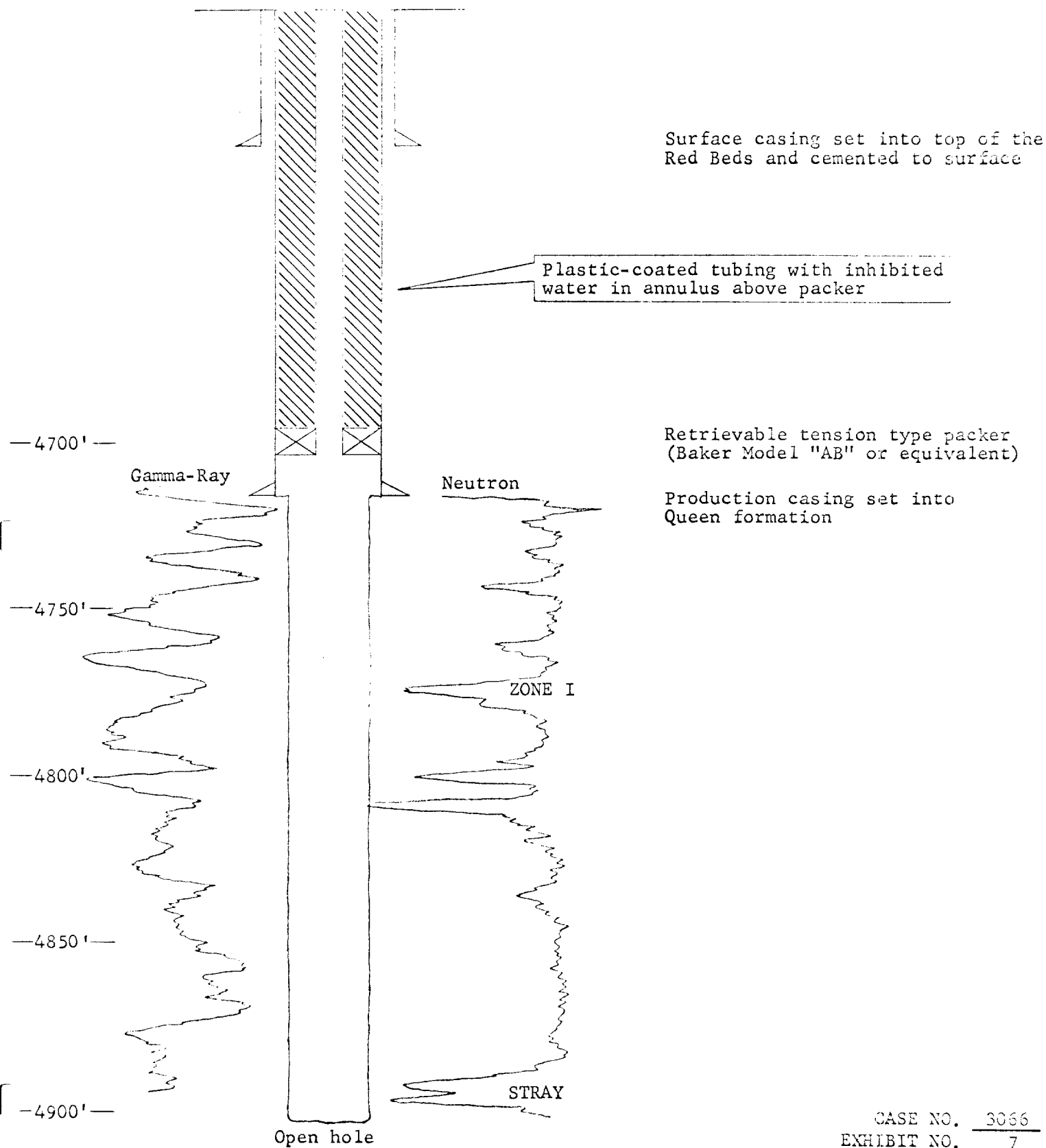


DIAGRAMMATIC SKETCH
TYPICAL SINGLE INJECTION WELL

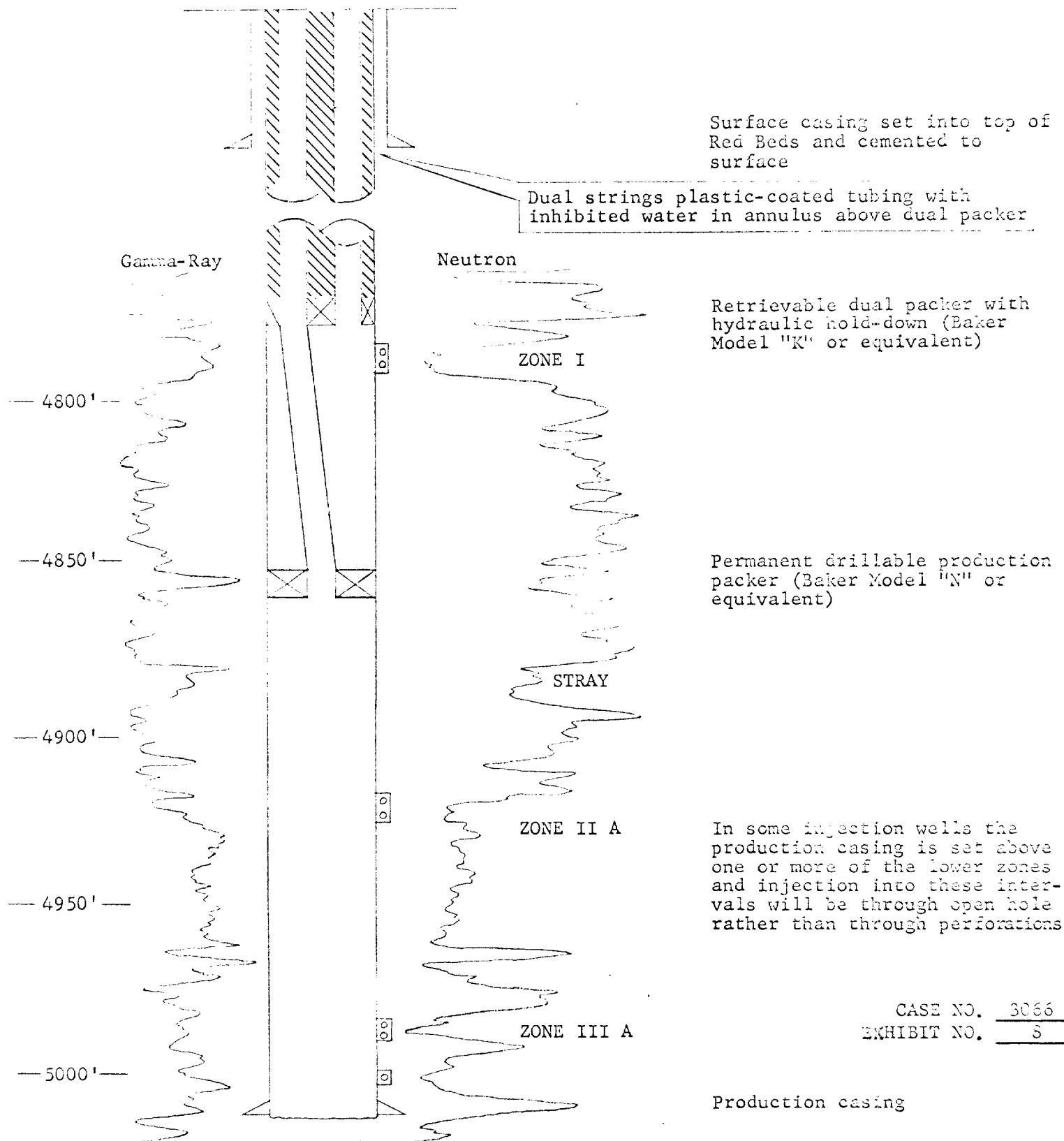
West Pearl Queen Unit
Lea County, New Mexico



CASE NO. 3066
EXHIBIT NO. 7

DIAGRAMMATIC SKETCH
TYPICAL DUAL INJECTION WELL

West Pearl Queen Unit
Lea County, New Mexico



INJECTION WELL DETAIL
TWO TUBING STRINGS IN ALL DUAL WELLS
WEST PEARL QUEEN UNIT
LEA COUNTY, NEW MEXICO

SECTION I
CASING AND CEMENT

INJECTION WELL	UNIT DESIG- NATION	SURFACE CASING				PRODUCTION CASING				ADDITIONAL CEMENTED INTERVALS #
		SIZE (INCHES)	DEPTH (FEET)	CEMENT (SACKS)	TOP CEMENT (FEET)	SIZE (INCHES)	DEPTH (FEET)	CEMENT (SACKS)	TOP CEMENT (FEET)	
HAMON ST. E-8182	NO. 3 NO. 4	8-5/8 8-5/8	327 326	300 300	Surface Surface	4-1/2 4-1/2	4991 4961	350 350	3423 3393	E E
CABOT ST. NEW MEX. "C"	NO. 5 NO. 1 NO. 4 NO. 7	8-5/8 8-5/8 8-5/8 8-5/8	304 313 302 305	300 300 300 300	Surface Surface Surface Surface	5-1/2 5-1/2 5-1/2 4-1/2	4931 4904 4919 4932	200 300 200 200	3753 3180 3920 4036	E E E E
INMAN SUPERIOR-FED.	NO. 2	8-5/8	328	265	Surface	4-1/2	5049	240	2980	E
SHELL ST. "PK"	NO. 2	8-5/8	96	85	Surface	5-1/2	5145	200	3967	E
CACTUS PARKS	NO. 1	13-3/8	100	80	Surface	7	4932	150	3061	E
SKELLY HOBBS "J" ST.	NO. 1	13-3/8	88	80	Surface	5-1/4	4920	300	3153	E
GULF LEA ST. "IH"	NO. 1 NO. 4	8-5/8 8-5/8	308 144	300 100	Surface Surface	4-1/2 4-1/2	5009 4974	2050 250	795 4078	S E 1914-1864
CACTUS GULF ST.	NO. 4 NO. 2	13-3/8 13-3/8	100 90	50 80	Surface Surface	5-1/2 5-1/2	4965 4939	350 300	3026 3277	E E
GULF LEA ST. "AP"	NO. 3 NO. 1	8-5/8 8-5/8	143 137	100 100	Surface Surface	4-1/2 4-1/2	5075 4981	250 250	3597 4085	E 1875-1825 E 1924-1874
CACTUS AZTEC ST.	NO. 2 NO. 6 NO. 4 NO. 7	13-3/8 13-3/8 13-3/8 13-3/8	107 108 102 105	100 90 100 100	Surface Surface Surface Surface	7 7 7 5-1/2	4832 4714 4874 4714	125 150 150 150	3273 2843 3003 3300	E E E E
GULF LEA ST. "AQ"	NO. 2 NO. 4 NO. 5 NO. 7	8-5/8 8-5/8 8-5/8 8-5/8	108 101 130 145	60 100 100 100	Surface Surface Surface Surface	4-1/2 4-1/2 4-1/2 4-1/2	4984 4959 4948 4936	40 250 250 250	4144 4063 4052 4040	E E 1895-1845 E 1935-1885 E 1920-1870 E 1909-1859
PHILLIPS NEW MEX. "C"	NO. 1	8-5/8	144	145	Surface	5-1/2	5060	300	3293	E
GULF LEA ST. "BG"	NO. 3 NO. 1 NO. 6 NO. 8	8-5/8 8-5/8 8-5/8 8-5/8	327 349 146 141	300 300 100 100	Surface Surface Surface Surface	4-1/2 4-1/2 4-1/2 4-1/2	4932 4969 4965 5005	1850 1800 250 250	465 415 3487 3527	S S E 1882-1833 E 1896-1846
GULF LEA ST. "AR"	NO. 4	8-5/8	140	100	Surface	4-1/2	5011	250	3533	E 1865-1815

* E - Estimated S - Temperature Survey

Two-stage cementing tool set at lower depth and 50 sacks cement spotted at top of salt and anhydrite section.

INJECTION WELL DETAIL
TWO TUBING STRINGS IN ALL DUAL WELLS
WEST PEARL QUEEN UNIT
LEA COUNTY, NEW MEXICO

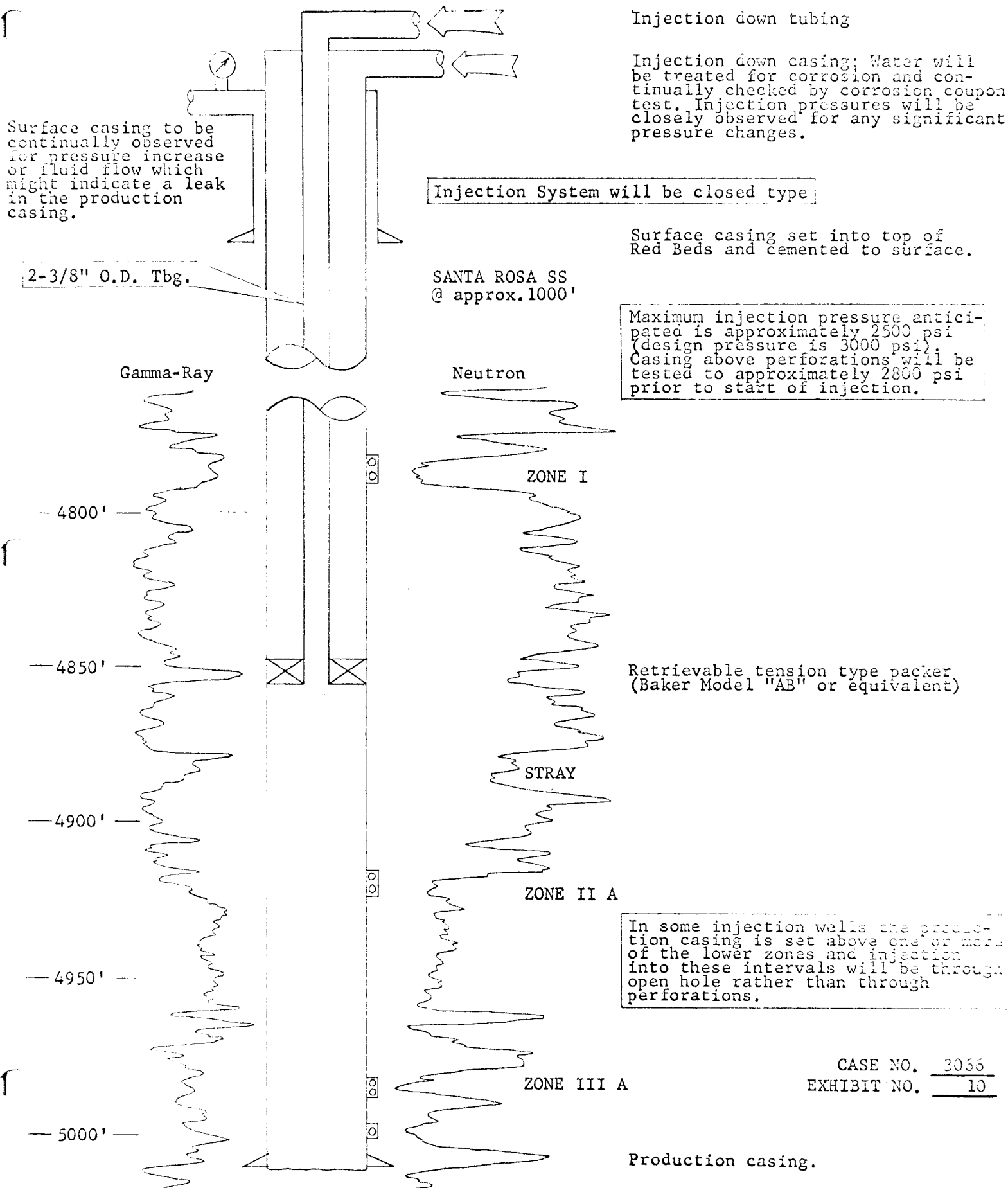
SECTION II
TUBING, PACKERS AND PERFORATIONS

INJECTION WELL	UNIT DESIG- NATION	UPPER INJECTION INTERVAL				LOWER INJECTION INTERVAL			
		GROSS PERF. AND/OR OPEN HOLE INTERVALS	TUBING		PACKER TYPE	GROSS PERF. AND/OR OPEN HOLE INTERVALS	TUBING		PACKER TYPE
			SIZE (OD)	DEPTH			SIZE (OD)	DEPTH	
HAMON ST. E-8182	NO. 3 NO. 4	28- 4 28- 6	1.660 1.660	4700 4650	RD W/HH RD W/HH	4880-4910 4814-4895	1.660 1.660	4850 4750	Permanent Permanent
CABOT ST. NEW MEX. "G"	NO. 5 NO. 1 NO. 4 NO. 7	28-10 28-12 28-14 28-16	2.063 2.063 2.063 1.660	4650 4700 4725 4675	RD W/HH RD W/HH RD W/HH RD W/HH	4826-4910 4860-4946 4854-4949 4842-4851	2.063 2.063 2.063 1.660	4775 4800 4825 4800	Permanent Permanent Permanent Permanent
INMAN SUPERIOR-FED.	NO. 2	29- 2	1.660	4775	RD W/HH	4934-5008	1.660	4900	Permanent
SHELL STATE "PK"	NO. 2	29- 4	2.063	4825	RD W/HH	5026-5054	2.063	4950	Permanent
CACTUS PARKS	NO. 1	29- 6	2.375	4750	RD W/HH	4932-5030	2.375	4875	Permanent
SKELLY HOBBS "J" ST.	NO. 1	29- 8	2.063	4725	RD W/HH	4898-5000	2.063	4850	Permanent
GULF LEA STATE "IH"	NO. 1 NO. 4	29-10 29-12	1.660 1.660	4750 4775	RD W/HH RD W/HH	4914-5000 4957-5050	1.660 1.660	4850 4900	Permanent Permanent
CACTUS GULF ST. "A"	NO. 4	29-14	2.063	4725	RD W/HH	4910-4993	2.063	4850	Permanent
GULF LEA STATE "AP"	NO. 2 NO. 3 NO. 1	29-16 30- 8 30-16	2.063 1.660 1.660	4700 4800 4750	RD W/HH RD W/HH RD W/HH	4888-4962 4927-5037 4947-5060	2.063 1.660 1.660	4825 4900 4900	Permanent Permanent Permanent
CACTUS AZTEC ST.	NO. 2 NO. 6 NO. 4 NO. 7	31- 2 31- 6 31- 8 31-10	2.375 2.375 2.375 2.375	4750 4700 4750 4700	RD W/HH RS Tension RD W/HH RD W/HH	4835-5030 Commingle 4877-4930 4880-4997	2.375 Injection w/Upper 2.375 2.375	4825 Interval in Open Hole. 4825 4825	Permanent Permanent Permanent Permanent
GULF LEA-STATE "AQ"	NO. 2 NO. 4 NO. 5 NO. 7	32- 2 32- 4 32- 6 32- 8	1.660 1.660 1.660 1.660	4725 4725 4725 4750	RD W/HH RD W/HH RD W/HH RD W/HH	4924-5015 4929-5020 4884-5025 4949-5040	1.660 1.660 1.660 1.660	4850 4850 4825 4875	Permanent Permanent Permanent Permanent
PHILLIPS NEW MEX. "C"	NO. 1	32-10	2.063	4750	RD W/HH	4898-5022	2.063	4850	Permanent
GULF LEA ST. "BG"	NO. 3 NO. 1 NO. 6 NO. 8	33- 2 33- 4 33- 6 33- 8	1.660 1.660 1.660 1.660	4700 4725 4700 4700	RD W/HH RD W/HH RD W/HH RD W/HH	4881-4975 4920-5010 4927-5020 4890-4962	1.660 1.660 1.660 1.660	4800 4850 4850 4800	Permanent Permanent Permanent Permanent
GULF LEA ST. "AR"	NO. 4	33-10	1.660	4725	RD W/HH	4876-4998	1.660	4825	Permanent

RD W/HH -Retrievable Dual with Hydraulic Hold-down Similar to Baker Model "K"
RS Tension -Retrievable Single Tension Type Packer Similar to Baker Model "AB"
Permanent -Drillable Packer Similar to Baker Model "N" (Tubing Set)

DIAGRAMMATIC SKETCH
Typical Dual Injection Well

West Pearl Queen Unit
Lea County, New Mexico



CASE NO. 3036
EXHIBIT NO. 10

INJECTION WELL DETAIL
DUALS EQUIPPED WITH SINGLE TUBING STRING
WEST PEARL QUEEN UNIT
LEA COUNTY, NEW MEXICO

INJECTION WELL	UNIT DESIG- NATION	SURFACE CASING				PRODUCTION CASING				INJECTION INTERVALS AND EQUIPMENT SETTING DEPTHS			
		SIZE (INCHES)	DEPTH (FEET)	CEMENT (SACKS)	TOP CEMENT (FEET)	SIZE (INCHES)	DEPTH (FEET)	CEMENT (SACKS)	TOP CEMENT (FEET)	★ INTERVALS	AND/OR OPEN HOLE UPPER	INTERVALS LOWER	APPROXIMATE TUBING AND PACKER DEPTH
HANON ST. E-8182	NO. 3	8-5/8	327	300	Surface	4-1/2	4991	350	3423	E	4762-4772	4880-4910	4850
	NO. 4	8-5/8	326	300	Surface	4-1/2	4961	350	3393	E	4700-4710	4814-4895	4750
CABOT ST. NEW MEX. "C"	NO. 5	8-5/8	304	300	Surface	5-1/2	4931	200	3753	E	4710-4720	4826-4910	4775
	NO. 1	8-5/8	313	300	Surface	5-1/2	4904	300	3180	E	4733-4747	4860-4946	4800
	NO. 4	8-5/8	302	300	Surface	5-1/2	4919	200	3920	E	4774-4786	4854-4949	4825
	NO. 7	8-5/8	305	300	Surface	4-1/2	4932	200	4036	E	4726-4736	4842-4851	4800
INNAN SUPERIOR-FED.	NO. 2	8-5/8	328	265	Surface	4-1/2	5049	240	2980	E	4814-4820	4934-5008	4900
SHELL ST. "PK"	NO. 2	8-5/8	96	85	Surface	5-1/2	5145	200	3967	E	4870-4880	5026-5059	4950
CACTUS PARKS	NO. 1	13-3/8	100	80	Surface	7	4932	150	3061	E	4810-4820	4932-5030	4875
SKELLY HOBBS "J" ST.	NO. 1	13-3/8	88	80	Surface	5-1/4	4920	300	3153	E	4770-4785	4898-5000	4850
GULF LEA ST. "IH"	NO. 1	8-5/8	308	300	Surface	4-1/2	5009	2050	795	S	4782-4790	4914-5000	4850
	NO. 4	8-5/8	144	100	Surface	4-1/2	4974	250	4078	E	4819-4821	4957-5050	4900
CACTUS GULF ST.	NO. 4	13-3/8	100	50	Surface	5-1/2	4965	350	3026	E	4775-4790	4910-4993	4850
	NO. 2	13-3/8	90	80	Surface	5-1/2	4939	300	3277	E	4746-4761	4888-4962	4825
GULF LEA ST. "AP"	NO. 3	8-5/8	143	100	Surface	4-1/2	5075	250	3597	E	4848-4850	4927-5037	4900
	NO. 1	8-5/8	137	100	Surface	4-1/2	4981	250	4085	E	4803-4805	4947-5060	4900
CACTUS AZTEC ST.	NO. 2	13-3/8	107	100	Surface	7	4832	125	3273	E	4790-4800	4835-5030	4820
	NO. 6	13-3/8	108	90	Surface	7	4714	150	2843	E	4714-4900	NOT DUAL	4700
	NO. 4	13-3/8	102	100	Surface	7	4874	150	3003	E	4784-4790	4877-4930	4825
	NO. 7	13-3/8	105	100	Surface	5-1/2	4714	150	3300	E	4767-4772	4880-4997	4825
						Liner	4984	40	4144	E			
GULF LEA ST. "AQ"	NO. 2	8-5/8	108	60	Surface	4-1/2	4959	250	4063	E	4774-4776	4924-5015	4850
	NO. 4	8-5/8	101	100	Surface	4-1/2	4948	250	4032	E	4785-4787	4929-5020	4850
	NO. 5	8-5/8	130	100	Surface	4-1/2	4936	250	4040	E	4786-4788	4884-5025	4825
	NO. 7	8-5/8	145	100	Surface	4-1/2	4979	250	4081	E	4802-4804	4949-5040	4875
PHILLIPS NEW MEX. "C"	NO. 1	8-5/8	144	145	Surface	5-1/2	5060	300	3293	E	4790-4806	4898-5022	4850
GULF LEA ST. "BG"	NO. 3	8-5/8	327	300	Surface	4-1/2	4932	1850	465	S	4737-4741	4881-4975	4800
	NO. 1	8-5/8	349	300	Surface	4-1/2	4969	1800	415	S	4773-4785	4920-5010	4850
	NO. 6	8-5/8	146	100	Surface	4-1/2	4965	250	3487	E	4767-4782	4927-5020	4850
	NO. 8	8-5/8	141	100	Surface	4-1/2	5005	250	3527	E	4750-4752	4890-4962	4800
GULF LEA ST. "AR"	NO. 4	8-5/8	140	100	Surface	4-1/2	5011	250	3533	E	4776-4778	4876-4998	4825

★ E - Estimated S - Temperature Survey
Two-stage cementing tool set at lower depth and 50 sacks cement spotted at top of sale and anhydrite section.
§ 2-3/8" OD Tubing and retrievable tension type packer (Baker Model "AB" or equivalent).

May 19, 1964

Mr. Frank Irby, State Engineer
Post Office Box 1079
Santa Fe, New Mexico 87501

Dear Mr. Irby:

As you suggested in the May 14, 1964 telephone conversation with Mr. D. G. Dilbrey of our office, we are writing this letter outlining briefly one of several possible water injection programs which Gulf might employ in the West Pearl Queen Unit waterflood project in hopes of obtaining your approval prior to our waterflood hearing before the CTR.

As pointed out by Mr. Dilbrey, none of the 30 injection wells in the West Pearl waterflood has the production casing cemented across the Santa Rosa formation, found from approximately 900 to 1300 feet in this area. Since Gulf might wish to dually inject into two separate intervals simultaneously down the tubing and the tubing-casing annulus, you wanted to know precisely what steps we would take to insure that the Santa Rosa would not be endangered by contamination from injected waters through possible casing leaks. The following steps, which are also briefly described on the attached diagrammatic sketch, would be taken during injection operations to insure that the Santa Rosa formation would be adequately protected:

- (1) The maximum injection pressure anticipated during the waterflood is 2500 psi and the casing above the perforations would be tested to approximately 2800 psi (slightly lower than the 3000 psi design pressure of the system) prior to start of water injection.
- (2) The injection system would be of the closed type to minimize oxygen corrosion. The C-2500 water, which will be utilized to flood the Queen reservoir, would be treated to reduce its oxygen content to 0.20 ppm. When recycled water is used in the injection wells additional corrosion treatment would be initiated.
- (3) To check the effectiveness of our water treating program, corrosion coupon tests would be continually conducted at the injection wells.

Mr. Frank Irby

- 2 -

May 19, 1964

- (4) To detect any leak in the production casing which might occur even after all precaution had been taken, frequent observation of the surface casing for increase in pressure or actual fluid flow would be maintained. At the same time injection pressure at the well head, especially that on the annulus, would be closely watched for any significant change.

We believe this injection program with the safeguards outlined would insure that the Santa Rosa or any other shallow fresh water sands would be protected from contamination during the ten years of waterflood operations. Dual injection, which we believe to be very important in this reservoir, simultaneously down the tubing and the tubing-casing annulus could effect sizable monetary savings to the West Pearl Cason Unit as compared to injection down two strings of small-size coated-tubing.

We hope this program will be acceptable to you; however, if you have any suggestions or objections concerning this possible approach, please notify us as soon as possible.

Yours very truly,

GULF OIL CORPORATION

M. I. Taylor

Attachment
DCL:ers

CASE NO. 3066
EXHIBIT NO. 12



STATE OF NEW MEXICO

STATE ENGINEER OFFICE

SANTA FE

S. E. REYNOLDS
STATE ENGINEER

May 22, 1964

ADDRESS CORRESPONDENCE TO:
STATE CAPITOL
SANTA FE, N. M.

87501

Mr. M. I. Taylor
District Production Manager
Gulf Oil Corporation
P. O. Drawer 1938
Roswell, New Mexico 88201



Dear Mr. Taylor:

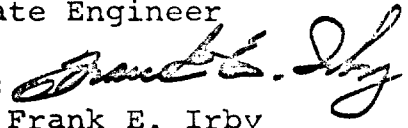
Your letter of May 19, 1964 referring to my telephone conversation with Mr. D. G. Bilbrey is gratefully acknowledged.

It appears from your outline of the protective measures set forth in your letter and a perusal of your diagrammatic sketch that I can refrain from objecting to your proposal provided your statements 1 through 4 and the paragraph following statement 4 and the diagrammatic sketch are entered in the record for the Oil Conservation Commission without change.

If you find a change necessary, it would be advisable to inform me in order that I may have an opportunity to review it before appearing at the hearing.

Very truly yours,

S. E. Reynolds
State Engineer

By: 
Frank E. Irby
Chief
Water Rights Division

FEI/ma

CASE NO. 3056
EXHIBIT NO. 13