3) October 12, 1977 Page Two

> 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.

Attachments

Joe D. Ramey (3) October 12, 1977 Page Three

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

88

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

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.

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

Commission expires:

CO'My Commission Expires Aug. 15, 1980

NOTATIV DIEST TO

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

	The state of the s	•			•				
WELL NAME OPERATOR	WELL LOCATION	HOLE		NG SIZE D wt.	SETTING DEPTH (FT)	CEMENT	CEMENT		PRODUCING
Payne No. 5A	1140 PGT - 17051 Pm					CEMENT	TOPS	_ TD	INTERVAL
Southern Union	1140' FSI, w 1725' FRI. Sec. 27, T-32-N, R-10-W	13-3/4		4" 30#	3461	350 ax	OTDO		
Suprom Energy Corp		8-3/4"	7"	23#	14421	230 sx	2400' V	⁵⁷⁷⁰ '	
. 71		6-1/4"	4-1/2	2" 10.5#	3323-5690'	310 sx	46001		Mesaverde
Cahn Gas Com No. 1	1030' FNL x 1600' FWL				•	OK	4000		
Amoco	Sec. 33, T-32-N, R-10-W	12-1/4"	9-5/8	32.3#	2531	250 ax	CIRC.	2812'	
	20, 1 32 N, K-10-W	8-3/4"	7	20#	2795'	600 sx	* 100-200	1 2012	Fruitland
Cann Gas Com No. 2	1510' FNL x 800' FWL	12-1/4"	0 - 1-				200 200		ie.
Amoco	Sec. 33, T-32-N, R-10-W	7-7/8"	8-5/8	24#	276'	250 sx	CIRC	29461	Provided and
		7-776	4-1/2	11#	29571	680 sx	* 100-200	1 27,70	Fruitland
Ealum Gas Com No. 1	1650' FNL x 1140' FEL	12-1/4"	0_5/0	" 32.3#	•			•	
Amoco	Sec. 33, T-32-N, R-10-W	8-3/4"	, -	32.3#	256 '	200 sx	CIRC	53201	Mesaverde
	*	6-1/4"	5"	# x 23#	4642'	438ft3	3585	7020	TICOUACT GE
: ¹		V 2/4	5-1/2	15# " 16#	4346-53201	′ 190 sx	* 4300 '		
Ralum Coo Com W			3-1/2	748			•	7"1 .	
Kalum Gas Com No. 1A Amoco	1450' FNL x 1030' FWL	12-1/4"	9-5/R	32.3#	0501	<_			
**************************************	Sec. 33, T-32-N, R-10-W	8-3/4"	7"	23#	2591	280 sx	CIRC	5400'	Mesaverde
		6-1/4"		10.5#	3200'	775 sx	CIRC		7
Schneider Coe Com Wa		•	, -	10.34	3018-5400'	375 sx	CIRC		
Amoco	1 1450' FSL x 990' FWL	12-1/4"	9-5/8	32.3#	2551	0.75	2.4		•
48	Sec. 28, T-32-N, R-10-W	8-3/4"	7" 204	x 23#	4646'	275 sx	CIRC	5410'	Mesaverde
		6-1/4"	. "5-1/2"	14#	4570-5144'	428ft ³	4020		
chneider Ges Com No	1A 1460' FNL x 810' FWL		, -	• •	4570-5144	122 sx	47001		
Amoco	TA 1460 FNL x 810 FWL	12-1/4"	9-5/8"	36#	270'	280 sx			
	Sec: 28, T-32-N, R-10-W	8-3/4"	7"	23#	3349'		CIRC	5525'	Mesaverde
		6-1/4"	4-1/2"	10.5#	3159-5514'	685 sx	CIRC	•	
chneider Gas Com "R"	No. 1 1110 FSL x 1185' FWL				- 	280 sx	4796'		
Åmoco	Sec. 28 m 30 x 1185 FWL	12-1/4"	8-5/8"	24#	258 1	200 sx	0770		
	Sec. 28, T-32-N, R-10-W	7-7/8"	4-1/2"	10.5#	3050'	930 sx	CIRC	3050'	Fruitland
ptegrove Gas Com No.	1 1850' FSL x 790' FWL			ŧ	5450	330 8X	CIRC		
Amoco	Sec. 33, T-32-N, R-10-W	12-1/4"	9-5/8"	32.3#	279 '	190 sx	OTRO		
	55. 33, 1-32-N, K-10-W	8-3/4"	7"/	20#	45791	438ft3	CIRC 3210'	5270'	Mesaverde
		6-1/4"	5"	15#	4445-5261'	285 sx	CIRC	•	}
tegrove Gas Com No.	LA 1470' FSL x 1190' FEL	10 1/48					CIAC .	•	C
Amoco	Sec. 33, T-32-N, R-10-W	12-1/4"		36#	2671	280 sx	CIRC	5250'	· · · · · · · · · · · · · · · · · · ·
5.하는 : 	00, x-32-n, K-10-W	8-3/4"	7"	23#	3075	635 sx	CIRC	J230	Mesaverde 💍
CAT CIR AWED COM	<u></u>	6-1/4"	4-1/2"	10.5#	2868-52501	280 sx	CIRC		2
CALCULATED CEMENT TO	?\$						OTW		w

WELL NAME		HOLE	CASING SIZE	SETTING		CEMENT		- PRODUCTNG
VI HAILUA	WALL LUCATION	SIZE		<u> Drpth (FT)</u>	<u> Cement</u> -	TOPS	<u>TD</u>	INTERVAL
eeper Gas Com No. 1A Amoco	800' FNL x 1590' FWL Sec. 34, T-32-N, R-10-W	12-1/4" 8-3/4"	9-5/8" 32.3# 7" 23#		280 sx -775 sx	CIRC *100-200'	5305'	Mesaverde
The second residence of the second course of the se		6-1/4"	4-1/2" 10.5#	2962-5305'	375 sx	CIRC		
Amoco	1 1110' FNL x 1450' FWI. Sec. 34, T-32-N, R-10-W	12-1/4" 7-7/8"	8-5/8" 24# 4-1/2" 10.5#	258¹ 2851¹	200 sx 870 sx	CIRC CIRC	2851,	Fruitland
Valentine Gas Com No.] Amoco	990' FNL x 990' FEL Sec. 32, T-32-N, R-10-W	12-1/4" 8-3/4" 4-3/4"	x 11# 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" N Amoco	No.1 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#	261'	275 sx 640 sx	CIRC *100-200'	2960'	Pictured Cliff
Leys 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"	x 11# 9-5/8" 32.3# 7" 20# x 23# 5" 15#		225 sx 438ft ³ 100 sx	CIRC 2490' *CIRC	52431	Mesaverde

Calculated cement tops

an 623

Ar

Amoco Production Company 623

FILE ATTACINES TO

ENGINEERING CHART

SUBJECT HOLMBERG GAS COM "B" No. 1

1190' FSLX BIO' FEL, SEC 28 32-10

SAN JUAN COUNTY, NEW MEXICO

DATE 9-14-77 BY WRC

CIRC CMT.

124" hole 858" 24# CSA CMT X 250 SX

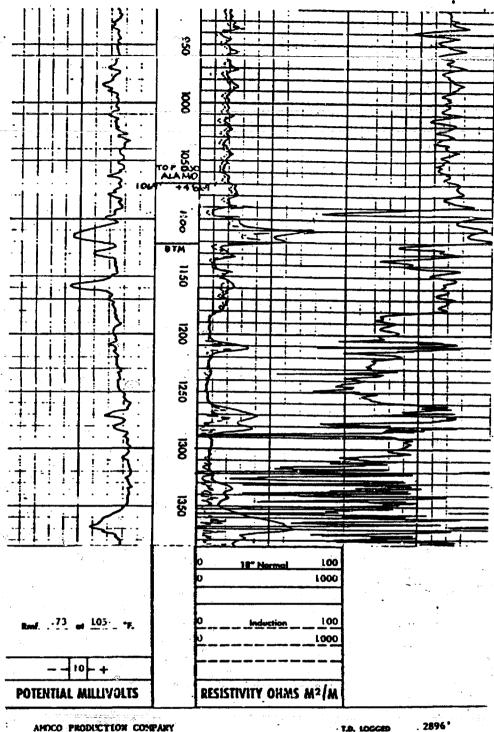
7% hole

4'2" 10.5# c

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

WELL PLUGGED X ABANDONED 12-04-73

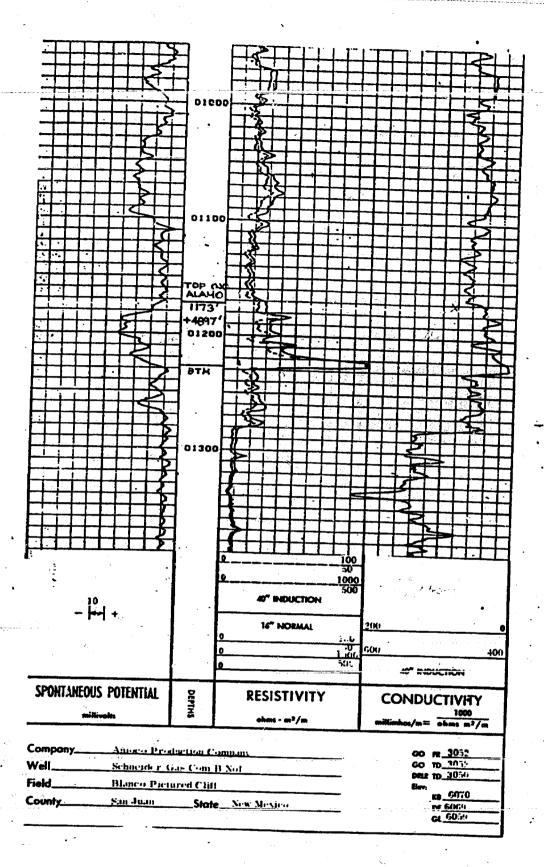
Ferm 271 2.71



AMOCO PRODUCTION COMPANY KEYS GAS COM. "F" MO. 1 UNDESIGNATED FRUITLAND SAN JUAN COUNTY, NEW HEXICO SEC. 27-12W-10W

29001

2439, 2412, 3415; TO. WHEX
A.B. ELEV.
G.L. ELEV.



1680

N'SHO

55.94

WATER ANALYSIS EXCHANGE REPORT FARMING:
ATTACHMENT 7a

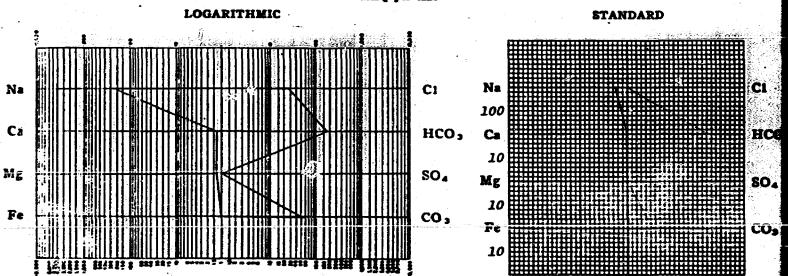
Amoco Production Company MEMBER. Amoco Production Company **OPERATOR** LOCATION. WELL NO. Ealum Gas Com. No. 1 FORMATION. Mesaverde Blanco-Mesaverde FIELD_ INTERVAL COUNTY. San Juan Bradenhead (10-20-76) SAMPLE FROM. STATE. New Mexico November 2, 1976 DATE_ uren REMARKS & CONCLUSIONS: mg/1 :mg/1 meq/1 meq/i 52.84 0.15 1.05 28.48

Calcium 27 1.35 Magnesium 17 1.40 Iron - -	Bicarbonate 10492 172.07 Hydroxide
Total Cations 256.64	Total Anions 256.64
Total dissolved solids, mg/1	Specific resistance @ 68° F.:

WATER ANALYSIS PATTERNS

MEQ per unit

9.0



(No value in above graphs includes Na, K, and Li)

NOTE: Mg/1=Miligrams per liter. Mog/1=Milligram equivalents per liter

Sedium chloride equivalent=try Dunlag & Heavtherns calculation from companies.

FACIALISTCA

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WATER ANALYSIS EXCHANGE REPORT

MEMBER Amoco Production Company

OPERATOR Amoco Production Company

WELL NO. Keys Gas Com. No. 1

FIELD Blanco-Mesaverde

COUNTY San Juan

STATE New Mexico

LAB NO. 216.

LOCATION

FORMATION

INTERVAL

SAMPLE FROM

DATE

LAB NO. 21618-1 REPORT NO. 747-10 LOCATION PORMATION Mesaverde INTERVAL SAMPLE FROM Bradenhead (10-18-76)
DATE November 2, 1976

REMARKS & CONCLUSIONS:

Cations mg/1	meq/1	Anione	mg/1	meq/1
Sodium	228.40 0.79 3.19 0.49	Sulfate	5 820 576 11614	0.10 23.12 19.18 190.47
Total Cations Total dissolved solids, mg/l NaCl equivalent, mg/l	232.87 12473 10039	Total Anic Specific resistance @ 68* I Observed		232.87 ohm-meters

WATER ANALYSIS PATTERNS

LOGARITHMIC STANDARD

Ca 100

HCO, Ca 10

SO4 Mg

CO 7 Fe 10

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

IOTE: Mg/t=Milligrams per Neer. Mog/t=Milligram equivalents per Neer

Solium chloride equivalent=by Dunlap & Hawthorne calculation from seenpanens

WATER ANALYSIS EXCHANGE REPORTMINGTON

ATTACHMENT 7c

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

LAB NO 21618-3 REPORT NO.

LOCATION Mesaverde
INTERVAL WWM —

SAMPLE PROM Bradenhead (10-20-76)

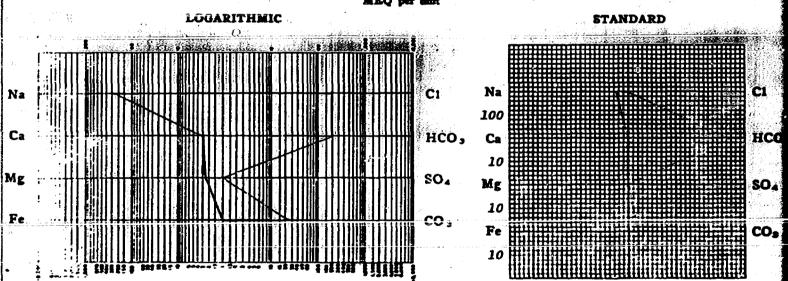
DATE November 2, 1976

REMARKS & CONCLUSIONS:

		- · · · · · · · · · · · · · · · · · · ·	
Cations mg/1	meq/1	<u>Anions</u> m	g/1 meq/1
Sodium 5903	<u>256.79</u>	Sulfate	2 0.04
Potassium 40	1.02	Chloride 84	0 23.69
Lithium		Carbonate	0 23.98
Calcium 69	3.44	Bicarbonate 1317	6 216.09
Magnesium 31	2.55	Hydroxide	
Iron	<u> </u>	Hydrogen sulfide	
Total Cations	263.80	Total Anions	263.80
Total dissolved solids, mg/l	14094	Specific resistance @ 68° F.:	<u></u>
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



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

NOTE: Mg/I=Milligrams per liter. Meg/I=Milligram equivalents per liter

Sodium chloride equivalent=by Dunlap & Hawthorne calculation from component

Amoco Production Company

RESEARCH CENTER WATER ANALYSIS

API Well No.

OCATION SAMPLED: Division Denver	District South	Area			Υ.
Operator (Plant) Amoco	Well No. I	Lease	Cahn G	as Com.	
Operator (Plant) Amoco State (Province) New Mexico Twp. Rng. Sec.	County (Parish) Sa	in Juan			
Tern Ring Sec	Ouarter (Lsd.)	Other	(Meridian)		
	Wildcat () Field \\ Date 3/25/77	Yell () Field r	12mc		
ample collected from Wellhead	Date	Samol	collected by	Inskeep	
Interval sampledto	interval name				
Recovery					
form 97 transmitted byH.Montgomery		Autho	rized by		
ORGANIC CONSTITUENTS in mg/1	CO	NVENTIONAL I	MA IOR ION	ANALYSIS	
				7.17.21313	
BOTTOM MIDDLE TOP MUD	-		% of Total	Reaction	% of Total
enane	-	lons mg/1	Major Ions	Value mêq/1	Reaction Value
Folucine HC Gases	Sadium Na+	• • • • • • • • • • • • • • • • • • • •			
IC Gases	Cakium C1++	5,791	<u>27.9</u> 7	<u>251.91</u>	49.37
	Magnesium Mg++	40 15	9	2.00	
	Porassium K+		<u>.0</u> 7	1.23	. 24
	Chloride CI	061	1.65	07 10	
DESCRIPTION OF SAMPLE	Bicarbonate HCO3	964	4.65	27.18	5.33
Sample used for detailed analyses	Sulfate SO4-	13,900	67.12	227.96	44.67
Pate received	Carbonate CO2	0	0	<u>0</u>	0
Condition as received	TOTAL	20,710			
Color	_			13,350	
Ddor	_ Total solids by evapora	ation			mg/1
suspended solids	NaCl resistivity equiva	ilent (Dünlap) 520 .		77	mg/1
Bottom sediment	Resistivity 2	0	hm-metersat.	72	
Dil or fluorescence	_ pH <u>8.1</u> S _I	pecinc gravity	1.017 a.		
	Ryznar stability index	(2pHs-pH)	2f .		
QUALITY OF SAMPLE	0	THER IONS AN	D DISSOLVE	D SOLIDS	
BOTTOM MIDDLE TOP	CATIONS mg	/I ANIONS	5 mg/1	OTHERS	mg/3
Lionac	-				_ _
ion mg/1:					
COMMENTS:					
				-	
					
	REMARKS AND CON	NCLUSIONS:	ere 📗		•
	_ '	•	!	MAY 2 1977	Ì
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CC: Bob Reed	<i>D</i>	D			67.00
G. W. Schmidt	_ // // //	1/ AN	MAA	•	
	Analyst Dalle	DAM	W	DateA/1	5/77
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MEN.

STATE OF NEW MEXICO ENERGY AND MINERALS DEPARTMENT

OIL CONSERVATION DIVISION

JERRY APODACA

NICK FRANKLIN .

Hobbs OCC Artesia OCC Aztec OCC__

Other P. T. McGrath, Charles Malone

August 9, 1979

POST OFFICE BOX 2088 STATE LAND OFFICE BUILDING BANTA FE, NEW MEXICO 87501 (506) 827-2434

· · · · · · · · · · · · · · · · · · ·	CASE NO. 6233
Mr. Gordon Ryan	CASE NO. 6233 ORDER NO. R-5780
Attorney	
Amoco Production Company	
Security Life Building Denver, Colorado 80202	Applicant:
	Amoco Production Company
Dear Sir:	
Enclosed herewith are two of Division order recently ent	copies of the above-referenced tered in the subject case.
Yours very truly,	
JOE D. RAMEY	and the second of the second o
Director	
· · · · · · · · · · · · · · · · · · ·	
JDR/fd	en e
Copy of order also sent to:	.

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 easing tubing annulus by means of a cross-over assembly.
- CASE 6226: Application of Barber 0il, 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 560 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 623: 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 Alaro formation through the perforated interval from 1175 feet to 1230 feet in its Cahn Ges 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.

NEW MEXICO OIL CONSERVATION COMMISSION

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

DPERATOR :	, e		ADORESS			
AMOCO PRODUCTION (COMPANY	TWELL NO.	501 AI	RPORT DRIVE, FA	RMINGTO	N, NM 87401
Cahn Gae Com		. 3	Undest	eneted Oio Alem	^	San Juan
	ed. Propose					
UNIT LETTER	; WE	LL 15 LOCATED		OM THE	LINE AND	FEET FROM
Not yet drilled. Proposed location: NW/4 Sec. 33, T-32-N, R-10-N UNIT LETTER : WELL IS LOCATED						
LINE, SECTION	TOW					
NAME OF STRING	- size				ENT	TOP DETERMINED BY
URFACE CASING			2			
TERMENIATE	8-5/8" 24#	250'	250	Circula	te	
	/ _{-1/2} !! 0.5/	1,4001	500	Circulo		
ONG STRING	4-1/2 9.0%	1400	300	CIICUIA	LE	
UBING		i				
AME OF PROPOSED INJECTION FOR		1150'	Baker Mode	1 "N" set at 11		OF FORMATION
Olo Alemo			111	751		_
INJECTION THROUGH TULING, CAS	ING OR ANNULUS?	PERFORATIONS				
Tubing						
	IF ANSWER IS	NO, FOR WHAT PURPOS	SE WAS WELL ORIGIN	ALLY DRILLED?	ZONE OTH	L EVER SEEK PERFORATED IN HER THAN THE PROPOSED INJ E?
Yes STALL SUCH PERFORATED INTERV	ALS AND SACKS OF CE	MENT USED TO SEAL O	FF OR SQUEEZE EAC	1		
A CONTRACTOR OF THE CONTRACTOR	٠ 🚐					
PTH OF BOTTOM OF DEEPEST		DEPTH OF BOTTOM OF OIL OR GAS ZONE IN T	NEXT HIGHER	DEPTH OF T	OP OF NEXT	LOWER S AREA
Approximately 100	ft.					
MBLS.)	1 2.56		1	PRESSURE?		APPROX. PRESSURE (PSI)
	ALLOWING WAYERS AR	CAIN. IWATES		NATURAL WATER IN DISPO		*1200 Max
		1		1		Yes
9.					-	
Katie Cahn, 3703 S	equoia St.,	Coral Gables	Florida 33	134		
and the second second					. •	
NO OCHEL OPELACOL	<u> </u>		· · · · · · · · · · · · · · · · · · ·			
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VE COPIES OF THIS APPLICATION	MEEN SURFACE OWN	ER	FACH OPERAT	OR WITHIN ONF-WALE MILE	THE MEW	MEXICO STATE ENGINEES
ENT TO EACH OF THE FOLLOWING?	l 		OF THIS WEL	L	1	
TE THE FOLLOWING ITEMS ATTACH	ED TO PLAT OF AREA		ELECTRICAL	rae .	DIAGRAM	MATIC SKETCH OF WELL
Λ					<u> </u>	
hereby	ertify that the inf	ormation above is	truft and complete	to the best of my know	wiedge and	belief.
UXX M:	01		Stall	<u> </u>		חדלכולר
(Signature)	<u> </u>		(Thie)			Date)
USE: Should walvers from	the State Fusi-s	er the surface on		eratore within one 1-2	(mila aka	
not accompany this	application, the	New Mexico Oil (Conservation Con	rmission will hold th	e applicat	tion for a period of 15 e
from the date of rec	eipt by the Comm	nission's Santa F	e office. If at i	he end of the 15-day t	vaiting per	iod no protest has been
if the applicant so rea	and the second s		processea, 11 a	process is received, th	e applicat	tion will be set for hear

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

NEW MEXICO OIL CONSERVATION COMMISSION

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

OPERATOR			AUDRESS		1.40	
AMOCO PRODUCTION C	OMPANY			PORT DRIVE, FAR	RMINGTON, NM 87401	
LEASE NAME		WELL NO.	FIELD		COUNTY	
Keys Gas Com "F"		11	Mt. Neb	o Fruitland	San Juan	
	•					
URIT LETTER	K I WELL	IN LOCATED	TO PEET PROM	THE South	THE AND 1685 PEET P	-
West LINE, SECTION	27 TOWNS	11P 32-N	RANGE 10-W	WMPM.		
1,000	27 101143		AND TUBING DATA	чмгм.		
NAME OF STRING	SIZE SE	TTING DEPTH	SACKS CEMENT	TOP OF CEME	NT TOP DETERMINED	BY
BURFACE CASING						
INTERMEDIATE	8-5/8" 24#	250'	200	G.L.	Circ to surfac	<u>e</u>
	4-1/2" 9.5#	28861	750		Cina to ourse	
LONG STRINS	4-1/2 9.31	2000	730	G.L.	Circ to surfac	<u>e</u>
				i	· ·	
TUBING		· · · · · · · · · · · · · · · · · · ·	HAME, MODEL AND DEP			
	2-3/8" 4.7#	1050'	Baker Mode	1 "N" set at 10	050'	
NAME OF PROPOSED INJECTICA FORMA	TIUN		ļ ·		1	<i>j</i>
Ojo Alamo	GOR ANNULUS?	PERFORATIONS	1069	OSED INTERVAL(S) OF INJE	11221	
Tubing	•	Perf	i	1104-22'		
IS THIS A NEW WELL DRILLED FOR DISPOSAL!	IF ANSWER IS NO.		E WAS WELL ORIGINAL	LY DRILLED!	HAS WELL EVER SEEN PERFORATE ZONE OTHER THAN THE PROPOSED TION ZONE?	D IN ANY
NO	Gas Prod	uction	<u></u>		TION ZONE? Yes	
NO LIST ALL SUCH PERFORATED INTERVAL 2780-84, 2794-98 2600-081, and 2668 DEPTH OF BOTTOM OF DEEPEST PRESH WATER ZONE IN THIS AREA	2804-08 . 2	820-24 . 28	32-36 x 2	SPF (Sqz. with	100 sx); 2451-59'.	<i>c</i> -
2600-08' and 2668	-76' x 2 SPF.	Cmt well x	200 sx.	1		
FRESH WATER ZONE IN THIS AREA	S A		HIS AREA:	OIL OR GAS I		
Approximately 100 ANTICIPATED DAILY MINIMUM MINISTRUME 200	I E .	None	D TYPE SYSTEM	S INJECTION TO BE BY GRA	2450 APPROX. PRESSURE (PE	61)
1 . /1181		Closed		Pressure	*1200 MAX	
ANSWER YES OR NO WHETHER THE FOL ERALIZED TO SUCH A DEGREE AS TO S STOCK, IRRIGATION, OR OTHER SENER.	LOWING WATERS ARE ME UNFIT FOR DOMESTIC	IN- WATER	TO BE DISPOSED OF N		ARE WATER ANALYSES ATTACHED?	
			Yes	Yes 🔑	Yes	
NAME AND ADDRESS OF SURFACE OWN			·			
Henry Knowlton, Rt	. 1, Box 65-E	, Aztec, Ne	W Mexico 87	4 <u>10</u>		
Supron Energy Corp						
Duplon anergy outp		Lorena F		2011, 111 07701		. 62
					9	
					······································	
					w .	
MAYE COPIES OF THIS APPLICATION SENT TO EACH OF THE POLLOWING?	SURFACE OWNER		EACH OPERATOR OF THIS WELL	WITHIN ONE-HALF MILE	THE NEW MEXICO STATE ENGINEES	
THE THE POLLOWING ITEMS ATTACHED THE APPLICATION (SEE RULE 701-8)	TO PLAT'OF AREA		ELECTRICAL LOS		DIAGRAMMATIC SKETCH OF WELL	
PB This	rtify that the inform	ation above is to	1+115	the best of my knowledge of the LOA.	ledge and belief.	-
(Jignature)		,	(Title)		(Dece)	

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-Frv tland frac gradient of 1 psi/ft (avg)



CONSTRUMNION CON

Amoco Production Company

Security Life Building Denver, Colorado 80202

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.

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

COUNTY OF DENURR

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 011 Conservation Commission's Rules and Regulations.

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

My Commission expires:

Commission Expires Aug. 15, 1980

Campany for self water desposal, Bal Juda County, how mexico applicant in the above - styled Course salt water in the Ois alland formation through the commenters)
perforated 3 interval From 1175 feat
to 1230 feat in its Cahn Gas Com well no. 3 focated in Unit of Section 33, and from 1104 feet to 1/22 feet in its Keyo Gas Com think "F" Weel No I located in Unit K of Rection 27, see in Township 32 north, Range 10 West, Mt. hebo Fruitland Pool, Son Juan County hm.

NEW MEXICO OIL CONSERVATION COMMISSION

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

			ADDRESS			
AMOCO PRODUCTION C	OMPANY	WELL NO.	501 A1	RPORT DRIVE,	FARMING'	TON, NM 87401
Gahn Gas Com			Under	gnated Olo A	l amo	San Juan
Not yet drill	ed. Propose			33, T-32-N,		1 Cui veri
UNIT LETTER	-	LL IS LOCATED		ROM THE	LINE AND	FEET FROM
LINE, SECTION	TOW	CASINO	AND TUBING DA	NMPM.		·
NAME OF STRING	SIZE	SETTING DEPTH	SACKS CEME		CEMENT	TOP DETERMINED BY
SURFACE CASING			\$100 miles (100 miles			
	8-5/8" 24#	250'	250	Circ	ulate	
INTERMEDIATE	1 1011 0 54	1,001	500			
LONG STRING	4-1/2" 9.5	1400'	500	Circ	ulate	
*						The second secon
TUBING				DEPTH OF TUBING PACE		<u> </u>
NAME OF PROPOSED INJECTION FORM	2-3/8" 4.74	11501	Baker Mode	el "N" set at		
	-1104		1		-	12301
Ojo Alamo	NG, OR ANNULUS?	PERFORATIONS		175 TROPOSEO INTERVAL(S)	OF INJECTION	1230
Tubing	•	Perf	200	1175-123	10 1	
S THIS A NEW WELL DRILLED FOR	IF ANSWER IS	NO. FOR WHAT PURPO	SE WAS WELL ORIGI		HAS W	TELL EVER BEEN PERFORATED IN OTHER THAN THE PROPOSED INJE ZONE?
Yes	ALS AND SACKS OF CE	MENY HISED TO SEAL O	DEF OR SOUFERF FA			
				···		
DEPTH OF BOTTOM OF DEEPEST PRESH WATER ZONE IN THIS AREA		DEPTH OF BOTTOM OF	NEXT HIGHER	DEPT	H OF TOP OF NE	XT LOWER
Approximately 100	ft.	NONE	_	0.2.0	280	_
NTICIPATED DAILY I MINIMUM HJECTION VOLUME I SOLS.)	I MAXIMUM	OPEN OR CLOS	ED TYPE SYSTEM	IS INJECTION TO BE PRESSURE?	BY GRAVITY OF	APPROX. THESSURE (PSI)
MANUER YES OR NO WHETHER THE FO	600	Clos	ed	Press		*1200 Max
MÁLIZED TO SUCH A DEGNÉE AS TO. ITOCK, IRRIGATION, OR OTHER GENEI	BE UNFIT FOR DOMES RAL USE —	TIC.		SAL ZONE	i i	The state of the s
			Yes	Yes		Yes
NAME AND ADDRESS OF SURFACE OWN		TATE OF FEDERAL LAN	Yes	Yes		Yes
Katie Cahn. 3703 S	NER (OR LESSEE, IF S	Coral Gables	。 Florida 3	3134		Yes
Katie Cahn, 3703 S	NER (OR LESSEE, IF S ÉQUOÍA St., DPERATORS WITHIN O	Coral Gables	。 Florida 3	3134	158	
Katie Cahn. 3703 S	NER (OR LESSEE, IF S ÉQUOÍA St., DPERATORS WITHIN O	Coral Gables	。 Florida 3	3134	658	
Katie Cahn, 3703 S	NER (OR LESSEE, IF S ÉQUOÍA St., DPERATORS WITHIN O	Coral Gables	。 Florida 3	3134	658	
Katie Cahn, 3703 S	NER (OR LESSEE, IF S ÉQUOÍA St., DPERATORS WITHIN O	Coral Gables	。 Florida 3	3134	7	basel on grow of 1.015
Katie Cahn, 3703 S	NER (OR LESSEE, IF S ÉQUOÍA St., DPERATORS WITHIN O	Coral Cables	。 Florida 3	3134	7	basel on grow of 1.015
Katie Cahn, 3703 S	NER (OR LESSEE, IF S ÉQUOÍA St., DPERATORS WITHIN O	Coral Cables	。 Florida 3	3134	7	
Katie Cahn, 3703 S	NER (OR LESSEE, IF S ÉQUOÍA St., DPERATORS WITHIN O	Coral Cables	。 Florida 3	3134	7	basel on grow of 1.015
Katie Cahn, 3703 S	NER (OR LESSEE, IF S ÉQUOÍA St., DPERATORS WITHIN O	Coral Cables	。 Florida 3	3134	7	basel on grow of 1.015
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Katie Cahn, 3703 S IST NAMES AND ADDRESSES OF ALL NO other operators INVECTORIES OF THIS APPLICATION (IENT TO EACH OF THE POLLOWING)	BEEN SURFACE OWN	Coral Gables ONE-WALF () MILE OF	TEACH OPERA	3134	Accide hype	Basel on grow of 1.015 1175 of Broshotic head EW MEXICO STATE ENGINEER
Katie Cahn, 3703 S LIST NAMES AND ADDRESSES OF ALL NO other operators NAVE COPIES OF THIS APPLICATION (SENT TO EACH OF THE POLLOWING)	BEEN SURFACE OWN	Coral Gables ONE-WALF () MILE OF	Florida 3 THIS INJECTION WE	3134	Accide hype	based on grow of 1.015 1175' of Broshatic head
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NO other operators I hereby company this of accompany this of from the date of received by the Santa	DEEN SURFACE OWN TO PLAT OF AREA The State Engine The State Engine The State Engine The State Engine The Office, the apprication, the leipt by the Comm	coral Gables ONE-WALF (1) MILE OF formation above is er, the surface or New Mexico Dil (nission's Santa F oplication will be	THIS INJECTION WE CACH OPERA OF THIS WE ELECTRICAL True and complete True and complete True and complete Conservation Complete Co	aton within one-half Loc to the best of my cerators within on the end of the 15-	MILE THE N DIAGN knowledge a chalf mile o	Based on grav of 1,015 1175 of Exorbatic head EW MEXICO STATE ENGINEER AMMATIC SKETCH OF WELL and belief. 10/12/17 (Date) of the proposed injection we cation for a period of 15 depends no protest has been
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NO other operators I hereby company this of accompany this of from the date of received by the Santa	DEEN SURFACE OWN TO PLAT OF AREA The State Engine The State Engine The State Engine The Office, the application, the leasts. SEE RULE	Coral Gables ONE-WALF (1) MILE OF formation above is er, the surface ou New Mexico Oil (nission's Santa F oplication will be 701.	THIS INJECTION WE FOR THIS INJECTION WE FOR THIS WE FOR THIS WE FOR THE FOR TH	TOR WITHIN ONE-HALF LOG Le to the best of my cerators within on mmission will ho the end of the 15- protest is receiv	MILE THE H DIAGN knowledge s the applied of the	Based on grav of 1,015 1175 of Brothetic head EW MEXICO STATE ENGINEER AMMATIC SKETCH OF WELL and belief. 1012/17 (Date) of the proposed injection we cation for a period of 15 depends no protest has been

NEW MEXICO OIL CONSERVATION COMMISSION

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

OPERATOR			AUDRESS				
AMOCO PRODUCTION C	I WELL NO.	501 AI	501 AIRPORT DRIVE, FARMINGTON, NM 87401				
- Keys Gas Com "F"	and the second of the second o	1	Mr No	Mt. Nebo Fruitland San			
LOCATION P		1	TAC. NO	oo viuttialla	San Juan		
UNIT LETTER	K ; well is	LOCATED 15	10 / /	OM THE South	LINE AND 1685 FEET FROM TH		
West LINE, SECTION	27 TOWNSHI	32-N	MANGE 10-W	NMPM.			
		CASING	AND TUBING DAT				
NAME OF STRING	SIZE SET	TING DEPTH	SACKS CEMEN	TOP OF CEM	ENT TOP DETERMINED BY		
INTERMEDIATE	8-5/8" 24#	250'	200	G.L.	Circ to surface		
·	4-1/2" 9.5#	2886	750	G.L.	Circ to surface		
LONG STRING	1-1/2 3.50	2000	750	6.11.	CIIC LO SUITACE		
TUBING			AME MOOFE AND DE	PTH OF TUBING PACKER			
TOBIAG	0.4011 4 7/1		-		ñto l		
NAME OF PROPOSED INJECTION FORMA	2-3/8" 4.7#	1050'	Baker Mod	el "N" set at 1	DOU'		
Ojo Alamo			106	g t	1122'		
IS INJECTION THROUGH TUBING, CASIN	G, OR ANNULUS?	PERFORATIONS		OPOSED INTERVAL(S) OF INJ	ECTION		
Tubing	<u></u>	Perf		1104-22'	<u> </u>		
IS THIS A NEW WELL DRILLED FOR DISPOSAL!			E WAS WELL ORIGINA	LLLY DRILLED?	HAS WELL EVER BESH PERFORATED IN AN ZONE OTHER THAN THE PROPOSED INJECTION ZONE?		
NO LIST ALL SUCH PERFORATED INTERVA	Gas Produ	CTION	FF OR SQUEEZE EACH		I Vaa		
2780-84', 2794-98' 2600-08', and 2668	, 2804-08', 28	20-24', 28	32-36', x 2	SPF (Sqz. with	100 sx); 2451-59',		
ZOUU-US . ANG ZOOC DEPTH OF BOTTOM OF DEEPEST FRESH WATER ZONE IN THIS AREA	OFF.	CME WELL X TH OF BOTTOM OF OR GAS ZONE IN T	NEXT HIGHER	DEPTH OF TO	OP OF NEXT LOWER		
Approximately 100	_ [[None	HIS ARLA	OIL OR GAS	24501		
ANTICIPATED DAILY MINIMUM	MAXIMUM		O TYPE SYSTEM	IS INJECTION TO BE BY GR	AVITY OR APPROX. PRESSURE (PSI)		
200		Closed		Pressure	*1200 MAX 6/8		
ANSWER YES OR NO WHETHER THE FO ERALIZED TO SUCH A DESREE AS TO I BTOCK, IRRIGATION, OR OTHER SENER	LLOWING WATERS ARE MIN LE UNFIT FOR DOMESTIC, : AL USE	- WATER	TO BE DISPOSED OF	NATURAL WATER IN DISPO-	ARE WATER ANALYSES ATTACHED?		
NAME AND ADDRESS OF SURFACE OWN	1.94	OR FEDERAL LAND	Yes	Yes	Yes		
Henry Knowlton, Rt	. 1, Box 65-E,	Aztec, Ne	w Mexico 8	7410			
• • • • • • • • • • • • • • • • • • • •	•	· · ·					
Supron Energy Corp	oration, 400 S	. Lorena A	ve., Farmin	gton, NM 87401	· · · · · · · · · · · · · · · · · · ·		
				418,0	si surf press		
		7 F		Course	ed on speagure		
				8 1.0	015 × 1104 8		
		• (1 (he	, exostatic head		
HAVE COPIES OF THIS APPLICATION B SENT TO EACH OF THE POLLOWINS?	EEN SURFACE OWNER		EACH OPERAT	OR WITHIN ONE-HALF MILE	THE NEW MEXICO STATE ENGINEER		
THE THE POLLOWING ITEMS ATTACHE THE APPLICATION (SEE RULE 701-8)	D TO PLAT OF AREA	·.	ELECTRICAL I	.06	DIABRAMMATIC BRETCH OF WELL		
Bi agrepy o	tify that the informa	I Y	+11/5	to the best of my know	viedge and belief.		
(Fignature)			(Title) (1	(bate)		
not accompany this a from the date of rece	pplication, the New lpt by the Commiss e office, the applic	Mexico Oil C ion's Santa Fe	onservation Com office. If at t	mission will hold the he end of the 15-day w	mile of the proposed injection well e application for a period of 15 day vaiting period no protest has been re e application will be set for hearing		
*Based on Pictured	Cliffs-Fruitl	and frac g	gradient of	l_psi/ft (avg)	en e		

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

WELL NAME OPERATOR	WELL LOCATION	HOLE	CASING SIZE	SETTING		CEMENT		PRODUCING
'ayne No. 5A Southern Union	1140' FSL x 1725' FEL Sec. 27, T-32-N, R-10-W	13-3/4" 8-3/4"	10-3/4" 30#	DEPTH (FT)	350 sx	TOPS CIRC	TD 5770	INTERVAL
John Can Govern	**	6-1/4"	7" 23# 4-1/2" 10.5#	3443' 3323-5690'	230 sx 310 sx	2400 ' 4600 '		Mesaverde -
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 t 2795 t	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'	29461	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#	256' 4642' 4346-5320'	200 sx 438ft3	CIRC 35851	5320 ¹	Mesaverde
alum Gas Com No. 1A Amoco	1450' FNL x 1030' FWL Sec. 33, T-32-N, R-10-W	12-1/4"	5-1/2" 14# 9-5/8" 32.3#	259'	190 sx	* 4300 · .	5400'	e e e
hneider Gas Com No.	1 1450' FSL x 990' FWL	8-3/4" 6-1/4"	7" 23# 4-1/2" 10.5#	3200' 3018-5400'	775 sx 375 sx	CIRC	3400	Mesaverde
	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
amout	1A 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		5525'	Mesaverde
	No. 1 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 ¹ 3050 ¹	200 sx 930 sx	12	3050'	Fruitland
	l 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 S	5270'	Mesaverde
tegrove Gas Com No. 1	A 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#	267' 3075'	280 sx 635 sx		5250'	Mesaverde
CALCULATED CEMENT TOP	<u></u> S	,0-1/4°	4-1/2" 10.5#	2868-5250'	280 sx	CIRC		1

WELL NAME OPERATOR	WELL LOCATION	HOLE SIZE	CASING SIZE	SETTING DEPTH (FT)	CEMENT	CEMENT TOPS	TD	PRODUCING
eper Gas Com No 1A	900' THE A 1390' FWL Sec. 34, T-32-N, R-10-W	8-3/4" 6-1/4"	9-5/8" 32.3# 7" 23# 4-1/2" 10.5#	3149'	280 sx 775 sx 375 sx	CIRC *100-200' CIRC	5305'	Mesaverde
eper Gas Com "B" No. 1	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#	258' 2851'	200 sx 870 sx	CIRC CIRC	2851'	Fruitland
Lentine Gas Com No. 1 Amoco	990' FNL x 990' FEL Sec. 32, T-32-N, R-10-W	8-3/4"	9-5/8" 32.3# 7" 20#	45701	250 sx 800 sx	CIRC CIRC	5289 1	Mesaverde
		4-3/4"	4" 11.34#	4196-5289*	225 sx	CIRC		The second of th
lentine Gas Com "B" No. Amoco	1 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#	261 ' 2960 '	275 sx 640 sx	CIRC *100-200'	29601	Pictured Clif
	1650' FSL x 1650' FWL Sec. 27, T-32-N, R-10-W	12-1/4" 8-3/4" 6-1/4"	x 11# 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

Amoco Production Company

ENGINEERING CHART

SUBJECT HOLNIREDG GAS COLL'R" No 1

SAN JUAN COUNTY, NEW MEXICO

FILE ATTACHUEUT

UNIX 7-14-11

12/4" hole

8/8" 24# CSA 255'

CMT X 250 SX

CIRC CMT

2414-20'
2425-38'

1 SPF

2573-80!

1 SPF

2573-80!

TD 2669'

CMTx650 SX

CIRC CMT

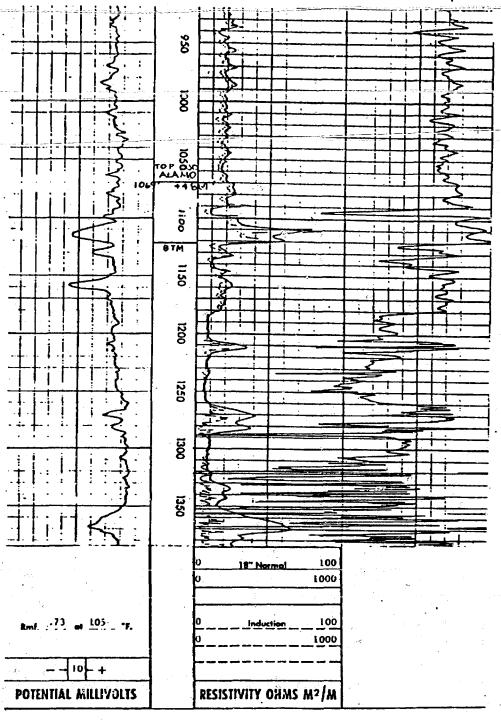
Coment retainer set at 2200'

Perfs squeezed with X 50 sx Class "A" coment

Plugs spotted from coment retainer - 2170',

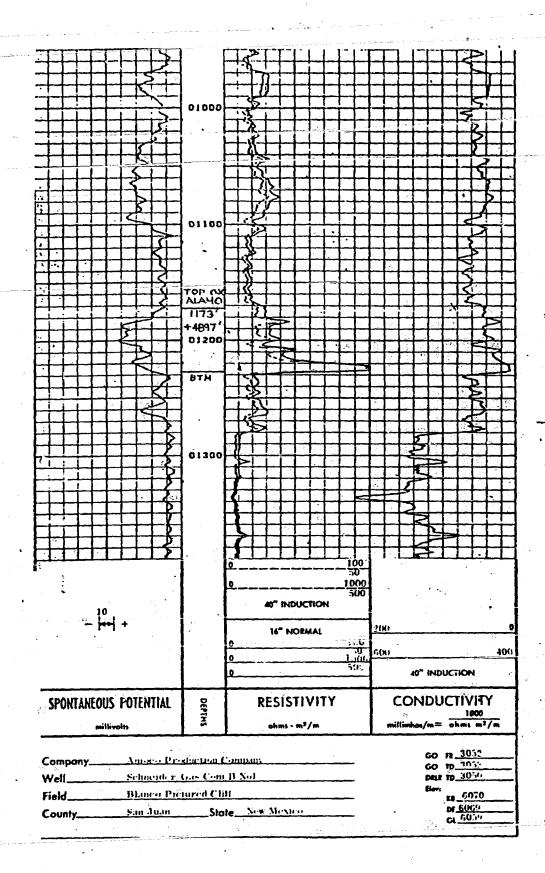
1220-1100', 325-205', and 2 sx at surface.

WELL PLUGGED X ABANDONED 12-04-73.



ANDCO PRODUCTION COMPANY KEYS GAS COM. "F" NO. I UNDESIGNATED FRUITLAND SAN JUAN COUNTY, NEW HEXICO SEC. 27-32%-10% T.D. LOGGED . 2896 '

T.O. WHEX 24025 K. B. ELEV. 9935 G. L. ELEV. 5926



OIL CONSERVATION COMMISSION Confer DISTRICT

OIL CONSERVATION COMMISSION	DATE 10-17-77
BOX 2088	and the second section of the section of the second section of the second section of the second section of the section of the second section of the
SANTA FE, NEW MEXICO	RE: Proposed MC
	Proposed DHC
James James	Proposed NSL
$\langle 2_{2}, \rangle$	Proposed SWD
20 1977	Proposed WFX
	Proposed PMX
	•
Gentlemen:	
I have examined the application dated	10-12-77
for the amoco Road, Co.)
Operator Lease and	Well No. Unit, S-T-R
	<u>.</u>
and my recommendations are as follows:	
the state of the s	
ahn #3, NW/4 33	-32N-10W
Beys Las Com F#1 K-Z	7-32N-10W
approve	
	Yours very truly,
	al Kendick



Intormation: 505/835/5420 Publications: 505/835/5440 After hours: 505/835/5014 A DIVISION OF NEW MEXICO INSTITUTE OF MEXICO & TECHNOLOGY

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

An Equal Opportunity/Affirmative Action Institution

Mr. Carl Ulvog November 16, 1977 Page 2

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,

William J. Stone Hydrogeologist

WJS/krb Enclosure

Summary of Hydrologic Characteristics of Ojo Alamo Sandstone

San Juan Basin, New Mexico

		Pumping	Specific**	Pump			Total Diss.	
-	Well No. (T.R. Sec.\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	kate (gpm)	Capacity (gpm/ft)	Time (hours	7**) (gpd/f	SAA t)	Solids (ppm)	Source (see below)
	21.1W.28.143	13.4	0.82	?		000 em	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	The second second	(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.

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:

A Del

CASE NO. 6233

Order No. *R-5780*

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

JAK

RH

ORDER OF THE DIVISION

BY THE DIVISION:

This cause came on for heari	ng at 9 a.m. on May 17	,
19 <u>78</u> , at Santa Fe, New Mexic	o, before Examiner Richard L. Stan	net

NOW, on this day of May 19 78

the lestimony,
the Division Director, having considered 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 Sahn Sas Com Well No. 3 located in Unit F of Section 27 and the Cahn Gas Com Well No. 1 located in Unit E of drilled in Unit F of Section 33,

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 1175
feet to 1230 feet and 1104 feet to 1132 feet, respectively.

chilit A while to the sound of the proposed disposed which are got comented within one held mile of comented which are got comented other of suid a wells and which are got comented on such a manner as to come to make the proposed waters to be in the proposed waters to be injected within said formation 5) That no mo disposal of salt water should be permitted into either of soid wells until all stive wells shown or sighibit A have been comented across the Ojo Alomo formation in accordance with a program to be approved by the supervisor of the Division's district office at Betec.

- That the injection should be accomplished through into the inference of th
- with a pep-off valve or acceptable substitute which will limit the wellhead pressure on the injection well to no more than
- (f) 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 premitted permitted to escape to other formations or onto the surface.
- (%) 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 tocated in Unit Will No. / Ci Section 33 and its Keys Gas Com "F" 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 $\frac{2\frac{1}{8}}{2}$ -inch tubing installed in 4packers set at approximately //50 feet and /050 feet, respectively, with injection into the perforated interval from approximately //75 feet to /230 1104 feet to 1122 feet, respectively.

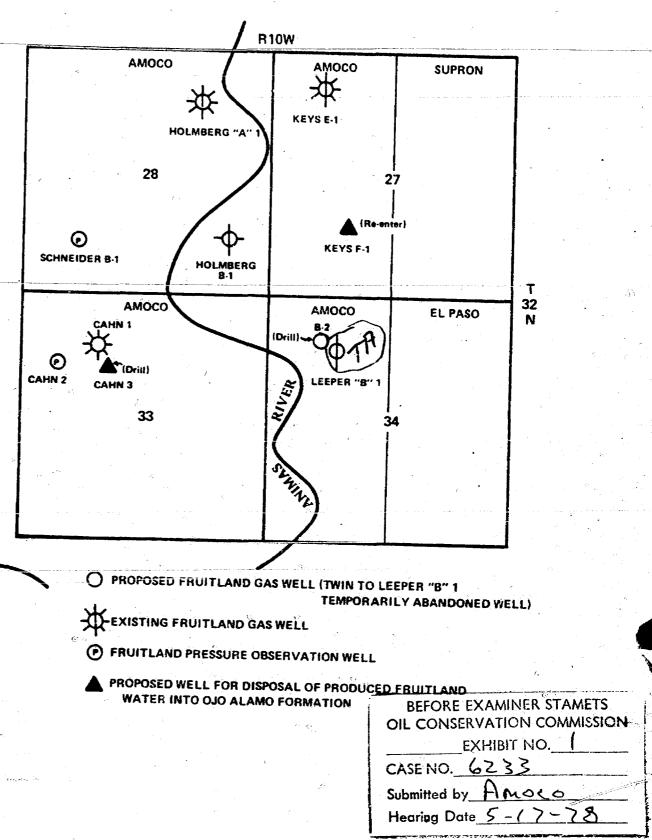
PROVIDED HOWEVER, that the tubing shall be plastic-lined; that the casing-tubing annulus shall be filled with an inert fluid; and that a pressure gauge shall be attached to the annulus or the annulus shall be equipped with an approved leak detection device in order to determine leakage in the casing,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

- (2) That the injection wells or system shall be equipped of present from the Surve of or other asseptate accord with a pop off valve or asceptable substitute which will limit the wallhead pressure on the injection wells to no more than 700 psi. 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.

Supron Energy Corp Payne 5A 0 127-32N-104 Operator Amow Production to Com Goston 1 H 33-32N-10W Schweider Gos Gom 1 L 28-32N-10W Uptegrove Gres Grun / L 33-32 N-10W Koys Gos Com A" 1 OK 27 - 32N-10 W Exhibit A CASENO 6233 ORDERNO. R-

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



 $\mathfrak{X}_{\mathcal{V}}$

san juan testing laboratory, inc.

P H D N E :

DOG WERT APACHE . P.O. BOX 2079 . FARMINGTON, NEW MEXICO

Dote January 10, 1978

Report to	AMOCO Production Company	j JAN 13 197
Requested by	Amoco Personnel Sampled by Amoco Personnel	FATTON TO THE
Project	Leeper B #1 Gas Well Location Cedar Hill Area	ARCA -
•	Water Sample # 4 - Possibly from Ojo Alamo Formation 800' de	th As
, <u></u>	1/9/78 1:00 p.m.	AA)
Lab N	26906 Water Analysis for Petroleum Engineering	
3	' TEST RESULTS	
	WATER ANALYSIS FOR PETROLEUM ENGINEERING	

Constitutents	Test Results	Constitutents		
Total Solids	17,664 mg/L	Cations	Meg/L	mg/L
pΗ	6.95	Sodium	190.9	4,389
Specific Gravity	1.012 at 64°F	Calcium	103.0	2,060
Resistivity	0.362 ohms/meter @ 70°F	Magnesium	2.0	24
Conductivity	27,600 micromhos / cm @ 70°F	Iron	Iron Sul	fide as blac
		Barium	0	0
Comments		Anions		
Essentially a 1.77%	salt solution	Ch1oride	253.5	8,975
		Bicarbonate	0.6	37
BEFORE EXAMIN	JER STAMETS	Carbonate	0	0
CONSERVATION	M COMMISSION	Hydroxide	0	0
EXHIBIT	NO3	Sulfate	41.7	2,000
CASE NO. 623		المستوسومكين المراسي	The second secon	
a wood by A	1060 - O304			
Hearing Date 5	-17-78	•	: •	
Hearing -	AM SA . The sales of the sales			

Copies to AMOCO Production Company (3)

A 3122 SALLY CHOCKED A PER NEW YORK TO NEW WAY TO SEE THE PER NEW YORK TO SEE

Form 360-

san juan testing laboratory, inc.

January 10, 1978 AMOCO Production Company Report to __ JAN 13 1978 Requested by Amoco Personnel Amoco Personnel Sampled by __ diamagron Leeper B #1 Gas Well AREA Cedar Hill Area Location . Project _ Water Sample #5 - Possibly from Ojo Alamo Formation 800' AAS Source of Material 1/9/78 shortly after 1:00 p.m. 26907 Water Analysis For Petroleum Engineering Lab No. TEST RESULTS WATER ANALYSIS FOR PETROLEUM ENGINEERING Constitutents Test Results Constitutents Total Solids 17,634 mg/L Cations Meg/L mg/L рН 7.0 Sodium 190.7 4,385 Specific Gravity 1.013 @ 64°F Calcium 101.5 2,030 Resistivity 0.365 ohms/meter @ 70°F Magnesium 3.2 39 Conductivity 27,400 micromhos/cm @ 70°F Iron Iron sulfate as black pres Bartum Comments **Anions** Essentially a 1.76% salt solution Chloride 254.2 9,000 Bicarbonate 0.5 29° BEFORE EXAMINER STAMETS Carbonate 0 . . OIL CONSERVATION COMMISSION Hydroxide EXHIBIT NO. CASE NO. 6233 Sulfate -40.6 1.950 Submitted by Huoco Hearing Date 5-AMOCO Production Company(3)

TEST NO. 24485

(Na volue in above graphs includes Na. E. and Li)

NOTE: Mg/1=Milligrame per liter Meq/1= Milligram equivalents per liter

Sodium chloride equivalent=by Dunlap & Hawtherne calculation from components

C1

HCO:

100

SO4

COs

50

5

Na

Ca

Mg

Fe

Na

Ca

Mg

Fe

Cı

HCO,

SO4

CO₃

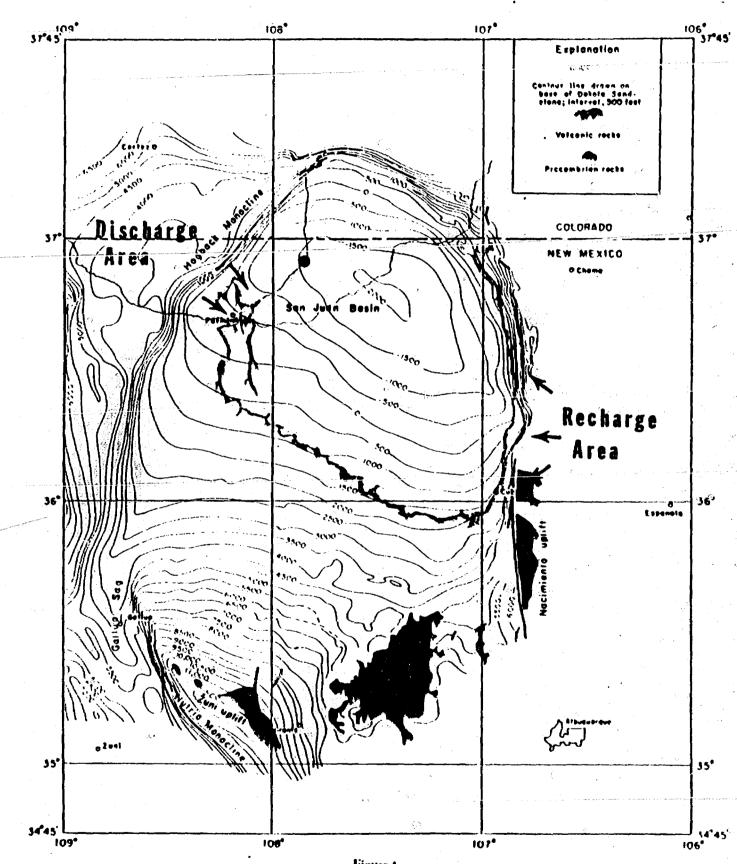


Figure 1,
Mar showing structure of San Juan Basin. Modified those Shver (1950)

Gary C. Harrison

BEFORE EXAMINER ST. OIL CONSERVATION COMMUNICATION COMMUNI	Dio Alamo OuteropDisposal Location
CASE N. 6233	
Submitted by Amoss Hearing Date 5-17-28	