



Amoco Producti



02144603

Proj 1594

**RESEARCH CENTER  
WATER ANALYSIS**

T.S. or File No. 5236WQ

Lab. No. W4138-A

Field No.

API Well No. 050710606400

071-06064

LOCATION SAMPLED: Region DENVER

Division SOUTHERN

District

Operator (Plant) AMOCO PRODUCTION

Well No. 1

Lease STATE OF COLORADO AS

State (Province) COLORADO

County (Parish) LAS ANIMAS

Twp. 32S Rng. 67W Sec. 36

Quarter (Lsd.)

Other (Meridian)

37.21648 N 104.83244 W

Wildcat ( ) Field Well ( ) Field name

Sample collected from Wellhead

Date 8/15/85

Sample collected by MIKE MELLOR

Interval sampled to

Interval name

Recovery 55 BWPD

Form 97 transmitted by

Date

Authorized by

**ORGANIC CONSTITUENTS in mg/l**

BOTTOM MIDDLE TOP MUD

	BOTTOM	MIDDLE	TOP	MUD
Benzene				
Toluene				
HC Gases				

**DESCRIPTION OF SAMPLE**

Sample used for detailed analyses

Date received

Condition as received

Color

Suspended solids

Bottom sediment

Oil or fluorescence

**QUALITY OF SAMPLE**

	BOTTOM	MIDDLE	TOP
Chloride			
Iron mg/l:			

**COMMENTS:**

Field Measurements

Measurement Temp. (°C) - 25.0

pH - 7.28

Eh - -264

S.G. - 1.004

Cond. (mS) - 4.36

NH<sub>3</sub> (mg/l) - 5.0

Phenols (mg/l) - 0.1

H<sub>2</sub>S (mg/l) - 0

Silica (mg/l) - 0

Wellhead Flowing Temp. - 26.4

**CONVENTIONAL MAJOR ION ANALYSIS**

		Major Ions mg/l	% of Total Major Ions	Reaction Value meq/l	% of Total Reaction Value
CATIONS	Sodium Na <sup>+</sup>	827.4			
	Calcium Ca <sup>++</sup>	22.9			
	Magnesium Mg <sup>++</sup>	0.75			
	Potassium K <sup>+</sup>	25.3			
ANIONS	Chloride Cl <sup>-</sup>	927			
	Bicarbonate HCO <sub>3</sub> <sup>-</sup>	127.2			
	Sulfate SO <sub>4</sub> <sup>- -</sup>	— 0 —			
	Carbonate CO <sub>3</sub> <sup>- -</sup>				
<b>TOTAL</b>					

Total solids by evaporation mg/l

NaCl resistivity equivalent (Dunlap) mg/l

Resistivity ohm-meters at °F

pH 6.60 Specific gravity 1.005 at 77 °F

Ryznar stability index (2pHs-pH) at °F

**OTHER IONS AND DISSOLVED SOLIDS**

CATIONS	mg/l	ANIONS	mg/l	OTHERS	mg/l
Sr	3.36	Acetate	<del>198</del>	B	.85
Ba	1.40	Propionate	<del>283</del>	Si	11.4
Li	2.015	Butyrate		Org. C	125.9
		Valerate		Inorg. C	191.3
		I	.24		

**REMARKS AND CONCLUSIONS:**δ<sup>18</sup>O

δ D

Field Alkalinity (mg/l as HCO<sub>3</sub>) - 1830

Wellhead Collected sample

Lab Cond = 4.14 mS

CC:

Analyst

Date

Water charts on back ( )

071-06064 AS-1

Pit: 105184

COMPANY: Wood, McShane & Thams  
FIELD: Wildcat

LEASE: State 36-32-67  
COUNTY: Las Animas STATE: Colorado

SOURCE OF SAMPLE AND DATE TAKEN

No. 1	Recoverec Water-6-24-82
No. 2	Recovered Water-7-30-82
No. 3	Recovered Water-8-13-82
No. 4	Recovered Water-8-19-82

CHEMICAL AND PHYSICAL PROPERTIES

	No.1	No.2	No.3	No.4
Specific Gravity at 60° F.	1.0040	1.0032	1.0040	1.0052
pH When Received	7.99	8.16	7.78	7.73
Bicarbonate as HCO <sub>3</sub>	1756	1982	2074	1867
Total Hardness as CaCO <sub>3</sub>	20	20	28	22
Calcium as Ca	6	6	6	6
Magnesium as Mg	1	1	3	2
Sodium and/or Potassium	787	814	882	803
Sulfate as SO <sub>4</sub>	72	5	7	7
Chloride as Cl	190	162	168	164
Iron as Fe	94.5	21.6	34.4	80.6
Total Solids, Calculated	2852	2936	3140	2849
Resistivity, ohms/m at 77° F.	3.45	3.30	3.30	3.50
Potassium as K	40	20		
Potassium as KCl	76	38		

Additional determinations and remarks:

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TREC, Inc.  
333 East Main  
Farmington  
New Mexico  
87401  
505/327-3311

**TREC**

Na SO<sub>4</sub> - Cl  
7152 ppm Cl  
SO<sub>4</sub> water  
071-06064  
Pit 105184

**OIL-FIELD WATER ANALYSIS REPORT**

DATE: August 30, 1984

FURNISHED BY: Randy Rickford

COPIES TO:

REPORTED TO: Amoco Production Company  
501 Airport Drive  
Farmington, NM 87401

LABORATORY No. 4-378 (5)

PAGE 5 of 7

Company APC		Sample No.		Date Sampled 8-27-84	
Field Wildcat		Legal Description NE/4, SEC 36, T32S, R67W		County or Parish La Plata	
State of Colo. As		Well #1		Depth 1934	
Lease or Unit		Formation Vermejo		Water, B, D 43	
Type of Water (Produced, Supply, etc.) Produced		Sampling Point Wellhead		Sampled By	

**DISSOLVED SOLIDS**

CATIONS	mg/l	me/l
Sodium, Na	2,050	89.1
Calcium, Ca	73.9	3.7
Magnesium, Mg	7.6	0.6
Barium, Ba		
<b>POTASSIUM, K</b>	239	6.1

**OTHER PROPERTIES**

pH	6.83
Specific Gravity, 60/60 F.	1.008
Resistivity (ohm-meters) 75 F.	1.32

**ANIONS**

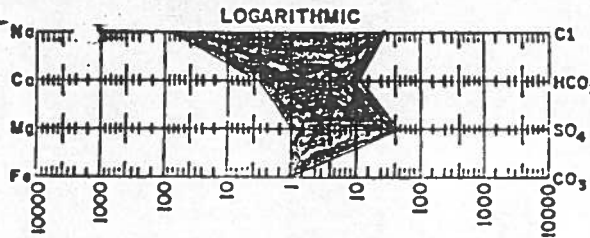
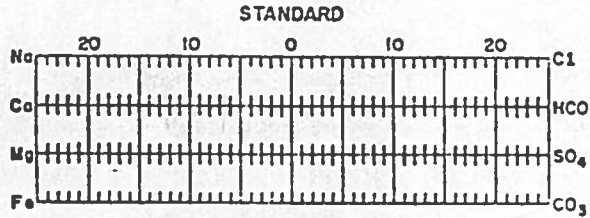
Chloride, Cl	1,249	35.2
Sulfate, SO <sub>4</sub>	2,620	54.6
Carbonate, CO <sub>3</sub>	-0-	-0-
Bicarbonate, HCO <sub>3</sub>	825	13.5

Total Dissolved Solids 7,152

Iron, Fe (total) \_\_\_\_\_  
Sulfide, as H<sub>2</sub>S \_\_\_\_\_

37% SO<sub>4</sub>  
12% HCO<sub>3</sub>

**WATER PATTERNS - me/l**



Date Received August 28, 1984	Preserved NO	Date Analyzed 8-28-84 - 8-30-84	Analyzed By C. Penney
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**REMARKS & RECOMMENDATIONS:**

Considerable iron appeared to be present.

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TREC, Inc.  
By Marilyn Penney



AS #1

Pit 105184  
071-06064

OPEN HOLE COMPLETIONS  
WATER ANALYSIS

<u>Well Name</u>	<u>AR #1</u>	<u>AS #1</u>	<u>AU #1</u>
Date	9-15-84	9-15-84	9-4-84
TDS	1636	7018	3129
Bicarbonate	942	432	2110
Chloride	210	3420	100
Sulfate	5	5	5
Sodium	477	1400	864
Calcium	21	522	2.2
Magnesium	.3	45.1	1.6
pH	8.18	7.03	8.09
Restivity	5.30	1.14	3.38
Gravity	1.004	1.009	1.006
	.2229	7.9167	.0474

AS NO. 1

Pit 105184

Attachment 4  
Water Analysis

067-06064

State of Colorado AS No. 1 and AU No. 1

1.5139

10583

State of Colorado AS No. 1

State of Colorado AU No. 1

Sodium	2050 mg/l	934 mg/l
Calcium	73.9	7.5
Magnesium	7.6	1.5
Potassium	239	55.8
Chloride	1249	123
Sulfate	2620 ✓	5
Bicarbonate	825	2110
TDS	7152	2208
PH	6.83 ✓	7.95
Specific Gravity	1.008	1.006
Resistivity	1.32 ohm-meters	3.76 ohm-meters

1.5139

9-1-84



CORE LABORATORIES, INC

1300 SOUTH POTOMAC ST, SUITE 130
AURORA, CO, 80012

PHONE: (303) 751-1780

ANALYTICAL REPORT

071-06064
Pit 105184

COMPANY: AMOCO PRODUCTION COMPANY

DATE SAMPLED: 30-JULY-85(1600)

WELL NAME: ST. OF CO. AS #1

DATE RECEIVED: 6-AUG-85

TYPE OF WATER:

DEPTH:

DATE ANALYZED: 7-AUG-85

DEPTH:

DEPTH:

DEPTH:

FILE NUMBER: 6307-W85512

DEPTH:

DEPTH:

SAMPLE #: 5

CONSTITUENTS

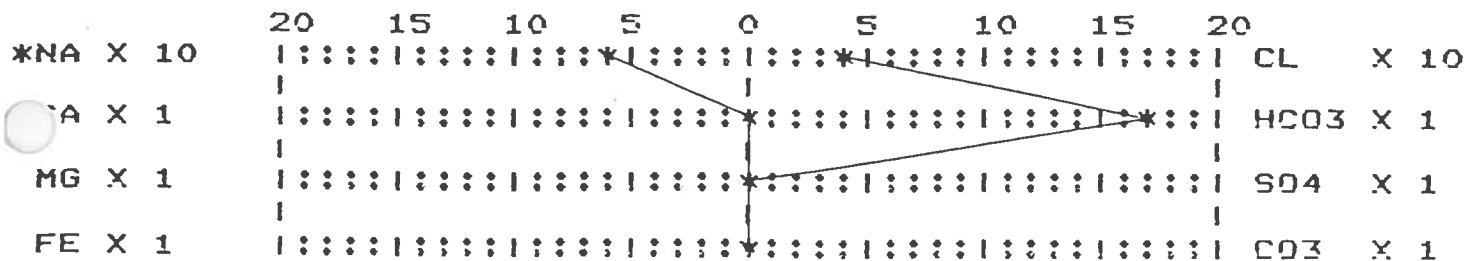
Table with 6 columns: CATIONS, MG/L, MEQ/L, ANIONS, MG/L, MEQ/L. Rows include Sodium, Calcium, Magnesium, Iron, Potassium, Chloride, Sulfate, Carbonate, Bicarbonate, Hydroxide.

TOTAL DISSOLVED SOLIDS (CALC.) 3896 MG/L

HYDROGEN SULFIDE: NEGATIVE

PHYSICAL PROPERTIES

TEMPERATURE 8.17
SPECIFIC GRAVITY @ 77 F 1.0029
RESISTIVITY (OHM-METERS) @ 77 F 1.60



-INCLUDES POTASSIUM MEQ



CORE LABORATORIES, INC

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071-06064
P: +105184

ANALYTICAL REPORT

COMPANY: AMOCO PRODUCTION COMPANY

DATE SAMPLED: 11-AUG-85

WELL NAME: ST. OF CO. AS #1

DATE RECEIVED: 15-AUG-85

TYPE OF WATER:

DEPTH:

DATE ANALYZED: 16-AUG-85

LEASE:

LOCATION:

FILE NUMBER: 6307-W85539

FORMATION:

COUNTY:

SAMPLE #: 2

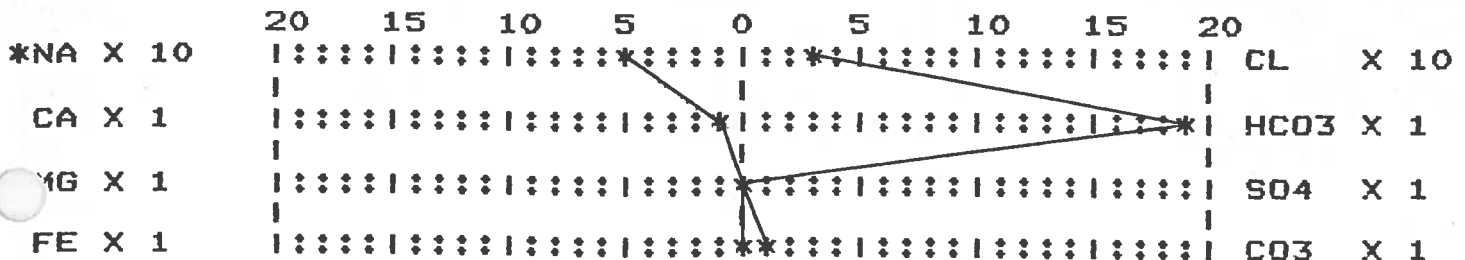
CONSTITUENTS

Table with 6 columns: CATIONS, MG/L, MEQ/L, ANIONS, MG/L, MEQ/L. Rows include Calcium, Magnesium, Iron, Potassium, Chloride, Sulfate, Carbonate, Bicarbonate, Hydroxide, and Total Dissolved Solids.

HYDROGEN SULFIDE: NEGATIVE

PHYSICAL PROPERTIES

Table with 2 columns: Property (PH, Specific Gravity, Resistivity) and Value (8.61, 1.0028, 1.90).



SCALE: MEQ/L

\*-INCLUDES POTASSIUM MEQ



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671-06064

**ANALYTICAL REPORT**

COMPANY: **AMOCO PRODUCTION COMPANY**

DATE SAMPLED: 8/22/85

WELL NAME:

DATE RECEIVED: 8/27/85

TYPE OF WATER:

DEPTH:

DATE ANALYZED: 8/27/85

LEASE: STATE OF COLORADO AS #1

LOCATION:

FILE NUMBER: 6307-W85577

FORMATION:

COUNTY:

SAMPLE #: 63070-W85577-1

**CONSTITUENTS**

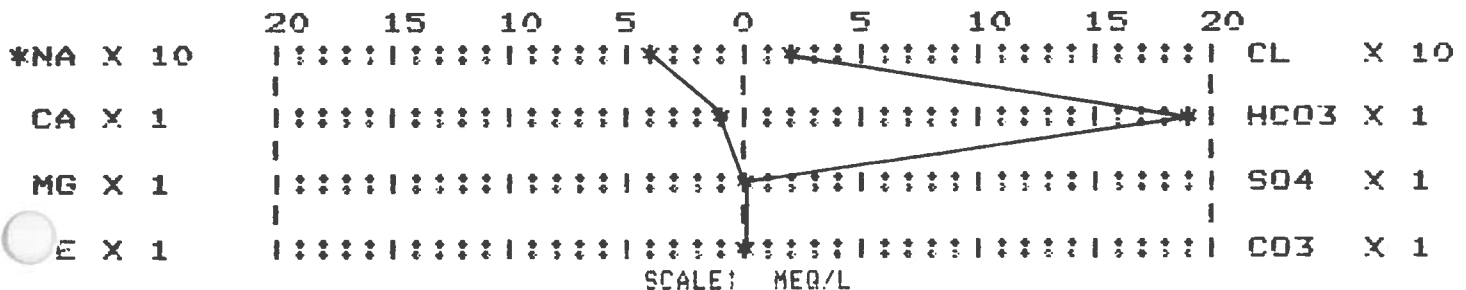
CATIONS	MG/L	MEQ/L	ANIONS	MG/L	MEQ/L
SODIUM (NA)	864	37.6	CHLORIDE (CL)	731	20.6
CALCIUM (CA)	17	0.8	SULFATE (SO4)	7.0	0.1
MAGNESIUM (MG)	2.2	0.2	CARBONATE (CO3)	4.0	0.1
IRON (FE)	0.1	0.0	BICARBONATE (HCO3)	1130	18.5
POTASSIUM (K)	31	0.8	HYDROXIDE (OH)	<0.1	0.0

TOTAL DISSOLVED SOLIDS (CALC.) 2786 MG/L ← SUM OF IONS

HYDROGEN SULFIDE: NEGATIVE

**PHYSICAL PROPERTIES**

PH 8.34  
SPECIFIC GRAVITY @ 77 F 1.0020  
RESISTIVITY (OHM-METERS) @ 77 F 2.58



SCALE: MEQ/L

\*-INCLUDES POTASSIUM MEQ

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071-06064

ANALYTICAL REPORT

COMPANY: AMOCO PRODUCTION COMPANY

DATE SAMPLED: 8/29/85

WELL NAME:

DATE RECEIVED: 9/12/85

TYPE OF WATER:

DEPTH:

DATE ANALYZED: 9/13/85

LEASE: STATE OF COLO AS#1

LOCATION:

FILE NUMBER: 6307-W85613

FORMATION:

COUNTY:

SAMPLE #: 4

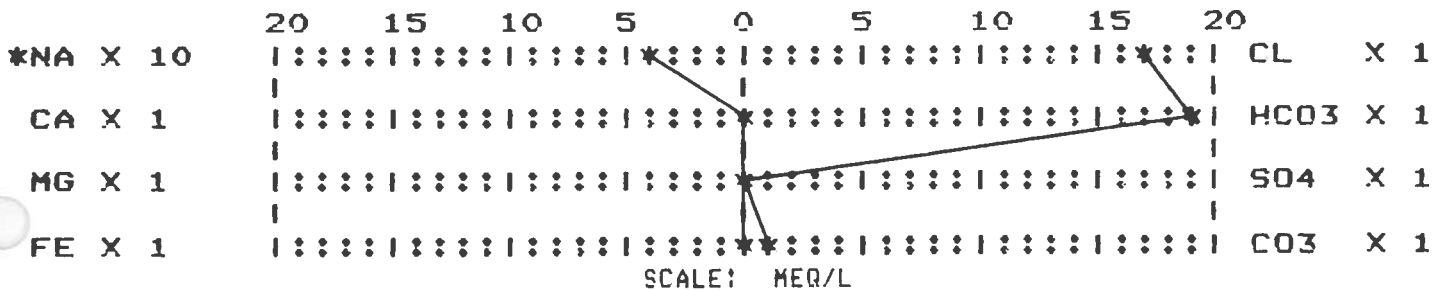
CONSTITUENTS

CATIONS	MG/L	MEQ/L	ANIONS	MG/L	MEQ/L
Na, SODIUM (NA)	833	36.3	CHLORIDE (CL)	613	17.3
CALCIUM (CA)	3.4	0.2	SULFATE (SO4)	19	0.4
MAGNESIUM (MG)	1.6	0.1	CARBONATE (CO3)	19	0.6
IRON (FE)	<0.1	0.0	BICARBONATE (HCO3)	1156	18.9
POTASSIUM (K)	28	0.7	HYDROXIDE (OH)	<0.1	0.0
TOTAL DISSOLVED SOLIDS (CALC.)			2673	MG/L	

HYDROGEN SULFIDE: NEGATIVE

PHYSICAL PROPERTIES

PH	8.34
SPECIFIC GRAVITY @ 77 F	1.0019
RESISTIVITY (OHM-METERS) @ 77 F	2.84



\*-INCLUDES POTASSIUM MEQ

CORE LABORATORIES, INC



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071-06064

ANALYTICAL REPORT

COMPANY: AMOCO PRODUCTION COMPANY

DATE SAMPLED: 9/03/85

WELL NAME:

DATE RECEIVED: 9/12/85

TYPE OF WATER:

DEPTH:

LEASE: STATE OF COLO AS#1

DATE ANALYZED: 9/13/85

LOCATION:

FORMATION:

FILE NUMBER: 6307-W85613

COUNTY:

SAMPLE #: 11

CONSTITUENTS

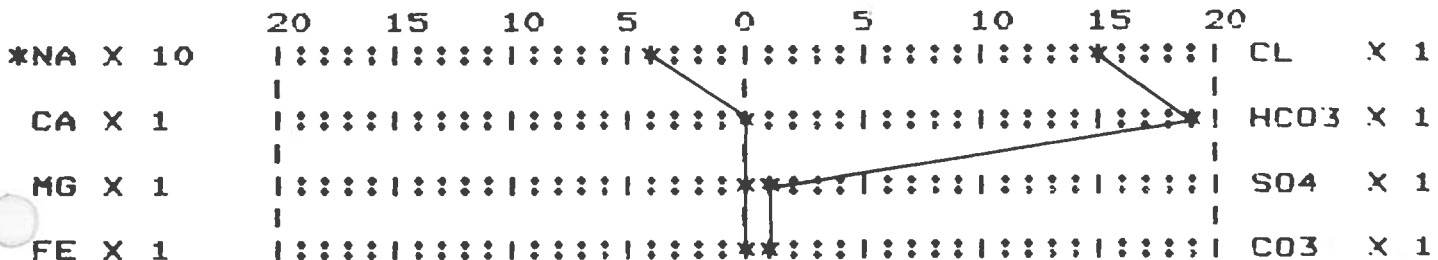
CATIONS	MG/L	MEQ/L	ANIONS	MG/L	MEQ/L
CL, SODIUM (NA)	792	34.5	CHLORIDE (CL)	545	15.4
CALCIUM (CA)	4.4	0.2	SULFATE (SO4)	22	0.5
MAGNESIUM (MG)	1.3	0.1	CARBONATE (CO3)	18	0.6
IRON (FE)	0.1	0.0	BICARBONATE (HCO3)	1162	19.0
POTASSIUM (K)	27	0.7	HYDROXIDE (OH)	<0.1	0.0

TOTAL DISSOLVED SOLIDS (CALC.) 2572 MG/L

HYDROGEN SULFIDE: NEGATIVE

PHYSICAL PROPERTIES

PH	8.42
SPECIFIC GRAVITY @ 77 F	1.0018
RESISTIVITY (OHM-METERS) @ 77 F	2.99



SCALE: MEQ/L

\*-INCLUDES POTASSIUM MEQ

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071-06064

ANALYTICAL REPORT

COMPANY: **AMOCO PRODUCTION COMPANY**

DATE SAMPLED: 9/12/85

WELL NAME:

DATE RECEIVED: 9/24/85

TYPE OF WATER:

DEPTH:

LEASE: STATE OF COLORADO AS #1

DATE ANALYZED: 9/25/85

LOCATION:

FORMATION:

FILE NUMBER: 6307-W85657

COUNTY:

SAMPLE #: 2

**CONSTITUENTS**

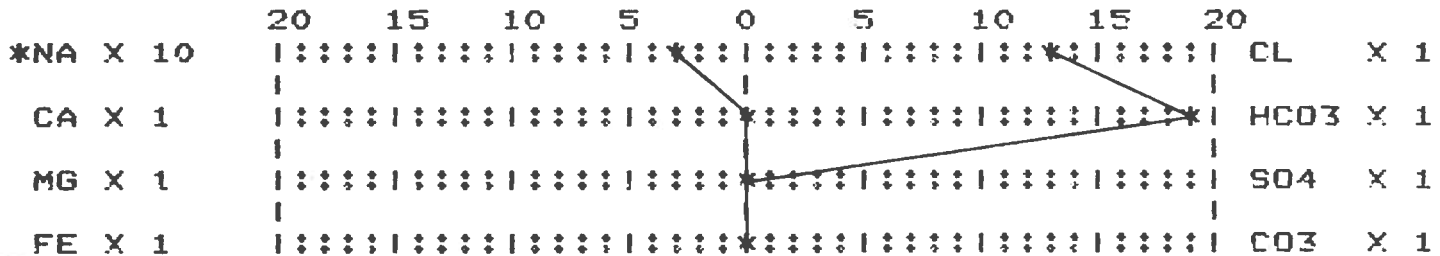
CATIONS	MG/L	MEQ/L	ANIONS	MG/L	MEQ/L
CALC. SODIUM (NA)	725	31.5	CHLORIDE (CL)	460	13.0
CALCIUM (CA)	6.5	0.3	SULFATE (SO4)	13	0.3
MANGANESE (MG)	1.3	0.1	CARBONATE (CO3)	10	0.3
IRON (FE)	0.1	0.0	BICARBONATE (HCO3)	1156	18.9
POTASSIUM (K)	22	0.6	HYDROXIDE (OH)	0.1	0.0

TOTAL DISSOLVED SOLIDS (CALC.) 2393 MG/L

HYDROGEN SULFIDE: NEGATIVE

**PHYSICAL PROPERTIES**

PH	8.41
SPECIFIC GRAVITY @ 77 F	1.0018
RESISTIVITY (OHM-METERS) @ 77 F	3.25



SCALE: MEQ/L

\* INCLUDES POTASSIUM MEQ

**CORE LABORATORIES, INC**



1300 SOUTH POTOMAC ST. SUITE 130  
AURORA, CO, 80012

PHONE: (303) 751-1780

071-06064

ANALYTICAL REPORT

COMPANY: **AMOCO PRODUCTION COMPANY**

DATE SAMPLED: 9/18/85

WELL NAME:

DATE RECEIVED: 9/24/85

TYPE OF WATER:

DEPTH:

DATE ANALYZED: 9/25/85

LEASE: STATE OF COLORADO AS #1

LOCATION:

FILE NUMBER: 6307-W85658

FORMATION:

COUNTY:

SAMPLE #: 6

**CONSTITUENTS**

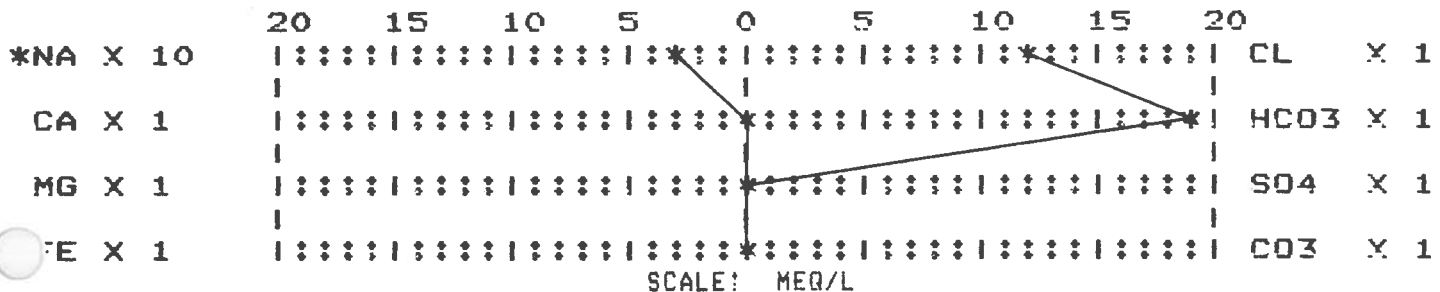
CATIONS	MG/L	MEQ/L	ANIONS	MG/L	MEQ/L
CALCIUM (CA)	714	31.1	CHLORIDE (CL)	429	12.1
MAGNESIUM (MG)	6.5	0.3	SULFATE (SO4)	17	0.4
IRON (FE)	1.2	0.1	CARBONATE (CO3)	8.0	0.3
POTASSIUM (K)	<0.1	0.0	BICARBONATE (HCO3)	1176	19.3
	20	0.5	HYDROXIDE (OH)	<0.1	0.0

TOTAL DISSOLVED SOLIDS (CALC.) 2371 MG/L

HYDROGEN SULFIDE: NEGATIVE

**PHYSICAL PROPERTIES**

PH 8.39  
SPECIFIC GRAVITY @ 77 F 1.0017  
RESISTIVITY (OHM-METERS) @ 77 F 3.40



SCALE: MEQ/L

\*-INCLUDES POTASSIUM MEQ

**CORE LABORATORIES, INC**



1300 SOUTH POTOMAC ST, SUITE 130  
AURORA, CO. 80012

PHONE: (303) 751-1780

071-06064

ANALYTICAL REPORT

COMPANY: **AMOCO PRODUCTION COMPANY**

DATE SAMPLED: 9/24/85

WELL NAME:  
TYPE OF WATER:  
DEPTH:

DATE RECEIVED: 9/30/85

LEASE: STATE OF COLORADO AS #1

DATE ANALYZED: 9/30/85

LOCATION:

FILE NUMBER: 6307-W85679

FORMATION:

COUNTY:

SAMPLE #: 7

**CONSTITUENTS**

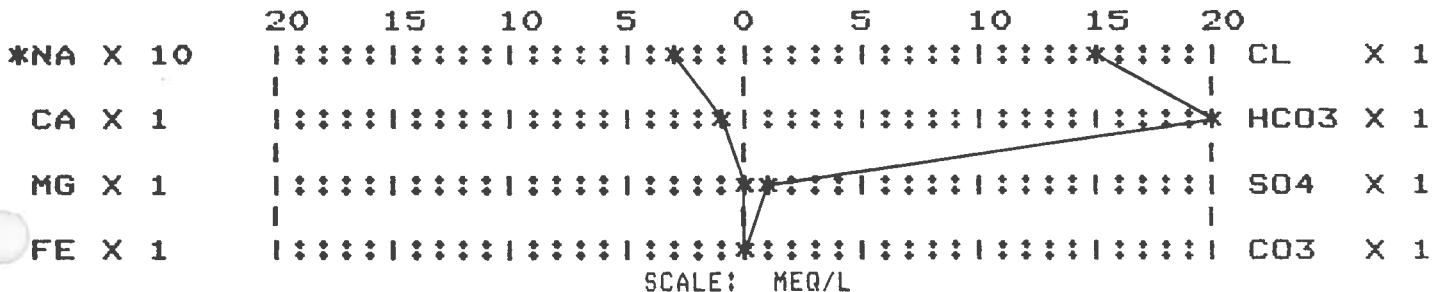
CATIONS	MG/L	MEQ/L	ANIONS	MG/L	MEQ/L
C. SODIUM (NA)	778	33.9	CHLORIDE (CL)	525	14.8
CALCIUM (CA)	11	0.5	SULFATE (SO4)	27	0.6
MAGNESIUM (MG)	1.4	0.1	CARBONATE (CO3)	<0.1	0.0
IRON (FE)	<0.1	0.0	BICARBONATE (HCO3)	1201	19.7
POTASSIUM (K)	21	0.5	HYDROXIDE (OH)	<0.1	0.0

TOTAL DISSOLVED SOLIDS (CALC.) 2564 MG/L

HYDROGEN SULFIDE: NEGATIVE

**PHYSICAL PROPERTIES**

PH 8.17  
SPECIFIC GRAVITY @ 77 F 1.0018  
RESISTIVITY (OHM-METERS) @ 77 F 3.12



\*-INCLUDES POTASSIUM MEQ

**CORE LABORATORIES, INC**



1300 SOUTH POTOMAC ST. SUITE 130  
AURORA, CO. 90012

PHONE: (303) 751-1780

071-06064

ANALYTICAL REPORT

COMPANY: **AMOCO PRODUCTION COMPANY**

DATE SAMPLED: 10/5/85

WELL NAME:

DATE RECEIVED: 10/9/85

TYPE OF WATER:

DEPTH:

DATE ANALYZED: 10/9/85

LEASE: STATE OF COLORADO AS #1

LOCATION:

FILE NUMBER: 6307-W85723

FORMATION:

COUNTY:

SAMPLE #: 7

**CONSTITUENTS**

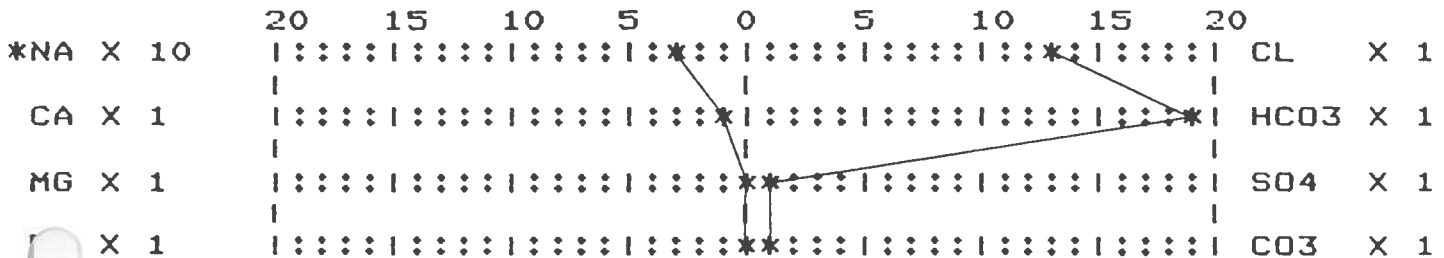
CATIONS	MG/L	MEQ/L	ANIONS	MG/L	MEQ/L
CALC. SODIUM (NA)	738	32.1	CHLORIDE (CL)	450	12.7
CALCIUM (CA)	11	0.5	SULFATE (SO4)	41	0.9
MAGNESIUM (MG)	1.4	0.1	CARBONATE (CO3)	19	0.6
IRON (FE)	0.1	0.0	BICARBONATE (HCO3)	1160	19.0
POTASSIUM (K)	18	0.5	HYDROXIDE (OH)	<0.1	0.0

TOTAL DISSOLVED SOLIDS (CALC.) 2437 MG/L

HYDROGEN SULFIDE: NEGATIVE

**PHYSICAL PROPERTIES**

PH 8.39  
 SPECIFIC GRAVITY @ 77 F 1.0016  
 RESISTIVITY (OHM-METERS) @ 77 F 3.23



SCALE: MEQ/L

\*-INCLUDES POTASSIUM MEQ