BEFORE THE NEW MEXICO OIL CONSERVATION DIVISION

APPLICATION OF ENERGY DEVELOPMENT CORPORATION FOR SALT WATER DISPOSAL, SANDOVAL COUNTY, NEW MEXICO

RECEIVED
JAN [illegible] 1996
Oil Conservation Division

NO. 11470

APPLICATION

Energy Development Corporation, for its application, states:

1. Applicant is the operator of the San Isidro (Shallow) Unit, which covers 18,897.16 acres of federal land located in Townships 20 and 21 North, Ranges 2 and 3 West, NMPM, in Sandoval County.

2. Applicant requests authorization to inject water into the Menefee formation through perforations from 2,438 feet to 2,624 feet in its existing San Isidro (Shallow) Unit Well No. 7-11, located 2,074 feet from the South line and 1,650 feet from the West line (Unit K) of Section 7, Township 20 North, Range 2 West.

3. The Form C-108 for the well is attached hereto as Exhibit A.

4. The granting of this application is in the interests of conservation and the prevention of waste.

WHEREFORE, Applicant requests that, after notice and hearing, the relief requested herein be granted.

Respectfully submitted,

HINKLE, COX, EATON, COFFIELD,
& HENSLEY, P.L.L.C., LTD., CO.

James Bruce
P. O. Box 2068
Santa Fe, New Mexico 87504-2068
(505) 982-4554

Attorneys for Energy Development Corporation

Energy Development Corporation
San Isidro (Shallow) Unit 7-11
2074' FSL & 1650' FWL
Sec. 7, T. 20 N., R. 2 W.
Sandoval County, NM

FORM C-108
DISPOSAL WELL APPLICATION

I. Purpose is disposal.

II. Operator is Energy Development Corporation.
Address is 1000 Louisiana, Suite 2900, Houston, Tx. 77002.
Contact is Brian Wood (Permits West, Inc.). Phone is (505) 466-8120.

III. A. (1) Lease is BLM oil and gas lease NM-44453, which comprises all of Sections 6-8, T. 20 N., R. & W. When APD was filed, prior to unit formation, lease was known as Johnson 7-11. Well name and number is San Isidro (Shallow) Unit 7-11. Well is at 2074' FSL and 1650' FWL Sec. 7, T. 20 N., R. 2 W.

A. (2) Surface casing (9-5/8", 36#, J-55) was set at 595' in a 13-1/2" hole and cemented to the surface (visually observed) with 135 sx (448 cu ft) 65/35 Pozmix and 150 sx (177 cu ft) Class B. Intermediate string (7", 23#, J-55) was set at 3666' KB in a 8-3/4" hole and cemented to 325' (checked by log) with 230 sx (766 cu ft) 65/35 Pozmix and 100 sx (118 cu ft) Class B. Long string (4-1/2", 10.5#, J-55) was set at 4762' KB in a 6" hole and cemented to 3339' (checked by log) with 165 sx (208 cu ft) 50/50 Pozmix.

A. (3) Tubing will be ceramic lined 2-7/8" 6.5# injection string set at 2349' (disposal interval is 2438' - 2624').

A. (4) Model R packer from Baker will be set at 2350'.

B. (1) Disposal zone will be Menefee Formation.

B. (2) Disposal interval will be 2438' - 2624'. It was perforated (0.36") with 2 shots per foot through 6 intervals (2438'-2441', 2516'-2522', 2550'-2562', 2590'-2594', 2600-2604', 2614'-2624') in 1992 during testing for a possible oil well completion (Mancos was completed in 1984, but became sub-marginal and was abandoned).

B. (3) Well was drilled in 1984 as a Mancos oil well.

B. (4) Mancos was perforated from 4169' to 4290'. During 1992 recompletion into Menefee a CIBP was set at 2667' and 4 perforations at 3160'-3162' were squeezed.

B. (5) Top of Mancos is 3112', which is 488' below the lowest Menefee

EXHIBIT A

PERMITS WEST INC.
PROVIDING PERMITS for LAND USERS

perforation. While neither produce locally, Pt. Lookout top (2940') is 316' below the lowest Menefee perforation and the Cliff House top (1632') is 806' above the highest Menefee perforation.

IV. This is not an expansion of an existing injection project.

V. A map is attached showing all wells within a half mile (there are none, closest is the 7-3 which is 2765' north and its BHL is 4757' north) and within 2 miles (12 oil + 3 P&A; all 15 wells are within the unit). The same map also shows all leases within a half mile (all Federal and all within the unit) and within two miles (all Federal or state).

VI. This is the only well within a half mile. Profile is attached.

VII. 1. Average injection rate = 100 bwpd. Maximum rate = 1000 bwpd.
2. System will be open (trucked to well). Two 300 bbl steel tanks, Gasso 3211 triplex pump with Waukesha CRG 155 engine, and a 20" filter cartridge with two 75 micron filters will be installed.
3. Average injection pressure = 700 psi. Maximum = 2000 psi.
4. Water source will be unit wells producing from Mancos. Analyses of receiving (7-11) and injected waters are attached. A summary follows:

Parameter	Drink. Water Stand.	7-11*	7-3	5-15	12-10
pH	6.5-8.5	7.6-8.0	7.5	7.5	7.3
TDS	500	8790	3243	27356	25495
Bicarbonate	-	630-2020	988	744	598
Chloride	250	1029-3800	1300	16000	15000
Sulfate	250	<300	11	81	3
Calcium	-	58-116	120	1080	120
Magnesium	-	0.1-64	389	98	170
Sodium	-	3062	348	9271	9495
Iron	0.3	1.0	2.6	36	3.6
Barium	1.0	17.0	85	46	105
Total Hardness	-	200	1900	3100	1000

*range of 3 different samples

5. Analysis of disposal zone water is attached. Salient points are that the disposal zone water TDS exceeds drinking water standards by over 17 times, chlorides by 4 to 15 times, iron by 3 times, and barium 17 times. The Menefee is a mix of coal, shale, claystone, carbonaceous siltstone, and sandstone layers. Its depositional environment was a marine lagoon. An analysis (S. E. Craigg's 1980 Hydrogeology and water resources of the Chico Arroyo - Torreon Wash Area, McKinley and Sandoval Counties, New Mexico) of Menefee water 20-30 miles southwest of the 7-11 well found TDS increased from southwest to northeast to a high of 10,272. Five unit wells (5-2, 6-16, 11-14, 12-10, 13-11) which penetrated the Menefee and reported what they found, found oil in the Menefee. All five wells are within 2 miles of the 7-11.

VIII. The Menefee consists of coal, shale, claystone, carbonaceous siltstone, and sandstone. Menefee oil pools are found at the Rusty (≈30 mi. W in 22n-7w) and Seven Lakes (≈50 mi. SW in 18n-10w) Fields. It is 627' thick in the 7-11 wellbore. Top is 2312' and bottom is 2939'. Fracture gradient is 0.82 psi/ft.

Two zones (Pictured Cliffs and Cliff House) above the Menefee are water bearing. Local TDS data from these zones is lacking. Basin wide, specific conductance of Pictured Cliffs and Cliff House water ranges from 2000 μmhos near outcrops to 30,000 μmhos in deeper gas prone areas. Five unit wells (5-2, 6-16, 11-14, 12-10, 13-11) penetrated the Pictured Cliffs and reported what was found there. All five found gas in the Pictured Cliffs. Three unit wells (5-2, 11-14, 12-10) penetrated the Cliff House and reported what was found there. All three found gas in the Cliff House.

The water bearing Pt. Lookout lies immediately below the Menefee. Four unit wells penetrated the Pt. Lookout and reported what was found there. Two (11-14, 12-10) of the four reported they found gas and two (6-16, 13-11) reported they found oil and gas.

IX. Stimulation, if needed, will be acidization.

X. Induction, CDL, GR, Compensated Density, Sidewall Neutron, and CBL logs were run and are on file.

XI. Based on a field inspection (Dec. 20) and the NM State Engineer's Office record review (Oct. 26), there are no fresh water wells within a mile of the 7-11.

XII. Geologic and engineering data at the NM Oil Conservation Div. and NM Institute of Mining & Technology have been examined. No evidence of open faults or other hydrologic connection between the Menefee and any underground source of water has been found. An injectivity test was run on 9-28-95 and the Menefee tested at a rate of 720 bwpd and 700 psi.

XIII. Notice has been sent to the surface owner (BLM Albuquerque District). Energy Development Corporation is the operator of all leases within a half mile since all leases within a half mile are in its San Isidro (Shallow) Unit.

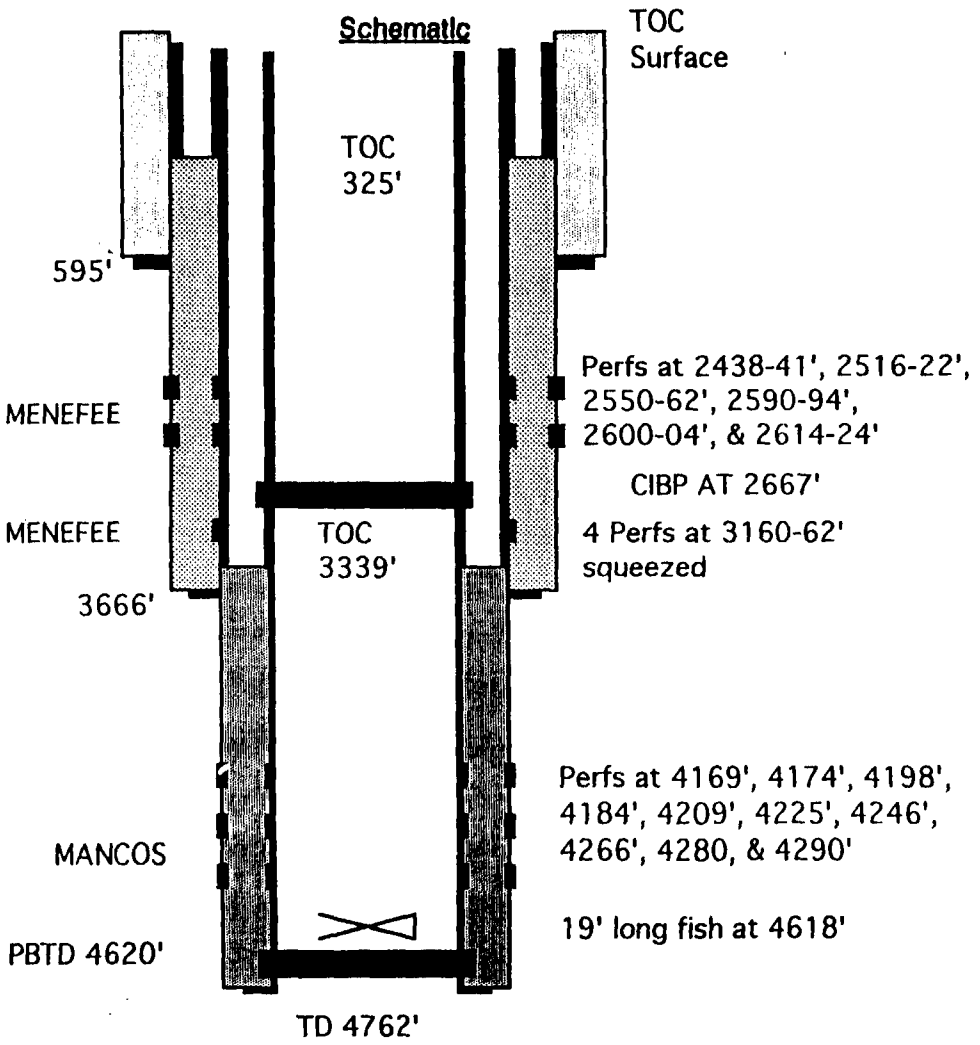
INJECTION WELL DATA SHEET

Sld

OPERATOR: Energy Development Corporation — LEASE: NM-44453

WELL NO.: San Isidro (Shallow) Unit 7-11 — FOOTAGE LOCATION: 2074' FSL & 1650' FWL — SECTION: 7 — TOWNSHIP: 20n — RANGE: 2w

Schematic



Well Construction Data

Surface Casing

Size 9-5/8" • Cemented with 285 sx.

TOC Surface feet determined by Visual

Hole Size 13-1/2" (448 cf 65/35 Poz + 177 cf Class B)

Intermediate Casing

Size 7" • Cemented with 330 sx.

TOC 325' feet determined by Log

Hole Size 8-3/4" (766 cf 65/35 Poz + 118 cf Class B)

Long String

Size 4-1/2" • Cemented with 165 sx.

TOC 3,339' feet determined by Log

Hole Size 6" (208 cf 50/50 Poz)

Total Depth 4,775' (PBTD 4620' with CIBP @ 2,667')

Injection Interval

2,438' feet to 2,624' feet

(perforated or open-hole; indicate which)

INJECTION WELL DATA SHEET

Tubing Size 2-7/8" 6.5# lined with Ceramic set in a
(type of internal coating)

Baker packer at 2,350' feet

Other type of tubing / casing seal if applicable N/A

Other Data

1. Is this a new well drilled for injection? ____ Yes __X__ No

   If no, for what purpose was the well originally drilled? Drilled & produced briefly as Mancos oil well. Later recompleted in Menefee (no production).

2. Name of the injection formation Menefee

3. Name of Field or Pool (if applicable) Rio Puerco Mancos

4. Has the well ever been perforated in any other zone(s)? List all such perforated intervals and give plugging detail, i.e., sacks of cement or plug(s) used. Mancos perf'ed. between 4,169' & 4,290' at 10 different levels (1 spf, 0.32" holes, 3-1/8" carrier gun). CIBP @ 2667'.

5. Give the names and depths of any over or underlying oil of gas zones (pools) in this area.

   Over: None designated, but some unproductive oil & gas zones present

   Under: Mancos

SAN ISIDRO

WATER ANALYSIS REPORT

Company : E D C
Address : CUBA, N.M.
Lease : REO PERCO
Well : INJ. WELL
Sample Pt. : SWAB

Date : 10-26-95
Date Sampled : 10-25-95
Analysis No.

ANALYSIS		mg/L		* meq/L
1. pH	8.0			
2. H2S	N/A			
3. Specific Gravity	1			
4. Total Dissolved Solids		8790.1		
5. Suspended Solids				
6. Dissolved Oxygen				
7. Dissolved CO2				
8. Oil in Water				
9. Phenolphthalein Alkalinity (CaCO3)				
10. Methyl Orange Alkalinity (CaCO3)				
11. Bicarbonate	HCO3	1830.0	HCO3	30.0
12. Chloride	Cl	3800.0	Cl	107.2
13. Sulfate	SO4	0.0	SO4	0.0
14. Calcium	Ca	80.0	Ca	4.0
15. Magnesium	Mg	0.1	Mg	0.0
16. Sodium (calculated)	Na	3062.1	Na	133.2
17. Iron	Fe	1.0		
18. Barium	Ba	17.0		
19. Strontium	Sr	0.0		
20. Total Hardness (CaCO3)		200.0		

PROBABLE MINERAL COMPOSITION

*milli equivalents per Liter			Compound	Equiv wt	X meq/L	= mg/L
4	*Ca <-----	*HCO3	30	Ca(HCO3)2	81.0	4.0	324
	/------->			CaSO4	68.1		
0	*Mg ---->	*SO4	0	CaCl2	55.5		
	<--------/			Mg(HCO3)2	73.2	0.0	0
133	*Na ---->	*Cl	107	MgSO4	60.2		
				MgCl2	47.6		

Saturation Values Dist. Water 20 C
CaCO3 13 mg/L
CaSO4 * 2H2O 2090 mg/L.
BaSO4 2.4 mg/L

NaHCO3	84.0	26.0	2184
Na2SO4	71.0		
NaCl	58.4	107.2	6264

REMARKS:

Petrolite Oilfield Chemicals Group

Respectfully submitted, D. STEWART

SAN ISIDRO (SHALLOW) UNIT 7-11

Company	: E D C	Date	: 10-26-95
Address	: CUBA, N.M.	Date Sampled	: 10-25-95
Lease	: REO PERCO	Analysis No.	:
Well	: INJ. WELL	Analyst	: D. STEWART
Sample Pt	: SWAB		

STABILITY INDEX CALCULATIONS
(Stiff-Davis Method)
CaCO3 Scaling Tendency

S.I. = 1.3 at 80 deg. F or 27 deg. C
S.I. = 1.3 at 100 deg. F or 38 deg. C
S.I. = 1.3 at 120 deg. F or 49 deg. C
S.I. = 1.4 at 140 deg. F or 60 deg. C
S.I. = 1.4 at 160 deg. F or 71 deg. C

CALCIUM SULFATE SCALING TENDENCY CALCULATIONS
(Skillman-McDonald-Stiff Method)
Calcium Sulfate

S = 2290 at 80 deg. F or 27 deg. C
S = 2320 at 100 deg. F or 38 deg. C
S = 2315 at 120 deg. F or 49 deg. C
S = 2301 at 140 deg. F or 60 deg. C
S = 2264 at 160 deg. F or 71 deg. C

Petrolite Oilfield Chemicals Group

Respectfully submitted, D. STEWART

HALLIBURTON DISTRICT LABORATORY
WATER ANALYSIS DATA SHEET

Analysis Date: ~~8-11-92~~ Report No. ———

To Veteran Exploration

Submitted By ——— Date Received 8-11-92

Well Number Johnson 7-11 Location 2560'-2570' (2nd Swab) Formation Menefee
Data for Report

Specific Gravity ~~1.001~~ 1.002

pH ~~7.61~~ 7.64

Aliquot or Dilution	Ion	Calculation		
	Fe Log		~~Nil~~	Nil
	K %T		~~Nil~~	Nil
	Na %T			
	Ca		~~116~~	116
	Mg		~~64~~	64
	Cl		~~1030~~	1029
	SO4 Log		~~<300~~	<300
	CO3			
	HCO3		~~630~~	630
	TDS			

Rw 2.74 @ 75 ° F

NOTICE

This report is based on sound engineering practices, but because of variable well conditions and other information which must be relied upon, Halliburton makes no warranty, express or implied, as to the accuracy of the data or of any calculations or opinions expressed herein. You agree that Halliburton shall not be liable for any loss or damage whether due to negligence or otherwise arising out of or in connection with such data calculations or opinions.

SAN ISIDRO (SHALLOW) UNIT 7-11

HALLIBURTON DIST...

WATER ANALYSIS DATA SHEET

Analysis Date: ~~8-11-92~~ Report No. ____

To Veteran Exploration

Submitted By ____ Date Received 8-11-92

Well Number Johnson 7-11 Location 2560'-2570' (8th Swab) Formation Menefee
Data for Report

Specific Gravity ~~1.001~~ 1.001

pH ~~7.71~~ 7.71

Aliquot or Dilution	Ion	Calculation	
	Fe Log		~~Nil~~ NIL
	K %T		~~Nil~~ NIL
	Na %T		
	Ca		~~58~~ 58
	Mg		~~21~~ 21
	Cl		~~1074~~ 1074
	SO4 Log		~~<300~~ <300
	CO3		
	HCO3		~~2020~~ 2020
	TDS		

Rw 1.52 at 75 °F

NOTICE

This report is based on sound engineering practices, but because of variable well conditions and other information which must be relied upon, Halliburton makes no warranty, express or implied, as to the accuracy of the data or of any calculations or opinions expressed herein. You agree that Halliburton shall not be liable for any loss or damage whether due to negligence or otherwise arising out of or in connection with such data calculations or opinions.

WATER ANALYSIS REPORT

B. Schwartz

Company : E.D.C.
Address : [redacted] M.
Lease : REO PUERCO
Well : [redacted] 5-15 PRODUCER
Sample Pt. : WELLHEAD

Date : 1-13-95
Date Sampled : 1-10-95
Analysis No. :

	ANALYSIS		mg/L		* meq/L
1.	pH	7.5			
2.	H2S	1			
3.	Specific Gravity	1.02			
4.	Total Dissolved Solids		27356.2		
5.	Suspended Solids				
6.	Dissolved Oxygen				
7.	Dissolved CO2				
8.	Oil In Water				
9.	Phenolphthalein Alkalinity (CaCO3)				
10.	Methyl Orange Alkalinity (CaCO3)				
11.	Bicarbonate	HCO3	744.0	HCO3	12.2
12.	Chloride	Cl	16000.0	Cl	451.3
13.	Sulfate	SO4	81.0	SO4	1.
14.	Calcium	Ca	1080.0	Ca	53.
15.	Magnesium	Mg	97.9	Mg	8.
16.	Sodium (calculated)	Na	9271.3	Na	403.
17.	Iron	Fe	36.0		
18.	Barium	Ba	46.0		
19.	Strontium	Sr	0.0		
20.	Total Hardness (CaCO3)		3100.0		

PROBABLE MINERAL COMPOSITION

*milli equivalents per Liter

54	*Ca <----- *HCO3	12
	/------->	
8	*Mg ------> *SO4	2
	<----------/	
403	*Na -----> *Cl	451

Saturation Values Dist. Water 20 C

CaCO3	13 mg/L
CaSO4 * 2H2O	2090 mg/L
BaSO4	2.4 mg/L

Compound	Equiv wt	X meq/L	= mg/
Ca(HCO3)2	81.0	12.2	989
CaSO4	68.1	1.7	115
CaCl2	55.5	40.0	2220
Mg(HCO3)2	73.2		
MgSO4	60.2		
MgCl2	47.6	8.1	383
NaHCO3	84.0		
Na2SO4	71.0		
NaCl	58.4	403.3	23568

REMARKS:

Petrolite Oilfield Chemicals Group

Respectfully submi d,
D. STEWART

SAN ISIDRO (SHALLOW) UNIT 5-15

WATER ANALYSIS REPORT

Company : E.D.C.
Address : CUBA, N.M.
Lease : REO PUERCO
Well : 7-3 ~~Producer~~
Sample Pt. : SEPARATOR

Date : 9-3-93
Date Sampled : 9-1-93
Analysis No. : 1

	ANALYSIS		mg/L		* meq/L
1.	pH	7.5			
2.	H2S	1			
3.	Specific Gravity	1.01			
4.	Total Dissolved Solids		3243.1		
5.	Suspended Solids				
6.	Dissolved Oxygen				
7.	Dissolved CO2		22		
8.	Oil In Water				
9.	Phenolphthalein Alkalinity (CaCO3)				
10.	Methyl Orange Alkalinity (CaCO3)				
11.	Bicarbonate	HCO3	988.0	HCO3	16.2
12.	Chloride	Cl	1300.0	Cl	36.7
13.	Sulfate	SO4	11.0	SO4	0.2
14.	Calcium	Ca	120.0	Ca	6.0
15.	Magnesium	Mg	388.7	Mg	32.0
16.	Sodium (calculated)	Na	347.8	Na	15.1
17.	Iron	Fe	2.6		
18.	Barium	Ba	85.0		
19.	Strontium	Sr	0.0		
20.	Total Hardness (CaCO3)		1900.0		

PROBABLE MINERAL COMPOSITION

*milli equivalents per Liter

6	*Ca <----- *HCO3	16
	/------->	
32	*Mg -----> *SO4	0
	<----------/	
15	*Na -----> *Cl	37

Saturation Values Dist. Water 20 C

CaCO3	13 mg/L
CaSO4 * 2H2O	2090 mg/L
BaSO4	2.4 mg/L

Compound	Equiv wt	X meq/L	= mg/L
Ca(HCO3)2	81.0	6.0	485
CaSO4	68.1		
CaCl2	55.5		
Mg(HCO3)2	73.2	10.2	747
MgSO4	60.2	0.2	14
MgCl2	47.6	21.5	026
NaHCO3	84.0		
Na2SO4	71.0		
NaCl	58.4	15.1	884

REMARKS:

Petrolite Oilfield Chemicals Group

Respectfully submitted,
D. STEWART

SAN ISIDRO (SHALLOW) UNIT 7-3

Company : E.D.C.
Address : CUBA, N.M.
Lease : REO PUERCO
Well : 12-10 Producer
Sample Pt. : SEPARATOR

Date : 9-3-93
Date Sampled : 9-1-93
Analysis No. : 1

	ANALYSIS		mg/L		* meq/L
1.	pH	7.3			
2.	H2S	2			
3.	Specific Gravity	1.01			
4.	Total Dissolved Solids		25494.9		
5.	Suspended Solids				
6.	Dissolved Oxygen				
7.	Dissolved CO2		66		
8.	Oil In Water				
9.	Phenolphthalein Alkalinity (CaCO3)				
10.	Methyl Orange Alkalinity (CaCO3)				
11.	Bicarbonate	HCO3	598.0	HCO3	9.8
12.	Chloride	Cl	15000.0	Cl	423.1
13.	Sulfate	SO4.	3.0	SO4	0.1
14.	Calcium	Ca	120.0	Ca	6.0
15.	Magnesium	Mg	170.1	Mg	14.0
16.	Sodium (calculated)	Na	9495.2	Na	413.0
17.	Iron	Fe	3.6		
18.	Barium	Ba	105.0		
19.	Strontium	Sr	0.0		
20.	Total Hardness (CaCO3)		1000.0		

PROBABLE MINERAL COMPOSITION

*milli equivalents per Liter

6	*Ca <----- *HCO3	10
	/------->	
14	*Mg -----> *SO4	0
	<---------/	
413	*Na -----> *Cl	423

Saturation Values Dist. Water 20 C
CaCO3 13 mg/L
CaSO4 * 2H2O 2090 mg/L
BaSO4 2.4 mg/L

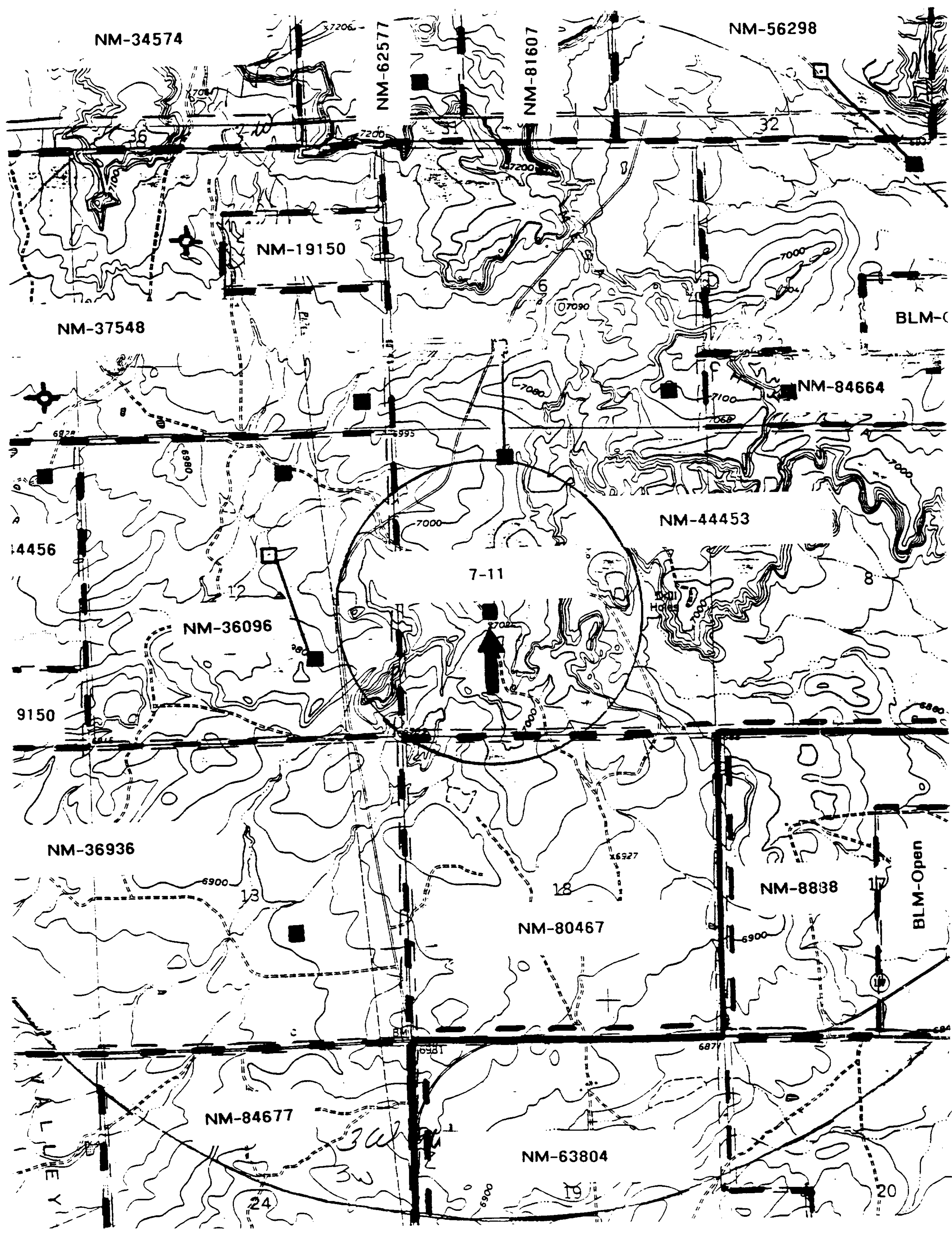
Compound	Equiv wt	X meq/L	mg
Ca(HCO3)2	81.0	6.0	48
CaSO4	68.1		
CaCl2	55.5		
Mg(HCO3)2	73.2	3.8	27
MgSO4	60.2	0.1	
MgCl2	47.6	10.1	48
NaHCO3	84.0		
Na2SO4	71.0		
NaCl	58.4	413.0	241

REMARKS:

Petrolite Oilfield Chemicals Group

Respectfully submitted,
D. STEWART

SAN ISIDRO (SHALLOW) UNIT 12-10



NM-34574
NM-62577
NM-81607
NM-56298
36
31
32
NM-19150
NM-37548
BLM-
NM-84664
NM-44453
4456
7-11
NM-36096
8
12
9150
NM-36936
NM-8888
BLM-Open
13
18
17
NM-80467
NM-84677
NM-63804
24
19
20
Drill Holes

PROPOSED ADVERTISEMENT

Case 11470: Application of Energy Development Corporation for Salt Water Disposal, Sandoval County, New Mexico. Applicant seeks authority to inject produced water into the Menefee formation through perforations from 2,438 - 2,624 feet in its existing San Isidro (Shallow) Unit Well No. 7-11, located 2,074 feet from the south line and 1,650 feet from the west line (Unit K) of Section 7, Township 20 North, Range 2 West, NMPM. Said well is located approximately eight miles southwest of Cuba, New Mexico.