APPENDIX C

DESERT RESEARCH INSTITUTE
GAS SAMPLING OF PROXIMATE PRODUCING WELLS
AUGUST 2005

DOE/NV/13609-LTR2005-001

Letter Report

Rulison:
Gas Sampling of Proximate Producing Wells

prepared by

Craig Shirley
Division of Hydrologic Sciences
Desert Research Institute
Nevada System of Higher Education

submitted to

Nevada Site Office
National Nuclear Security Administration
U.S. Department of Energy
Las Vegas, Nevada

August 2005

The work upon which this report is based was supported by the U.S. Department of Energy under Contract #DE-AC52-00NV13609; intended for limited distribution.

THIS PAGE INTENTIONALLY LEFT BLANK

INTRODUCTION

Five currently producing commercial gas wells near the site of the Project Rulison gas stimulation test were sampled and the gas analyzed for tritium. Sample wells were selected based on current gas production status and proximity to the Project Rulison underground nuclear test. Information on the location wells and production status of oil and gas was obtained from the Colorado Oil and Gas Commission Geographic Information System (COGIS) and is found in the Appendix.

Five wells meeting these criteria were selected for sampling (see Figure 1). All wells are operated by Encana Oil & Gas (USA) Inc. and were in production on the sampling date, May 5, 2005.

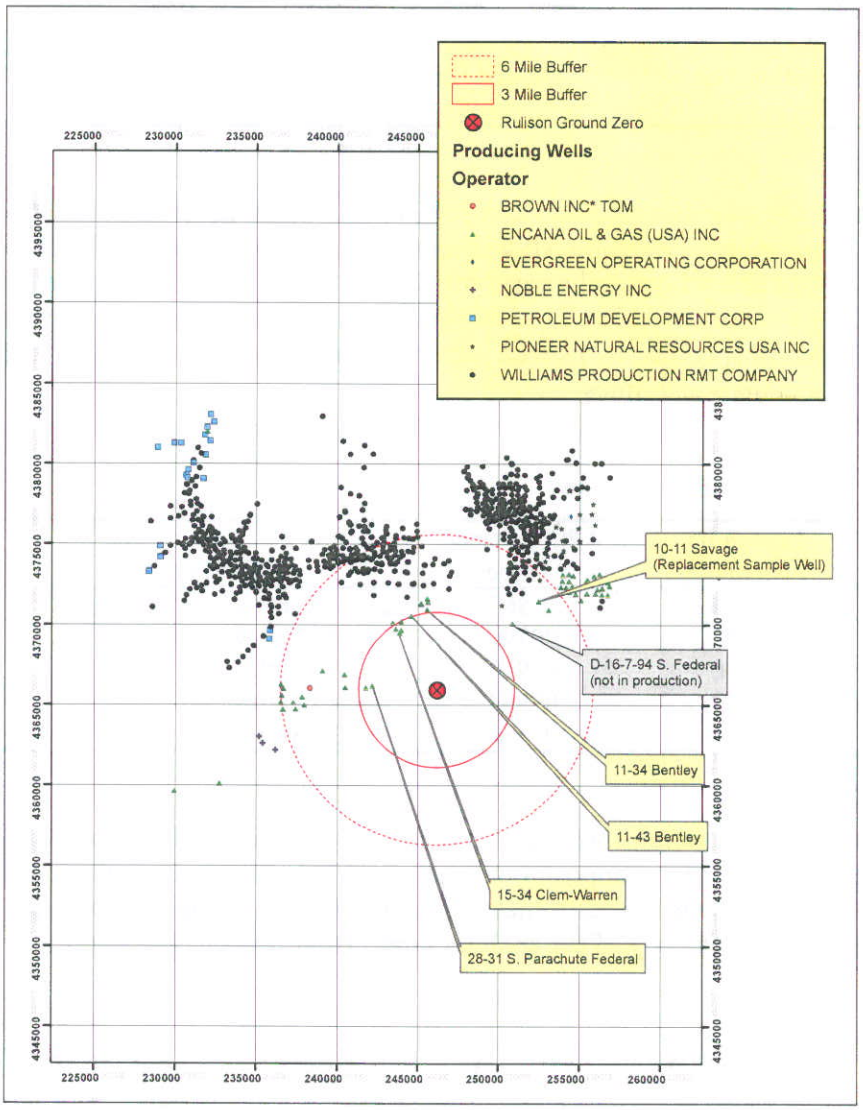

Figure 1. Sample wells.

The Rulison device was placed 8,426 feet below the ground surface at an elevation of -276 feet (see Figure 2). As shown in Table 1, four of the five sampled wells have perforated intervals that span the same elevation as the stimulation test. Well 28-31 South Parachute Federal has perforations that come within 146 vertical feet of the test.

Table 1. Elevation of perforated intervals and Rulison Test.

Well	Elevation of Highest Perforations (ft)	Elevation of Lowest Perforations (ft)	
28-31 S. Parachute Federal	1,806	-126	
15-34 Clem-Warren	1,095	-1,118	
11-43 Bentley	1,271	-975	
11-34 Bentley	1,009	-921	
10-11 Savage	807	-599	
Stimulation Test	**Ground Elevation (ft)**	**Depth of Burial (ft)**	**Elevation (ft)**
Rulison	8,154	8,426	-272

The wells were sampled between 8:40 am and 11:30 am (MDT) on May 5, 2005. Five new 20-pound steel propane bottles were used to obtain the samples. Each container was filled with wellhead gas and purged three times to ensure representative samples. The samples were obtained directly at the wellheads with the pressure being limited to less than 30 psi, as specified by Isotech Laboratories, the analytical facility. Table 2 lists the samples, locations and times.

Table 2. Sample numbering by well.

Sample Number	Isotech ID Number	API Sequence Number	Well name	Sample Time
1	82354	07867	28-31 S. Parachute Federal	8:40 am
2	82355	09790	15-34 Clem-Warren	9:53 am
3	82356	07910	11-43 Bentley	10:38 am
4	82357	07959	11-34 Bentley	10:20 am
5	82358	07186	10-11 Savage	11:27 am

The collected samples were sent to Isotech Laboratories, 1308 Parkland Court, Champaign, IL 61821, for compositional analysis, $\delta^{13}C$ analysis of methane, ^{14}C and ^{3}H analysis of methane by beta spectrometry. The results are summarized in Table 3 and detailed in the attached copy of the analysis report from Isotech (Appendix).

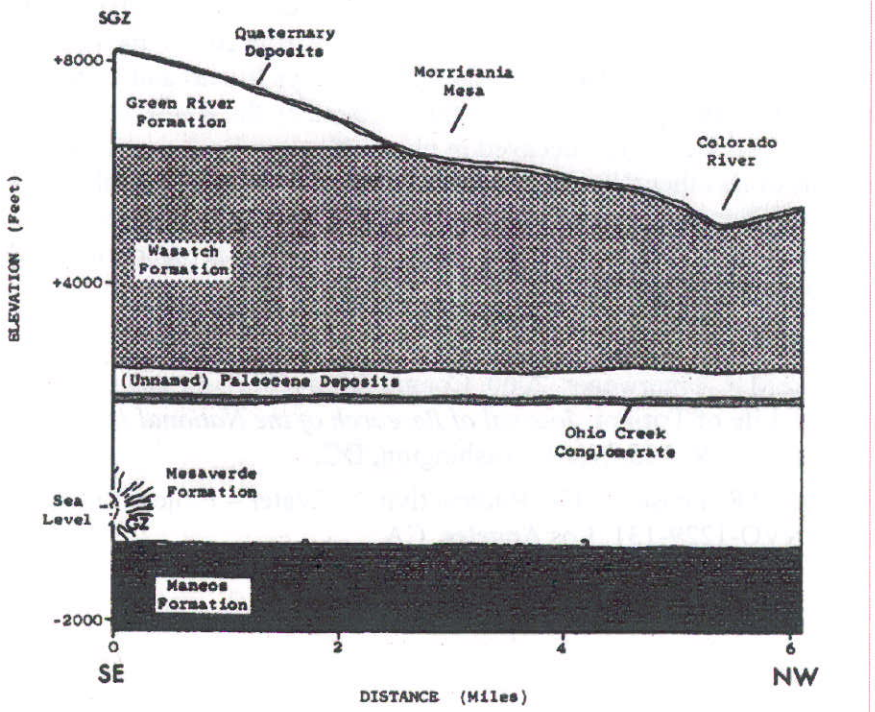

Figure 2. Cross section with Rulison emplacement (from Nork and Fenske, 1970).

Table 3. Sample results.

Isotech Lab No.	Sample Name	He %	H_2 %	Ar %	O_2 %	CO_2 %	N_2 %
82354	Sample #1	0.0029	0.0022	0.0061	0.0731	0.91	0.43
82355	Sample #2	0.0023	0.0015	0.0106	0.190	1.50	0.89
82356	Sample #3	0.0024	0.0012	0.0487	1.00	2.77	4.07
82357	Sample #4	0.0023	0	0.0261	0.502	4.45	2.17
82358	Sample #5	0.0021	0.0028	0.0268	0.527	1.30	2.10

Isotech Lab No.	Sample Name	C_1 %	C_2 %	C_3 %	iC_4 %	nC_4 %	iC_5 %	nC_5 %	C_6+ %
82354	Sample #1	91.69	4.57	1.32	0.276	0.291	0.117	0.0881	0.223
82355	Sample #2	92.59	3.37	0.869	0.178	0.178	0.0709	0.0503	0.0981
82356	Sample #3	87.77	3.11	0.752	0.158	0.138	0.0557	0.0370	0.0863
82357	Sample #4	88.19	3.63	0.643	0.155	0.0914	0.0407	0.0261	0.0783
82358	Sample #5	88.43	5.61	1.41	0.241	0.187	0.0518	0.0362	0.0745

Isotech Lab No.	Sample Name	MS date	$\delta^{13}C_1$ ‰	δDC_1 ‰	$^{14}C_1$ pMC	Std. Dev.	Tritium C_1 TU	Std. Dev.
82354	Sample #1	5/12/2005	-37.19	-173.1	< 0.6		< 10	
82355	Sample #2	5/12/2005	-36.63	-167.5	< 0.6		< 10	
82356	Sample #3	5/12/2005	-36.02	-167.5	< 0.7		< 10	
82357	Sample #4	5/18/2005	-36.19	-172.9	< 0.6		< 10	
82358	Sample #5	5/18/2005	-38.01	-177.8	< 0.6		< 10	

Chemical analysis based on standards accurate to within 2%

Subsequent to the stimulation test, 455 million cubic feet (ft^3) of gas was produced from the nearby (311 ft) R-EX well, which reduced the mass of tritium left in the subsurface. Tritium has a half-life of 4,500 (±8) days (Lucas and Unterweger, 2000), thus approximately 86.5 percent of the tritium created by the Rulison test and not removed by gas production has decayed in place. All samples show tritium concentrations of less then 10 tritium units, which is considered to be the lower limit of detection. One tritium unit equals 1 tritium atom per 10^{18} hydrogen atoms or approximately 0.1183 bequerels per liter (Bq/L). Expressed as picocuries per liter, 1 TU equals approximately 3.19 pCi/L.

REFERENCES

Lucas, L.L and M.P. Unterweger, 2000. Comprehensive Review and Critical Evaluation of the Half-Life of Tritium, *Journal of Research of the National Institute of Standards and Technology*, V. 105, No. 4, Washington, DC.

Nork, W.E. and P.R. Fenske, 1970. Radioactivity in Water – Project Rulison. In *Teledyne Isotopes*, NVO-1229-131. Los Angeles, CA.

APPENDIX: Rulison Tritium Decay Calculations

NIST decay rate in days is 4,500 plus or minus 8 days.

$$\lambda(t) := e^{\frac{-\ln(2)}{4500}\cdot t} \qquad \lambda_{low}(t) := e^{\frac{-\ln(2)}{4500-8}\cdot t} \qquad \lambda_{hi}(t) := e^{\frac{-\ln(2)}{4500+8}\cdot t}$$

Zero Time is 3:00 pm, MDT, September 10, 1969 (2100 UT).

Calculate Julian date to facilitate elapsed time in days.

ZeroTime :=JD(1969,9,10,21) ZeroTime = 2440475.4

Sample times range from 8:40 am, MDT to 11:27 am, MDT, on May 5, 2005 (1440 UT to 1727 UT).

SampleTime1:= JD(2005,5,5,14.666) SampleTime1 = 2453496.11

SampleTime2:=JD(2005,5,5,17.45) SampleTime2 = 2453496.23

t_1:=SampleTime1 – ZeroTime t_1 = 13020.74

t_2:=SampleTime2 – ZeroTime t_2 = 13020.85

Elapsed time in days from Rulison detonation until first and last samples taken

Calculate decay based on elapsed times and high, low, and mean decay rates

$\lambda(t_1) = 13.458\%$ $\lambda_{low}(t_1) = 13.410\%$ $\lambda_{hi}(t_1) = 13.506\%$

$1.0 - \lambda(t_1) = 86.542\%$ $1.0 - \lambda_{low}(t_1) = 86.590\%$ $1.0 - \lambda_{hi}(t_1) = 86.494\%$

$\lambda(t_2) = 13.457\%$ $\lambda_{low}(t_2) = 13.409\%$ $\lambda_{hi}(t_2) = 13.505\%$

$1.0 - \lambda(t_2) = 86.543\%$ $1.0 - \lambda_{low}(t_2) = 86.591\%$ $1.0 - \lambda_{hi}(t_2) = 86.495\%$

The decay ranges from 86.494% using the longest half life of 4,508 days and the earliest sample time to 86.543% using the shortest half life of 4,492 days and the last sampling time.

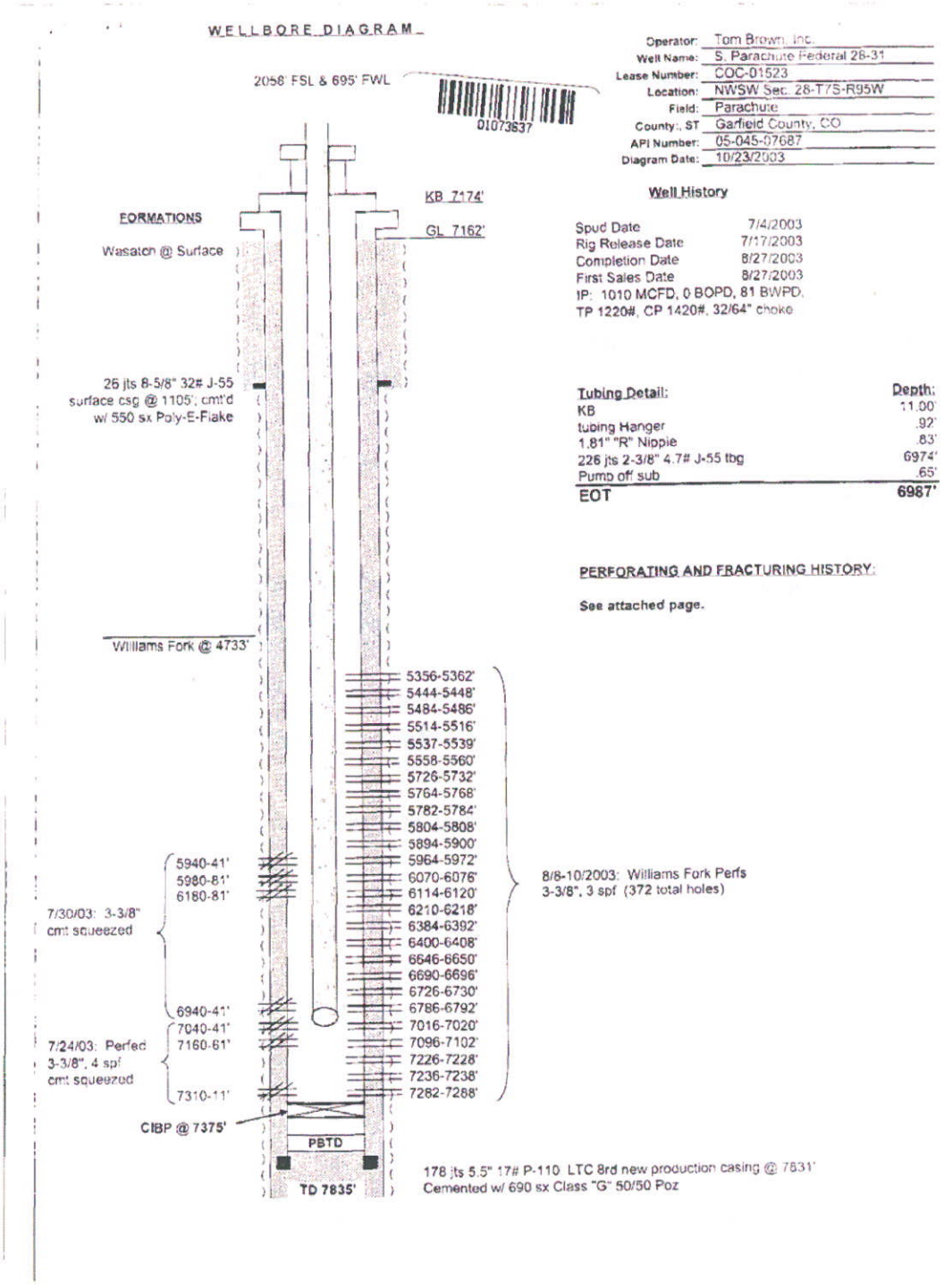

Figure A1. S. Parachute Federal 28-31 wellbore diagram (from Colorado Oil & Gas Commission Database).

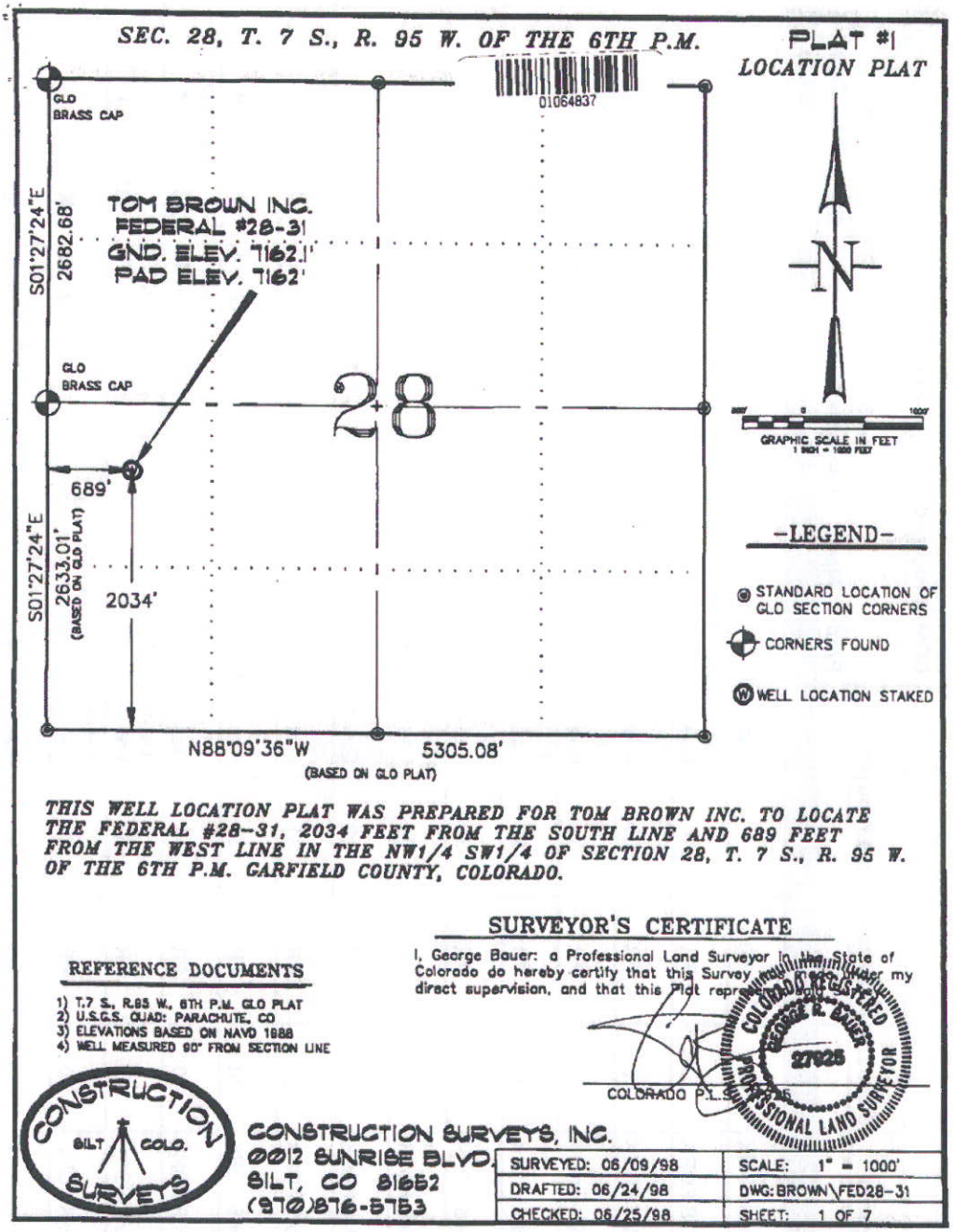

Figure A2. Location plat for S. Parachute Federal 28-31 (from Colorado Oil & Gas Commission Database).

Table A1. Production data for S. Parachute Federal 28-31 (from Colorado Oil & Gas Commission Database).

							OIL						Water Prod	Water(psig)	
							BOM	Produced	Sold	Adj.	EOM	Gravity		Tbg.	Csg.
Year	Month	Formation	Sidetrack	Well Status	Days Prod	Product	GAS						Water Disp. Code	Gas (psig)	
							Prod	Flared	Used	Shrinkage	Sold	BTU		Tbg.	Csg.
2003	Jul	WILLIAMS FORK	00	WO		Oil -> Gas ->									
2003	Aug	WILLIAMS FORK	00	PR	4	Oil -> Gas ->	5,386				5,386	1,000			
2003	Sep	WILLIAMS FORK	00	PR	28	Oil -> Gas ->	26,798				26,798	1,067	1,707 P		
2003	Oct	WILLIAMS FORK	00	PR	31	Oil -> Gas ->	29,381				29,381	1,067	945 P		
2003	Nov	WILLIAMS FORK	00	PR	29	Oil -> Gas ->	22,946				22,946	1,067	527 I		
2003	Dec	WILLIAMS FORK	00	PR	31	Oil -> Gas ->	20,290				20,290	1,067	165 P		
2004	Jan	WILLIAMS FORK	00	PR	31	Oil -> Gas ->	17,593				17,593	1,067	476 I		
2004	Feb	WILLIAMS FORK	00	PR	29	Oil -> Gas ->	14,370				14,370	1,067	360 I		
2004	Mar	WILLIAMS FORK	00	PR	31	Oil -> Gas ->	15,168	132			132 15,168	1,067	307 I		
2004	Apr	WILLIAMS FORK	00	PR	30	Oil -> Gas ->	132 12,874			-5	127 12,874	1,067	139 M		
2004	May	WILLIAMS FORK	00	PR	31	Oil -> Gas ->	127 14,137	14			141 14,137	1,081	327 M		
2004	Jun	WILLIAMS FORK	00	PR	30	Oil -> Gas ->	141 12,770			-12	129 12,770	1,081	135 I		
2004	Jul	WILLIAMS FORK	00	PR	29	Oil -> Gas ->	129 12,760	62			191 12,760	1,081			
2004	Aug	WILLIAMS FORK	00	PR	31	Oil -> Gas ->	191 13,400	25			216 13,400	1,088			

2004	Sep	WILLIAMS FORK	00	PR	30	Oil -> Gas ->	216 11,330	12	183		45 11,330	55.6 1,088	130 M		
2004	Oct	WILLIAMS FORK	00	PR	31	Oil -> Gas ->	45 12,279				45 12,279	1,088			
2004	Nov	WILLIAMS FORK	00	PR	30	Oil -> Gas ->	45 11,176				45 11,176	1,088			
2004	Dec	WILLIAMS FORK	00	PR	31	Oil -> Gas ->	45 10,850				45 10,850	1,088			
2005	Jan	WILLIAMS FORK	00	PR	31	Oil -> Gas ->	45 10,311				45 10,311	1,088			
2005	Feb	WILLIAMS FORK	00	PR	28	Oil -> Gas ->	45 8,567				45 8,567	1,088			

Clem 15-34

Operator: Tom Brown, Inc.
Field: Parachute
Location: NESE SEC. 15-T7S-R95W

Spud Date: 04/14/2004
Compl Date: 06/26/2004

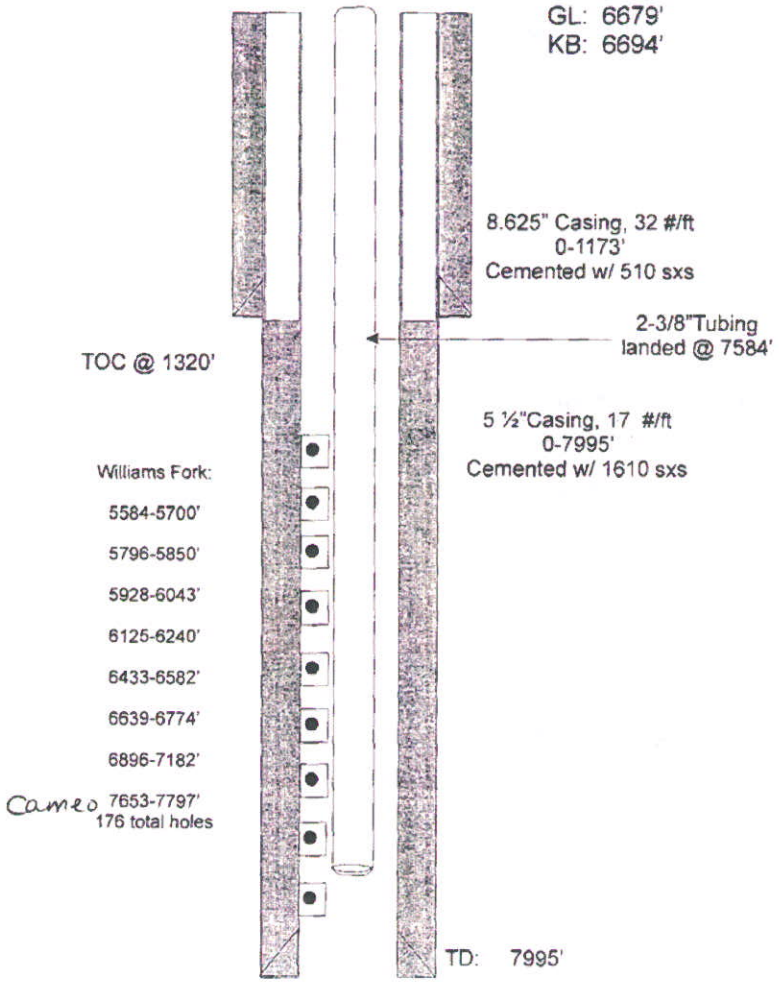

Figure A3. Wellbore diagram for Clem-Warren 15-34 (from Colorado Oil & Gas Commission Database).

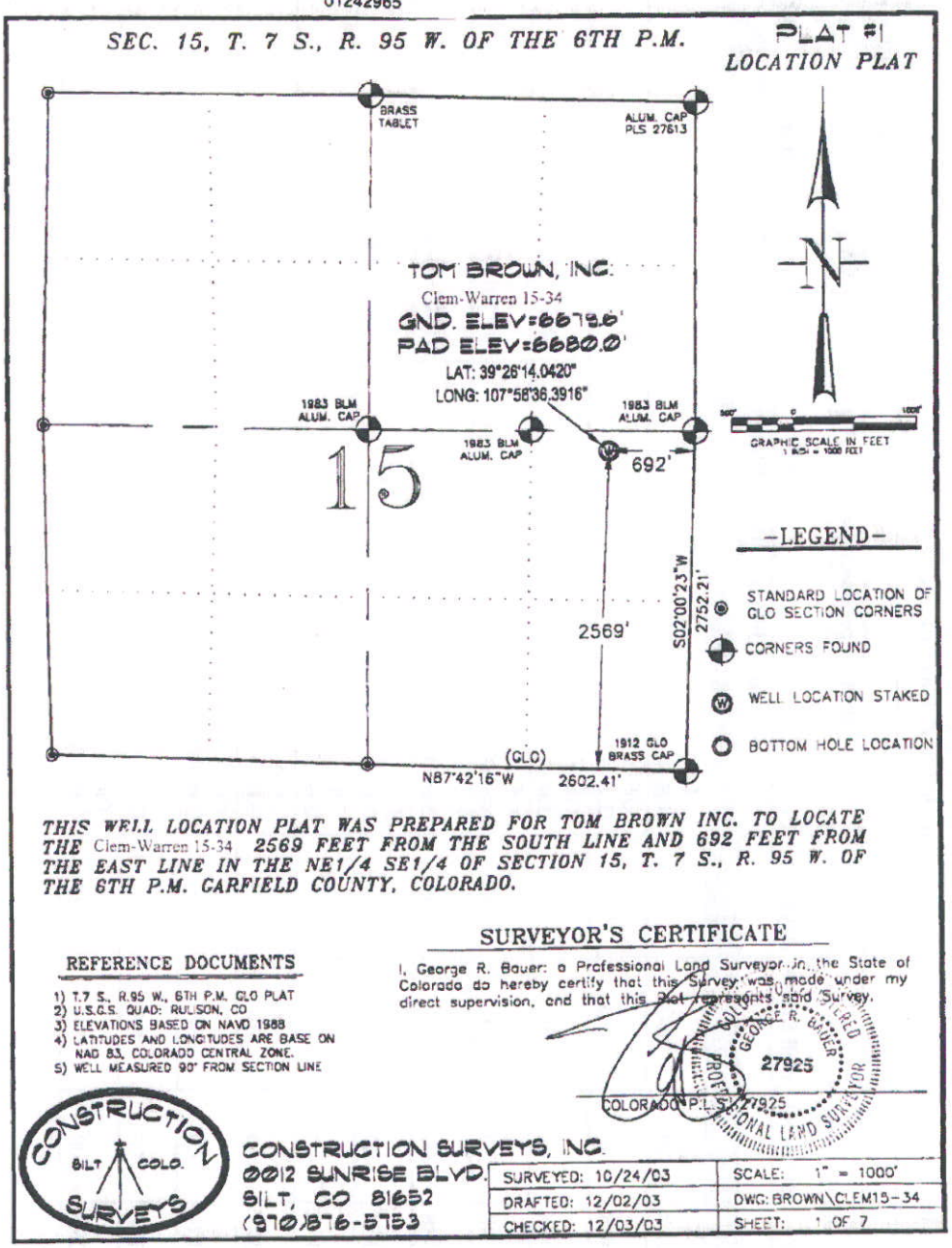

Figure A4. Location Plat for Clem-Warren 15-34 (from Colorado Oil & Gas Commission Database).

Table A2. Production data for Clem-Warren 15-34 (from Colorado Oil & Gas Commission Database).

							OIL						Water Prod	Water(psig)	
							BOM	Produced	Sold	Adj.	EOM	Gravity		Tbg.	Csg.
Year	Month	Formation	Sidetrack	Well Status	Days Prod	Product	GAS						Water Disp. Code	Gas (psig)	
							Prod	Flared	Used	Shrinkage	Sold	BTU		Tbg.	Csg.
2004	Apr	WILLIAMS FORK	00	WO		Oil -> Gas ->									
2004	May	WILLIAMS FORK	00	WO		Oil -> Gas ->									
2004	Jun	WILLIAMS FORK	00	PR	6	Oil -> Gas ->	898				898	1,075			
2004	Jul	WILLIAMS FORK	00	PR	31	Oil -> Gas ->	29,129				29,129	1,053			
2004	Aug	WILLIAMS FORK	00	PR	31	Oil -> Gas ->	20,498				20,498	1,050			
2004	Sep	WILLIAMS FORK	00	PR	30	Oil -> Gas ->	16,082				16,082	1,051			
2004	Oct	WILLIAMS FORK	00	PR	31	Oil -> Gas ->	14,210				14,210	1,051			
2004	Nov	WILLIAMS FORK	00	PR	30	Oil -> Gas ->	12,048	65			65 12,048	1,051			
2004	Dec	WILLIAMS FORK	00	PR	30	Oil -> Gas ->	65 10,487	12			77 10,487	1,060			
2005	Jan	WILLIAMS FORK	00	PR	28	Oil -> Gas ->	77 9,663	2			79 9,663	1,060			
2005	Feb	WILLIAMS FORK	00	PR	27	Oil -> Gas ->	79 8,261			-27	52 8,261	1,060			

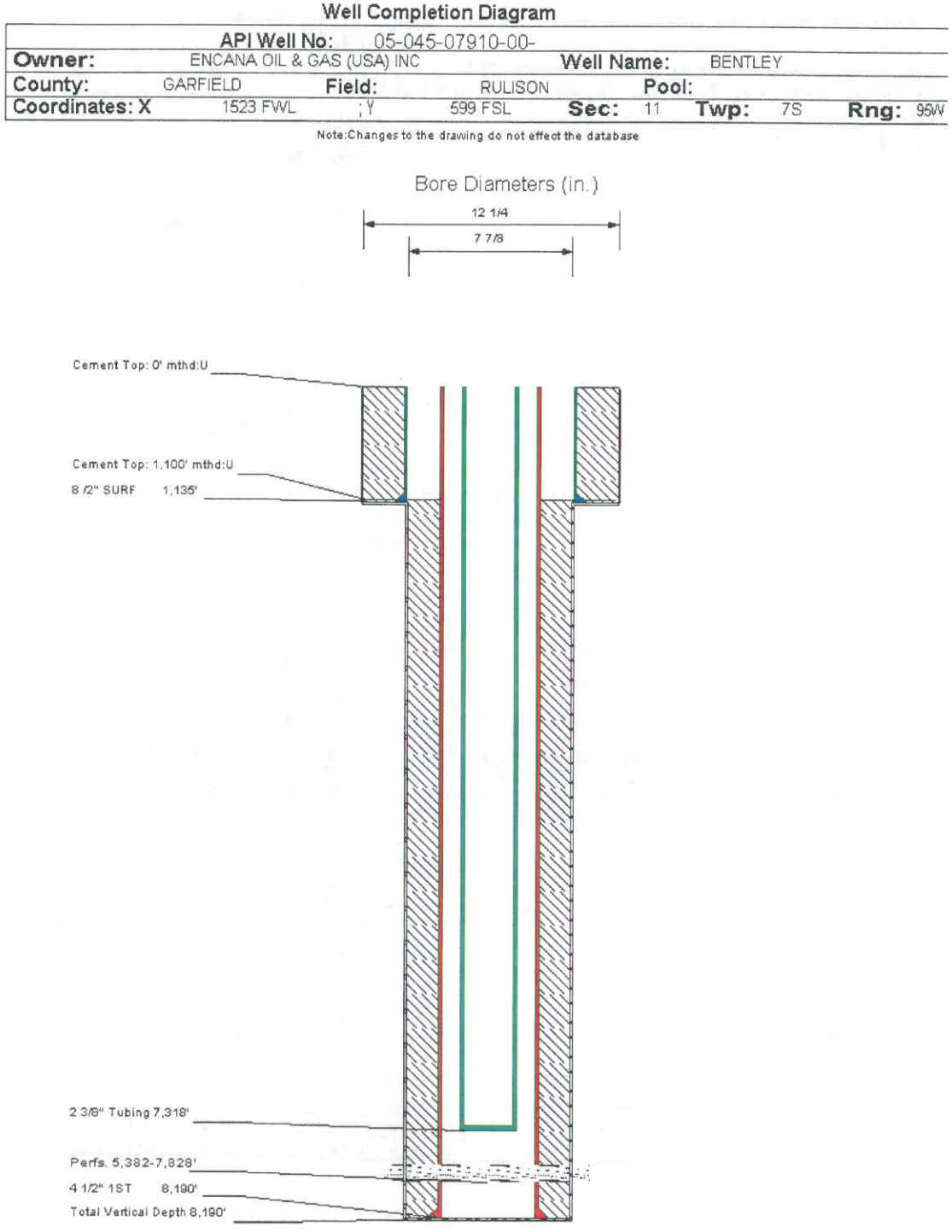

Figure A5. Wellbore diagram for Bentley 11-43 (from Colorado Oil & Gas Commission Database).

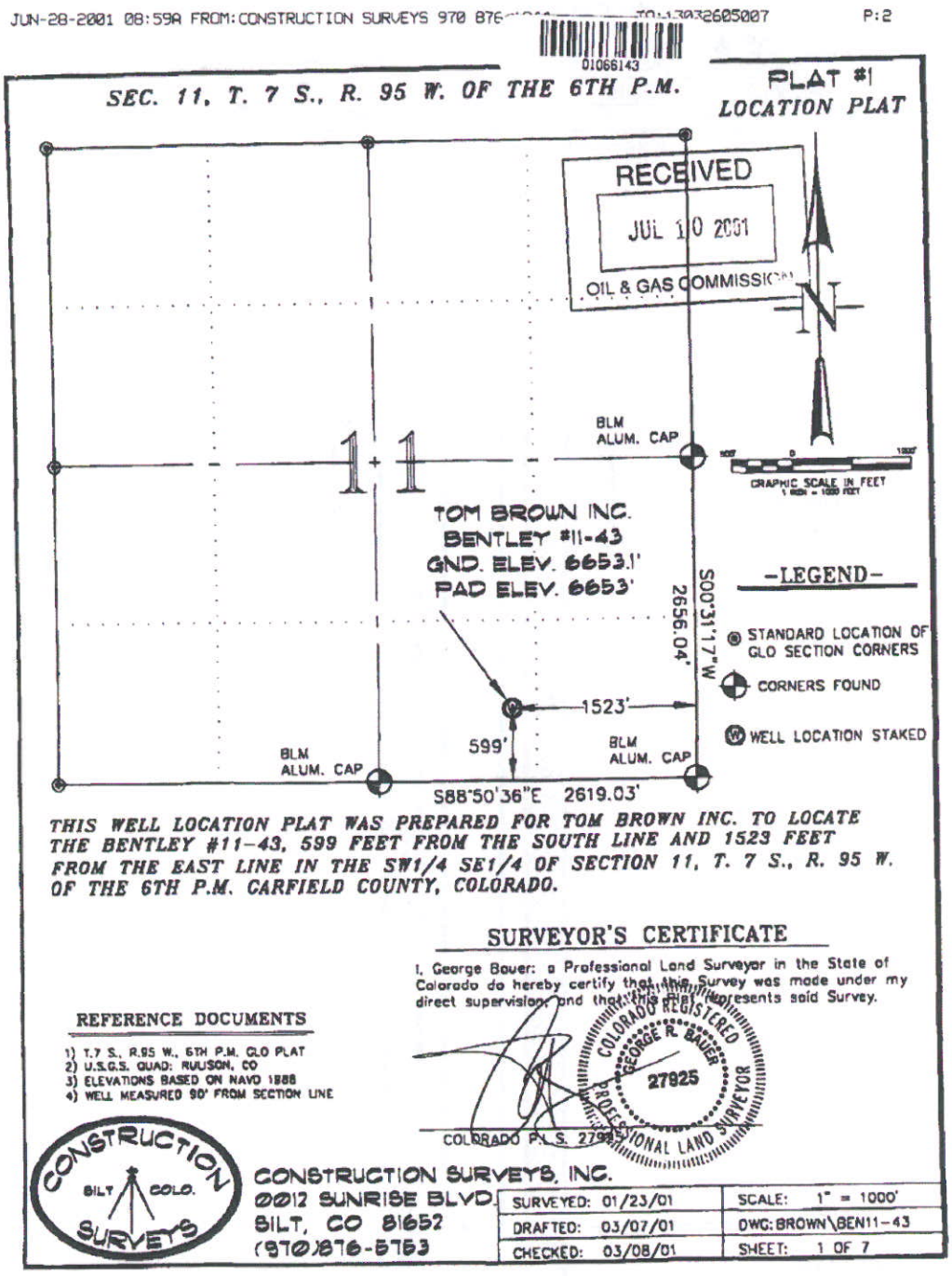

Figure A6. Location plat for Bentley 11-43 (from Colorado Oil & Gas Commission Database)

Table A3. Production data for Bentley 11-43 (from Colorado Oil & Gas Commission Database).

							OIL						Water Prod	Water(psig)	
							BOM	Produced	Sold	Adj.	EOM	Gravity		Tbg.	Csg.
Year	Month	Formation	Sidetrack	Well Status	Days Prod	Product	GAS						Water Disp. Code	Gas (psig)	
							Prod	Flared	Used	Shrinkage	Sold	BTU		Tbg.	Csg.
2003	Sep	WILLIAMS FORK	00	WO		Oil ->
Gas ->									
2003	Oct	WILLIAMS FORK	00	WO		Oil ->
Gas ->									
2003	Nov	WILLIAMS FORK	00	PR	26	Oil ->
Gas ->	48,184				48,184	1,040			
2003	Dec	WILLIAMS FORK	00	PR	31	Oil ->
Gas ->	48,243				48,243	1,028	3,461
P		
2004	Jan	WILLIAMS FORK	00	PR	31	Oil ->
Gas ->	39,284				39,284	1,028	2,496
M		
2004	Feb	WILLIAMS FORK	00	PR	29	Oil ->
Gas ->	32,503	45			45
32,503	1,053	1,790
M		
2004	Mar	WILLIAMS FORK	00	PR	31	Oil ->
Gas ->	45
30,796	4			49
30,796	1,053	1,416
M		
2004	Apr	WILLIAMS FORK	00	PR	30	Oil ->
Gas ->	49
27,019				49
27,019	1,053	929
M		
2004	May	WILLIAMS FORK	00	PR	31	Oil ->
Gas ->	49
25,433				49
25,433	1,035	757
M		
2004	Jun	WILLIAMS FORK	00	PR	30	Oil ->
Gas ->	49
22,799				49
22,799	1,035	2,235
M		
2004	Jul	WILLIAMS FORK	00	PR	31	Oil ->
Gas ->	49
23,209				49
23,209	1,035			
2004	Aug	WILLIAMS FORK	00	PR	31	Oil ->
Gas ->	49
20,550				49
20,550	1,012			
2004	Sep	WILLIAMS FORK	00	PR	30	Oil ->
Gas ->	49
18,821				49
18,821	1,012	580
M		
2004	Oct	WILLIAMS FORK	00	PR	31	Oil ->
Gas ->	49
18,183				49
18,183	1,012			

2004	Nov	WILLIAMS FORK	00	PR	29	Oil -> Gas ->	49 16,450				49 16,450	1,012			
2004	Dec	WILLIAMS FORK	00	PR	24	Oil -> Gas ->	49 12,676	1			50 12,676	1,012			
2005	Jan	WILLIAMS FORK	00	PR	31	Oil -> Gas ->	50 18,639			-6	44 18,639	1,012			
2005	Feb	WILLIAMS FORK	00	PR	28	Oil -> Gas ->	44 14,733				44 14,733	1,011			

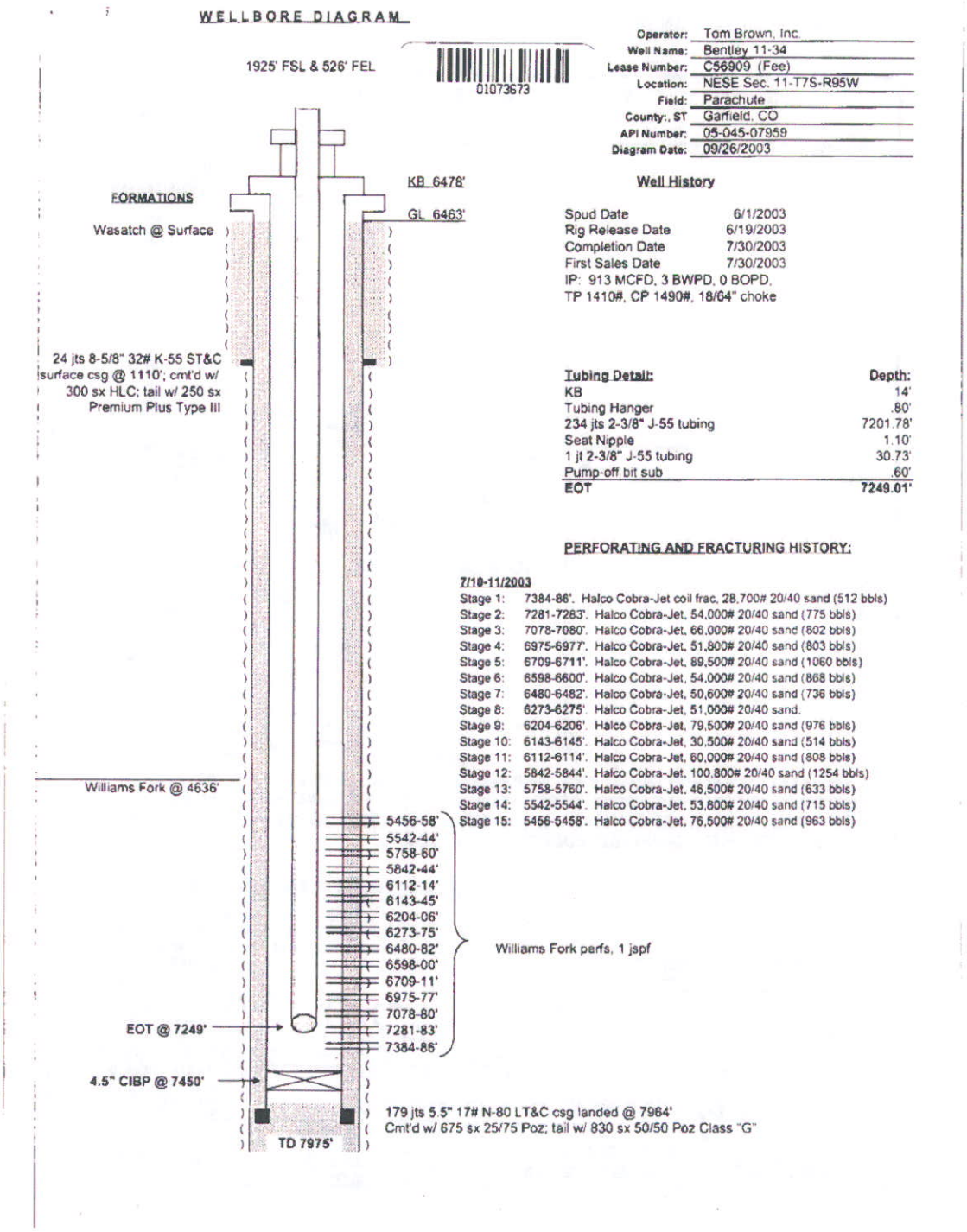

Figure A7. Wellbore diagram for Bentley 11-34 (from Colorado Oil & Gas Commission Database).

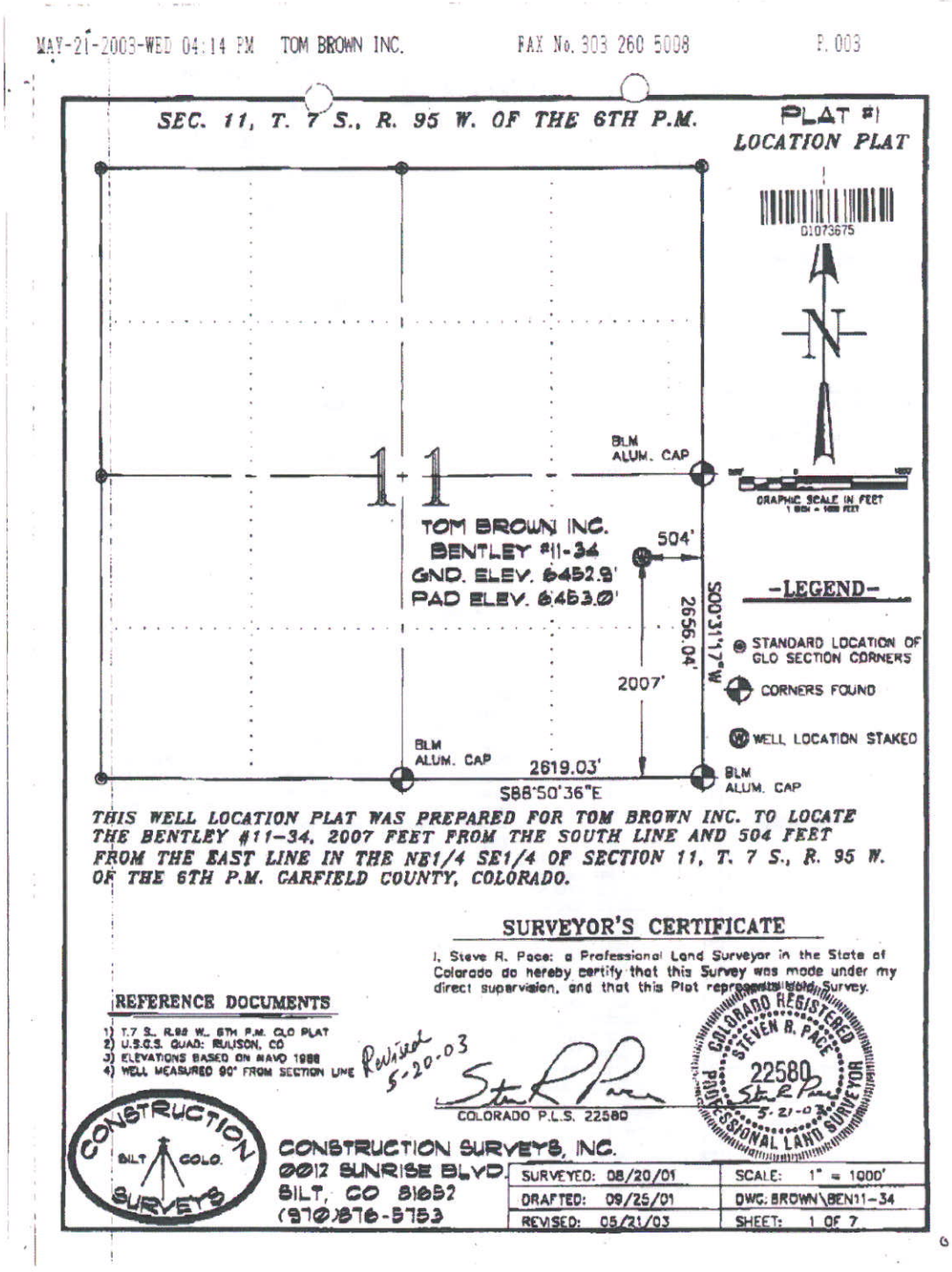

Figure A8. Location plat for Bentley 11-34 (from Colorado Oil & Gas Commission Database).

Table A4. Production data for Bentley 11-34 (from Colorado Oil & Gas Commission Database).

							OIL						Water Prod	Water(psig)	
							BOM	Produced	Sold	Adj.	EOM	Gravity		Tbg.	Csg.
Year	Month	Formation	Sidetrack	Well Status	Days Prod	Product	GAS						Water Disp. Code	Gas (psig)	
							Prod	Flared	Used	Shrinkage	Sold	BTU		Tbg.	Csg.
2003	Jun	WILLIAMS FORK	00	WO		Oil -> Gas ->									
2003	Jul	WILLIAMS FORK	00	PR	3	Oil -> Gas ->	2,346				2,346	1,122	3 P		
2003	Aug	WILLIAMS FORK	00	PR	30	Oil -> Gas ->	29,275				29,275	1,089	44 P		
2003	Sep	WILLIAMS FORK	00	PR	30	Oil -> Gas ->	20,248	54			54 20,248	1,077	1,219 P		
2003	Oct	WILLIAMS FORK	00	PR	29	Oil -> Gas ->	54 17,883	21			75 17,883	1,077	909 P		
2003	Nov	WILLIAMS FORK	00	PR	30	Oil -> Gas ->	75 14,993				75 14,993	1,077	712 P		
2003	Dec	WILLIAMS FORK	00	PR	31	Oil -> Gas ->	75 15,049				75 15,049	1,077	642 P		
2004	Jan	WILLIAMS FORK	00	PR	31	Oil -> Gas ->	75 14,089				75 14,089	1,077	624 M		
2004	Feb	WILLIAMS FORK	00	PR	29	Oil -> Gas ->	75 12,087				75 12,087	1,083	580 M		
2004	Mar	WILLIAMS FORK	00	PR	31	Oil -> Gas ->	75 11,626				75 11,626	1,083	1,133 M		
2004	Apr	WILLIAMS FORK	00	PR	30	Oil -> Gas ->	75 9,923				75 9,923	1,083	313 M		
2004	May	WILLIAMS FORK	00	PR	31	Oil -> Gas ->	75 10,525				75 10,525	1,081	383 M		
2004	Jun	WILLIAMS FORK	00	PR	27	Oil -> Gas ->	75 9,157			-15	60 9,157	1,081	1,225 M		
2004	Jul	WILLIAMS FORK	00	PR	31	Oil -> Gas ->	60 9,664				60 9,664	1,081			

2004	Aug	WILLIAMS FORK	00	PR	31	Oil -> Gas ->	60 9,120				60 9,120	1,081			
2004	Sep	WILLIAMS FORK	00	PR	30	Oil -> Gas ->	60 8,647				60 8,647	1,081			
2004	Oct	WILLIAMS FORK	00	PR	31	Oil -> Gas ->	60 8,618	20			80 8,618	1,081			
2004	Nov	WILLIAMS FORK	00	PR	30	Oil -> Gas ->	80 7,611				80 7,611	1,081			
2004	Dec	WILLIAMS FORK	00	PR	26	Oil -> Gas ->	80 6,095				80 6,095	1,081			
2005	Jan	WILLIAMS FORK	00	PR	23	Oil -> Gas ->	80 7,373				80 7,373	1,081			
2005	Feb	WILLIAMS FORK	00	PR	28	Oil -> Gas ->	80 7,537				80 7,537	1,018			

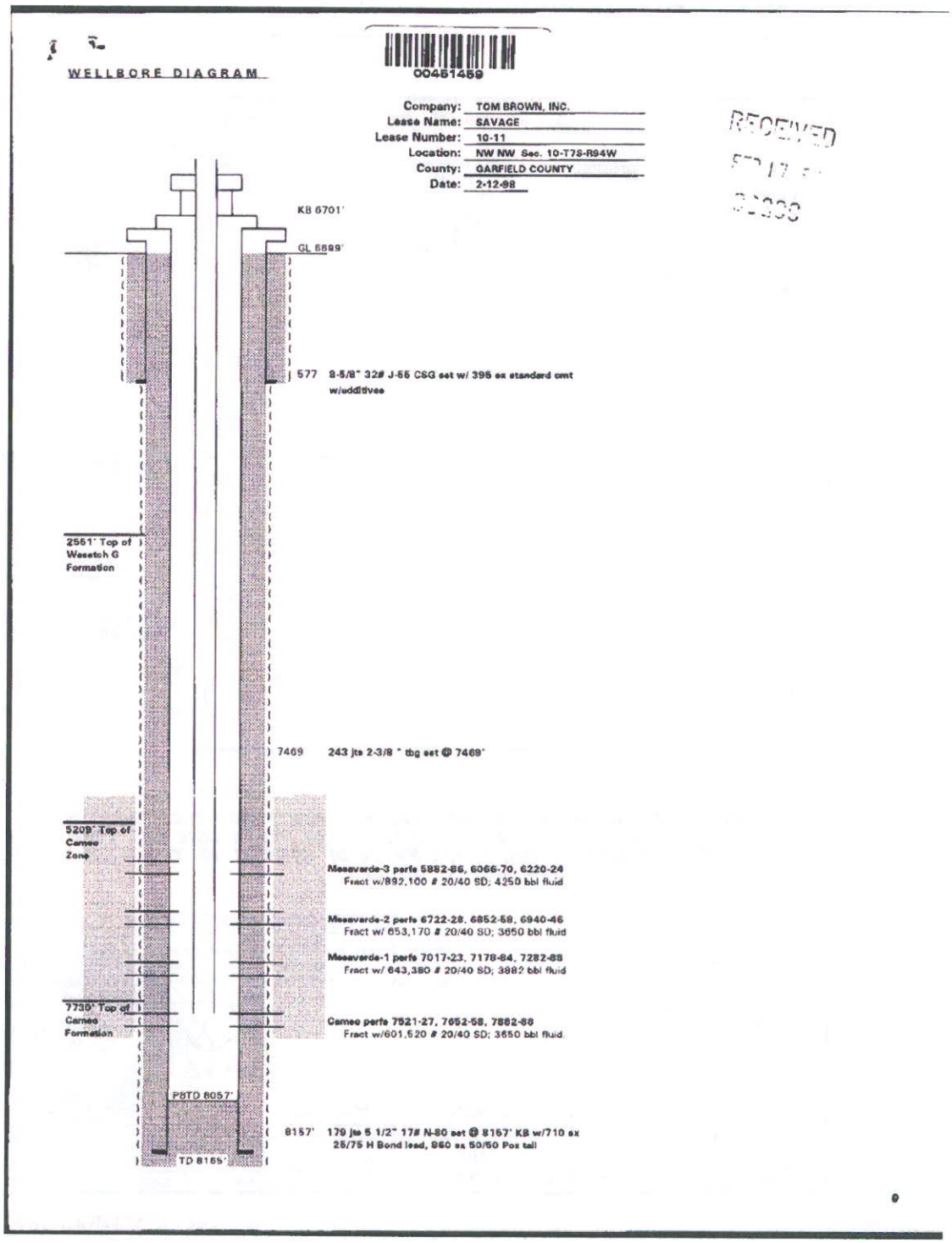

Figure A9. Wellbore Diagram for 10-11 Savage (from Colorado Oil & Gas Commission Database)

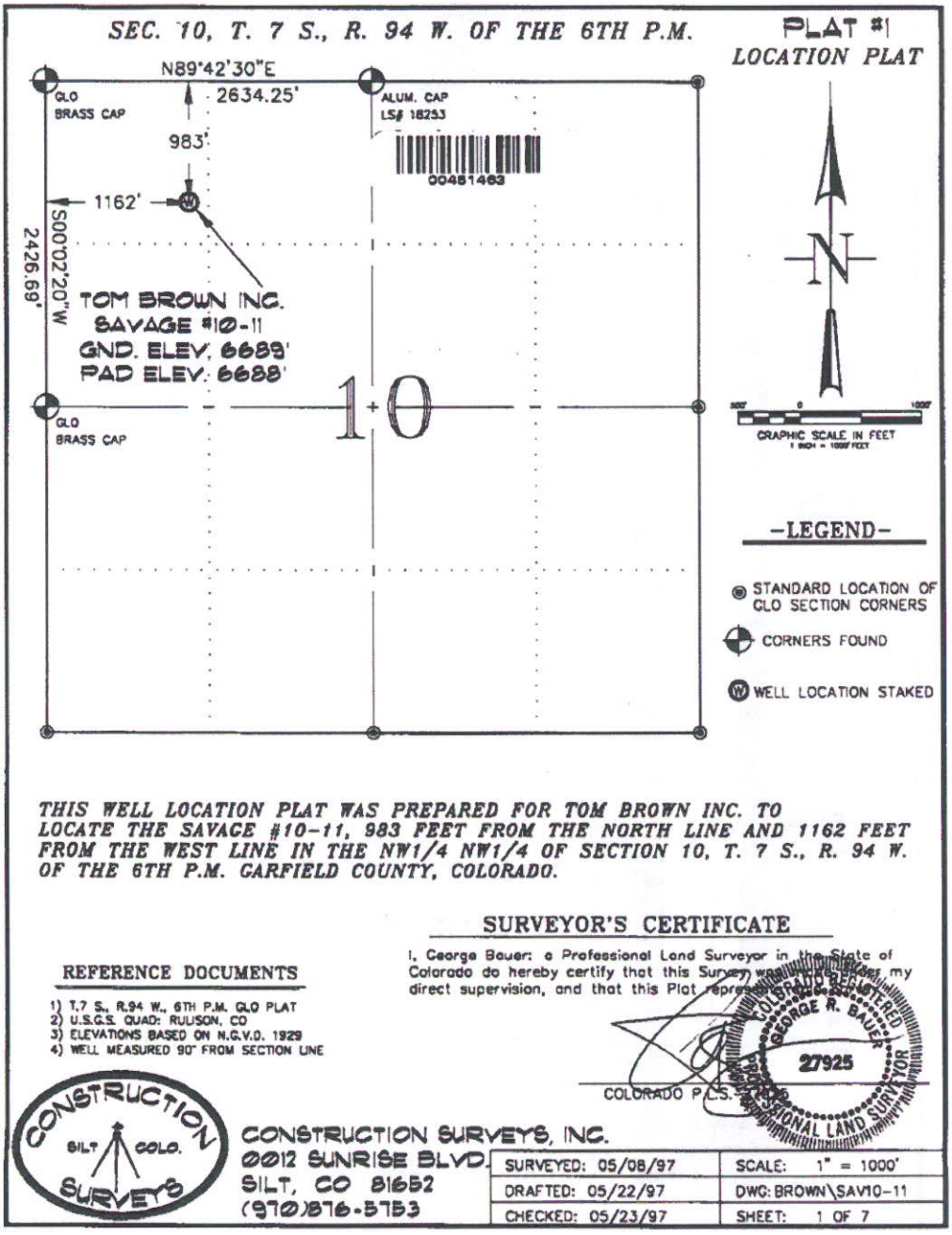

Figure A10. Well 10-11 Savage Location Plat (from Colorado Oil & Gas Commission Database).

Table A5. Production data for Well 10-11 Savage (from Colorado Oil & Gas Commission Database).

							OIL						Water Prod	Water(psig)	
							BOM	Produced	Sold	Adj.	EOM	Gravity		Tbg.	Csg.
Year	Month	Formation	Sidetrack	Well Status	Days Prod	Product	GAS						Water Disp. Code	Gas (psig)	
							Prod	Flared	Used	Shrinkage	Sold	BTU		Tbg.	Csg.
1999	Jan	WILLIAMS FORK - CAMEO	00	PR	31	Oil ->	174	35			209		204		
						Gas ->	7,116		93		7,023	1,112	M		
1999	Feb	WILLIAMS FORK - CAMEO	00	PR	28	Oil ->	209	23			232		235		
						Gas ->	6,360		84		6,276	1,112	M		
1999	Mar	WILLIAMS FORK - CAMEO	00	PR	31	Oil ->	232	25			257		174		
						Gas ->	6,712		93		6,619	1,112	M		
1999	Apr	WILLIAMS FORK - CAMEO	00	PR	30	Oil ->	257	33	190		100	57.2	165		
						Gas ->	6,180		90		6,090	1,112	M		
1999	May	WILLIAMS FORK - CAMEO	00	PR	31	Oil ->	100	30			130		133		
						Gas ->	5,712		93		5,619	1,081	M		
1999	Jun	WILLIAMS FORK - CAMEO	00	PR	30	Oil ->	130	24			154		132		
						Gas ->	5,721		90		5,631	1,081	M		
1999	Jul	WILLIAMS FORK - CAMEO	00	PR	31	Oil ->	154	20			174		151		
						Gas ->	5,646		93		5,553	1,109	M		
1999	Aug	WILLIAMS FORK - CAMEO	00	PR	31	Oil ->	174	26			200		106		
						Gas ->	5,674		93		5,581	1,109	M		
1999	Sep	WILLIAMS FORK - CAMEO	00	PR	30	Oil ->	200	25			225		228		
						Gas ->	5,280		90		5,190	1,109	M		
1999	Oct	WILLIAMS FORK - CAMEO	00	PR	31	Oil ->	225	23	198		50	56.3	124		
						Gas ->	5,210		93		5,117	1,123	M		
1999	Nov	WILLIAMS FORK - CAMEO	00	PR	30	Oil ->	50	24			74		136		
						Gas ->	5,087		90		4,997	1,123	M		
1999	Dec	WILLIAMS FORK - CAMEO	00	PR	31	Oil ->	74	35			109		124		
						Gas ->	5,157		93		5,064	1,123	M		
2000	Jan	WILLIAMS FORK - CAMEO	00	PR	31	Oil ->	109				109		135		
						Gas ->	5,191		93		5,098	1,123	M		
2000	Feb	WILLIAMS FORK - CAMEO	00	PR	29	Oil ->	109	48			157		54		
						Gas ->	4,347		87		4,260	1,123	M		

2000	Mar	WILLIAMS FORK - CAMEO	00	PR	31	Oil -> Gas ->	157 4,994		93		157 4,901	1,123	187 M		
2000	Apr	WILLIAMS FORK - CAMEO	00	PR	30	Oil -> Gas ->	157 4,722	20	90		177 4,632	1,123	209 M		
2000	May	WILLIAMS FORK - CAMEO	00	PR	31	Oil -> Gas ->	177 4,845	13	93		190 4,752	1,123	229 M		
2000	Jun	WILLIAMS FORK - CAMEO	00	PR	30	Oil -> Gas ->	190 4,652	22	90		212 4,562	1,129	157 M		
2000	Jul	WILLIAMS FORK - CAMEO	00	PR	31	Oil -> Gas ->	212 4,730	8	185 93		35 4,637	55.9 1,129	167 M		
2000	Aug	WILLIAMS FORK - CAMEO	00	PR	27	Oil -> Gas ->	35 3,973	22	81		57 3,892	1,129	80 M		
2000	Sep	WILLIAMS FORK - CAMEO	00	PR	30	Oil -> Gas ->	57 3,956	13	90		70 3,866	1,129	70 M		
2000	Oct	WILLIAMS FORK - CAMEO	00	PR	31	Oil -> Gas ->	70 3,865	10	93		80 3,772	1,129	30 M		
2000	Nov	WILLIAMS FORK - CAMEO	00	PR	30	Oil -> Gas ->	80 4,035	24	90		104 3,945	1,129	200 M		
2000	Dec	WILLIAMS FORK - CAMEO	00	PR	28	Oil -> Gas ->	104 3,814	36	84		140 3,730	1,129	85 M		
2001	Jan	WILLIAMS FORK - CAMEO	00	PR	31	Oil -> Gas ->	140 4,145		93		140 4,052	1,129	150 M		
2001	Feb	WILLIAMS FORK - CAMEO	00	PR	28	Oil -> Gas ->	140 3,690	10	84		150 3,606	1,129	150 M		
2001	Mar	WILLIAMS FORK - CAMEO	00	PR	31	Oil -> Gas ->	150 4,081	20	93		170 3,988	1,129	115 M		
2001	Apr	WILLIAMS FORK - CAMEO	00	PR	30	Oil -> Gas ->	170 3,355	24	90		194 3,265	1,129	100 M		
2001	May	WILLIAMS FORK - CAMEO	00	PR	31	Oil -> Gas ->	194 2,209	15	93		209 2,116	1,129	60 M		
2001	Jun	WILLIAMS FORK - CAMEO	00	PR	30	Oil -> Gas ->	209 3,101	16	90		225 3,011	1,129	60 M		
2001	Jul	WILLIAMS FORK - CAMEO	00	PR	31	Oil -> Gas ->	225 3,754	19	189 93		55 3,661	55.1 1,129	70 M		
2001	Aug	WILLIAMS FORK - CAMEO	00	PR	31	Oil -> Gas ->	55 3,657		93	-27	28 3,564	1,129	70 M		

2001	Sep	WILLIAMS FORK - CAMEO	00	PR	28	Oil -> Gas ->	28 3,285	29	84		57 3,201	1,129	30 M		
2001	Oct	WILLIAMS FORK - CAMEO	00	PR	31	Oil -> Gas ->	57 2,587	10	93		67 2,494	1,129	100 M		
2001	Nov	WILLIAMS FORK - CAMEO	00	PR	30	Oil -> Gas ->	67 3,872	30	90		97 3,782	1,129	80 M		
2001	Dec	WILLIAMS FORK - CAMEO	00	PR	31	Oil -> Gas ->	97 3,843	63	93		160 3,750	1,129	140 M		
2002	Jan	WILLIAMS FORK - CAMEO	00	PR	30	Oil -> Gas ->	160 759		90		160 669	1,129	20 M		
2002	Feb	WILLIAMS FORK - CAMEO	00	PR	28	Oil -> Gas ->	160 3,773	24	84		184 3,689	1,129	40 M		
2002	Mar	WILLIAMS FORK - CAMEO	00	PR	31	Oil -> Gas ->	184 3,285	66	93		250 3,192	1,075	46 M		
2002	Apr	WILLIAMS FORK - CAMEO	00	PR	30	Oil -> Gas ->	250 2,829		90	-96	154 2,739	1,074	40 M		
2002	May	WILLIAMS FORK - CAMEO	00	PR	17	Oil -> Gas ->	154 2,265	35	51		189 2,214	1,075	40 M		
2002	Jun	WILLIAMS FORK - CAMEO	00	PR	26	Oil -> Gas ->	189 2,349	11	78		200 2,271	1,075	60 M		
2002	Jul	WILLIAMS FORK - CAMEO	00	PR	31	Oil -> Gas ->	200 3,058	10	93		210 2,965	1,075	55 M		
2002	Aug	WILLIAMS FORK - CAMEO	00	PR	31	Oil -> Gas ->	210 2,996		93		210 2,903	1,075	60 M		
2002	Sep	WILLIAMS FORK - CAMEO	00	PR	30	Oil -> Gas ->	210 2,876	20	90		230 2,786	1,110	70 M		
2002	Oct	WILLIAMS FORK - CAMEO	00	PR	28	Oil -> Gas ->	230 2,788	51	84		281 2,704	1,110	30 M		
2002	Nov	WILLIAMS FORK - CAMEO	00	PR	27	Oil -> Gas ->	281 3,008		81	-104	177 2,927	1,110	140 M		
2002	Dec	WILLIAMS FORK - CAMEO	00	PR	31	Oil -> Gas ->	177 2,407	23	93		200 2,314	1,109	110 M		
2003	Jan	WILLIAMS FORK - CAMEO	00	PR	31	Oil -> Gas ->	200 2,340	10	93		210 2,247	1,109	100 M		
2003	Feb	WILLIAMS FORK - CAMEO	00	PR	28	Oil -> Gas ->	210 1,645	30	84		240 1,561	1,109			

2003	Mar	WILLIAMS FORK - CAMEO	00	PR	10	Oil -> Gas ->	240 311	20	30		260 281	1,109			
2003	Apr	WILLIAMS FORK - CAMEO	00	PR	23	Oil -> Gas ->	260 4,272	16	69		276 4,203	1,120			
2003	May	WILLIAMS FORK - CAMEO	00	PR	31	Oil -> Gas ->	276 3,247	20	186 93		110 3,154	55.6 1,120			
2003	Jun	WILLIAMS FORK - CAMEO	00	PR	30	Oil -> Gas ->	110 2,102	10	90		120 2,012	1,120			
2003	Jul	WILLIAMS FORK - CAMEO	00	PR	31	Oil -> Gas ->	120 2,459	10	93		130 2,366	1,120			
2003	Aug	WILLIAMS FORK - CAMEO	00	PR	31	Oil -> Gas ->	130 2,628	10	93		140 2,535	1,120			
2003	Sep	WILLIAMS FORK - CAMEO	00	PR	30	Oil -> Gas ->	140 2,851	20	90		160 2,761	1,120			
2003	Oct	WILLIAMS FORK - CAMEO	00	PR	30	Oil -> Gas ->	160 3,150		90		160 3,060	1,119			
2003	Nov	WILLIAMS FORK - CAMEO	00	PR	28	Oil -> Gas ->	160 2,784		84		160 2,700	1,119			
2003	Dec	WILLIAMS FORK - CAMEO	00	PR	31	Oil -> Gas ->	160 3,482	22	142 93		40 3,389	53.1 1,119			
2004	Jan	WILLIAMS FORK - CAMEO	00	PR	31	Oil -> Gas ->	40 3,011		93		40 2,918	1,119			
2004	Feb	WILLIAMS FORK - CAMEO	00	PR	28	Oil -> Gas ->	40 2,326		84	-8	32 2,242	1,119	36 M		
2004	Mar	WILLIAMS FORK - CAMEO	00	PR	30	Oil -> Gas ->	32 2,929		90		32 2,839	1,119	96 M		
2004	Apr	WILLIAMS FORK - CAMEO	00	PR	30	Oil -> Gas ->	32 2,525	13	90		45 2,435	1,119	120 M		
2004	May	WILLIAMS FORK - CAMEO	00	PR	9	Oil -> Gas ->	45 982		27		45 955	1,125	36 M		
2004	Jun	WILLIAMS FORK - CAMEO	00	SI		Oil -> Gas ->	45				45				
2004	Jul	WILLIAMS FORK - CAMEO	00	SI		Oil -> Gas ->	45				45				
2004	Aug	WILLIAMS FORK - CAMEO	00	SI		Oil -> Gas ->	45				45				

2004	Sep	WILLIAMS FORK - CAMEO	00	SI		Oil -> Gas ->	45				45				
2004	Oct	WILLIAMS FORK - CAMEO	00	PR	19	Oil -> Gas ->	45 3,488				45 3,488	 1,125	78 M		
2004	Nov	WILLIAMS FORK - CAMEO	00	PR	30	Oil -> Gas ->	45 6,213	362	182		225 6,213	54.0 1,105	180 M		
2004	Dec	WILLIAMS FORK - CAMEO	00	PR	31	Oil -> Gas ->	225 1,759	105	285		45 1,759	54.1 1,105	186 M		
2005	Jan	WILLIAMS FORK - CAMEO	00	PR	31	Oil -> Gas ->	45 4,786				45 4,786	 1,105	186 M		
2005	Feb	WILLIAMS FORK - CAMEO	00	PR	28	Oil -> Gas ->	45 3,438				45 3,438	 1,105	168 M		

DISTRIBUTION

Public Reading Facility
c/o Nuclear Testing Archive
Nevada Site Office
National Nuclear Security Administration
U.S. Department of Energy
P.O. Box 98521
Las Vegas, NV 89193-8521

Technical Library
Nevada Site Office
National Nuclear Security Administration
U.S. Department of Energy
P.O. Box 98518
Las Vegas, NV 89193-8518

Office of Scientific and Technical Information
U.S. Department of Energy
P.O. Box 62
Oak Ridge, TN 37831-9939
(electronic copy)