

**MINERAL RESOURCE EVALUATION OF THE PROPOSED
BIG SANDY RESERVOIR SITE**

by

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**Prepared for the
Sabine River Authority**

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Contents

	Page
Introduction	1
Geology	1
Oil and gas	4
Introduction	4
Pine Mills Field	21
Pine Mills East Field	35
Deupree and Deupree North Fields	35
Hawkins Field	41
Hawkins Northeast Field	41
Hydrocarbon potential	47
Lease Values	47
Pipelines	49
Estimates for slant and raised drilling.	49
Sand and gravel	49
Lignite	51
Summary	51
Acknowledgments	53
References	54

Figures

1. Geologic map of the proposed Big Sandy reservoir site	2
2. Generalized stratigraphic column and mineral resources for the proposed Big Sandy reservoir site	3
3. Schematic cross sections showing evolution of salt structures	5
4. Location and cross sections of Hawkins salt-pillow anticline, Earl-Lee turtle-structure anticline, and Hainesville salt diapir	7

5.	Location map of all wells within the study area	8
6.	Typical geophysical log for the Pine Mills Field area . . . . .	.22
7.	Cross section A-B through Pine Mills East and Pine Mills Fields . . . . .	.23
8.	Structure map on the base of the 2nd Sub-Clarksville sand at the Pine Mills, Pine Mills East, and Pine Mills West Fields . . . . .	.24
9.	Production decline for the Pine Mills Field, 2nd Sub-Clarksville reservoir . . . . .	.25
10.	Production decline for the Pine Mills Field, Orr reservoir . . . . .	.29
11.	Structure map on the top of the Woodbine Group and Pine Mills and Pine Mills East Fields . . . . .	.30
12.	Production decline for the Pine Mills Field, Woodbine reservoir . . . . .	.31
13.	Production decline for the Pine Mills Field, Woodbine Wagoner reservoir. . . . .	.32
14.	Structure map on the top of the Paluxy Formation at the Pine Mills Field . . . . .	.33
15.	Production decline for the Pine Mills Field, Paluxy reservoir . . . . .	.34
16.	Production decline for the Pine Mills East Field, 2nd Sub-Clarksville reservoir . . . . .	.36
17.	Structure map on the top of the Woodbine producing zone at the Deupree North and Deupree Fields . . . . .	.37
18.	Cross section B-C through Pine Mills and Deupree North Fields . . . . .	.38
19.	Production decline for the Deupree Field, Woodbine reservoir . . . . .	.39
20.	Production decline for the Deupree North Field, Woodbine reservoir . . . . .	.40
21.	Typical geophysical log for the Hawkins and Hawkins Northeast Fields . . . . .	.42
22.	Structure map on the top of the Woodbine Group at Hawkins and Hawkins Northeast Fields . . . . .	.43
23.	Production decline for the Hawkins Field, Woodbine reservoir . . . . .	.44
24.	Production decline for the Hawkins Field, Rodessa reservoir . . . . .	.45
25.	Production decline for the Hawkins Field, Woodbine reservoir . . . . .	.46
26.	Production decline for the Hawkins Northeast Field, Sub-Clarksville reservoir . . . . .	.48

Tables

1. Well statistics for all wells in the proposed Big Sandy reservoir site 12
2. Example of procedure for estimating remaining oil
that is available to secondary and tertiary recovery in a given reservoir 26
3. Operating companies and pipe sizes of pipelines that cross
the proposed Big Sandy reservoir site 50

Plate

1. Locations of wells in the proposed Big Sandy reservoir site. in pocket

INTRODUCTION

This report documents the mineral resources in the proposed Big Sandy reservoir area (fig. 1), referred to in this report as the contract area. The proposed reservoir is located on the Big Sandy Creek floodplain extending northward from 3 mi north of Big Sandy, in Upshur County, to about 2 mi south of East Point in Wood County. The boundary of the study area is the 360-ft ground level contour (fig. 1, plate 1). The contract boundary is the 340-ft ground level contour. In addition, the area up to the 360-ft ground level contour was evaluated at the request of the Sabine River Authority.

The evaluated resources include oil and gas, sand and gravel, and lignite. No other mineral resources are known to occur in the contract area in amounts significantly greater than the background levels present in all rocks.

GEOLOGY

Cenozoic strata of Eocene and Quaternary age crop out in the reservoir site. Units include the Eocene Queen City, Weches, and Sparta Formations of the Claiborne Group (figs. 1 and 2), as well as Quaternary fluvial terraces and alluvium. The Queen City and Sparta Formations are composed of fluvial-deltaic and shore-zone clays, silts, and sands. Weches strata are of marine origin and are characterized by shelf and prodelta muds and sands. The Quaternary fluvial terraces and alluvium are also composed of sand and mud.

Subsurface units of proven economic importance within the contract area are the Rodessa Member of the Lower Glen Rose Formation, the Paluxy Formation, the Woodbine Group, and the Sub-Clarksville Member of the Eagle Ford Group (fig. 2). Hydrocarbons are produced from these units. The Rodessa Member consists of interbedded shale, anhydrite, limestone, and sandstone (Wood and Guevara, 1981). The Paluxy Formation is composed of sandstone interbedded with shale and mudstone. In Wood and Upshur Counties, these sediments represent coastal-barrier facies of a deltaic system (Caughey, 1977). Woodbine

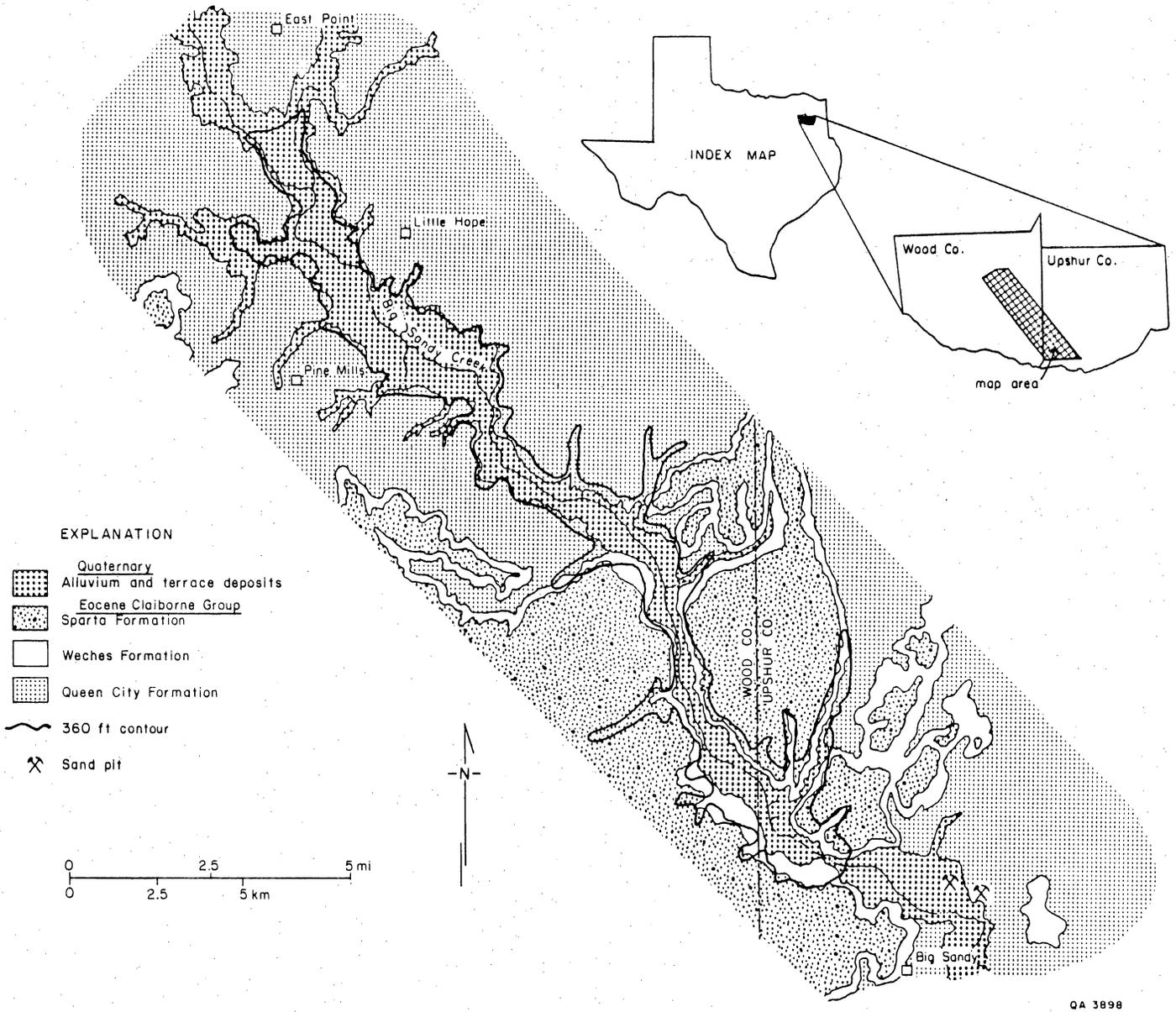


Figure 1. Geologic map of the proposed Big Sandy reservoir site, Wood and Upshur Counties (from Barnes, 1975).

Eratthem		Cenozoic			Mineral Resource (potential - P or known - K)					
		Quaternary	Tertiary							
System	Series	Pleistocene	Eocene		Group					
		Recent	Alluvium and Fluvialite Terrace deposits			sand and gravel - P				
			Claiborne		sand and gravel - P					
			Wilcox		lignite - P					
			Paleocene		Midway					
Mesozoic		Cretaceous				Navarro				
						Taylor				
						Austin				
						Sub - Clarksville	oil - K			
						Eagle Ford				
						Woodbine	oil / gas - K			
		Jurassic		Lower Cretaceous				Washita		
								Fredericksburg		
								Paluxy Fm	oil - K	
				Upper		Trinity				gas - K oil - P
										Rodessa Mbr
						Mid.		Cotton Valley				oil / gas - P
Lower		Louvain										oil / gas - P
						Upper		Louvain				oil / gas - P
Mid.		Louvain								
						Lower		Louvain		

GA-3879

Figure 2. Generalized stratigraphic column and mineral resources for the proposed Big Sandy reservoir site, Wood and Upshur Counties.

Group sandstones and interbedded shales are distinguished by two members. The lower Dexter Member is of fluvial origin, and the upper Lewisville Member is of shelf-strandplain origin (Oliver, 1971). The Sub-Clarksville Member contains sandstones in the upper part of the predominantly shaly Eagle Ford Group (Wood and Guevara, 1981). Subsurface strata within the contract area that have potential economic importance are Louark Group limestones and Cotton Valley Group sandstones (fig. 2). Hydrocarbons are produced from these units in this northern part of the East Texas Basin. Wilcox Group lignites that are interbedded with sandstones, siltstones, and claystones also have potential economic importance (fig. 2).

OIL AND GAS

Introduction

Hydrocarbon accumulation in the East Texas Salt Dome Province has been controlled by structures formed by mobilization of the Jurassic Louann Salt during the evolution of the East Texas Basin. The structural history of the East Texas Basin was discussed in detail by Seni and Jackson (1984). The Jurassic Louann Salt was deposited on Triassic rift fill and Paleozoic basement. Salt began to move during the early period of basin formation (Jurassic to early Cretaceous); as salt mobilization continued, a variety of structures formed.

A three-stage model of dome growth (fig. 3) developed by Trusheim (1960) for the Zechstein Salt Basin of North Germany is also appropriate for salt dome growth in the East Texas Basin (Seni and Jackson, 1984). The first stage is represented by the development of nonpiercing salt-pillow anticlines (figs. 3B and 3C). Synclines also form in adjacent areas of salt withdrawal and are filled with thick accumulations of sediments. During the subsequent diapir stage, deflation of the salt-pillow anticline occurs as salt flows into the central growing diapir (fig. 3D). As collapse of the pillow flanks progresses, the thickened

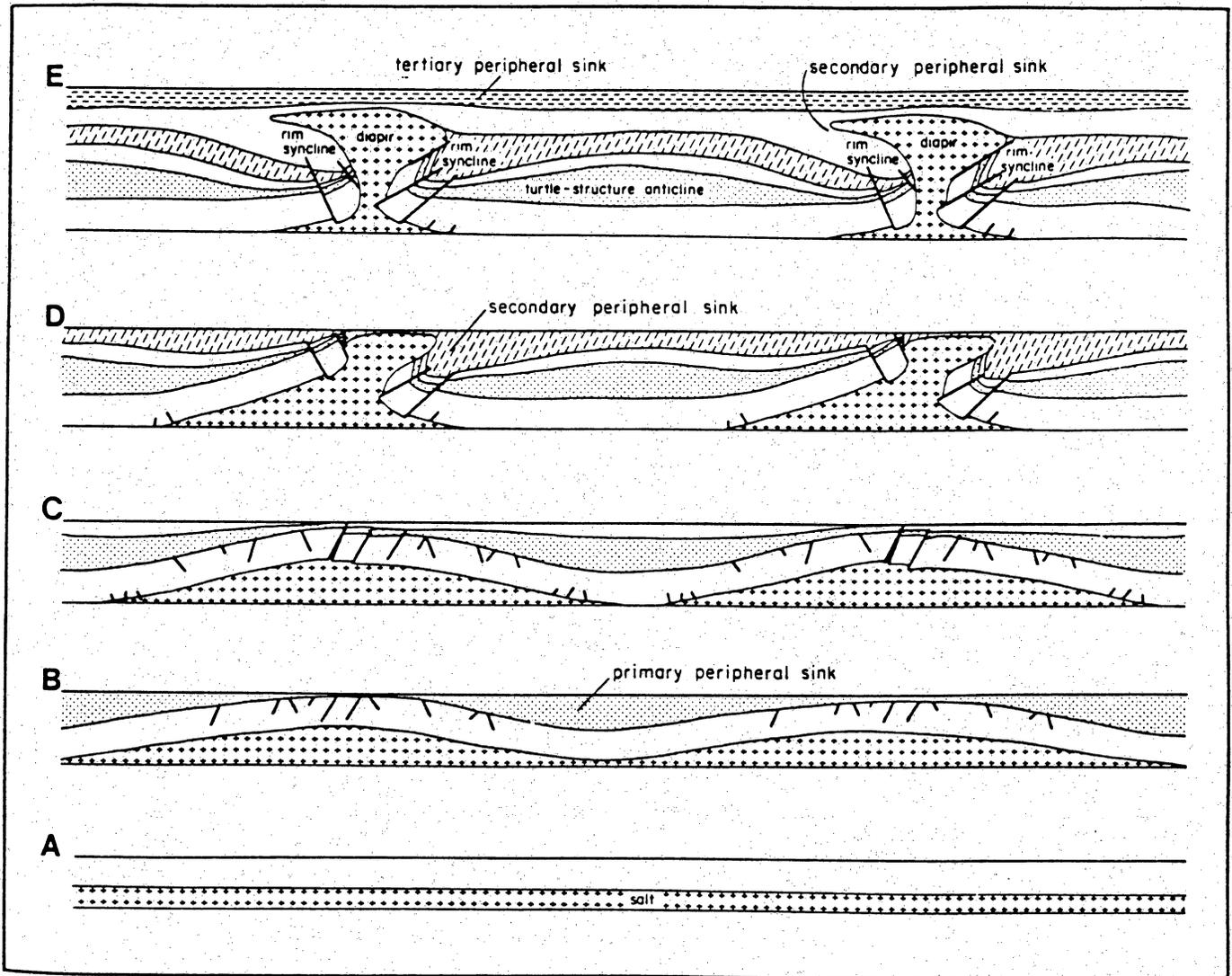
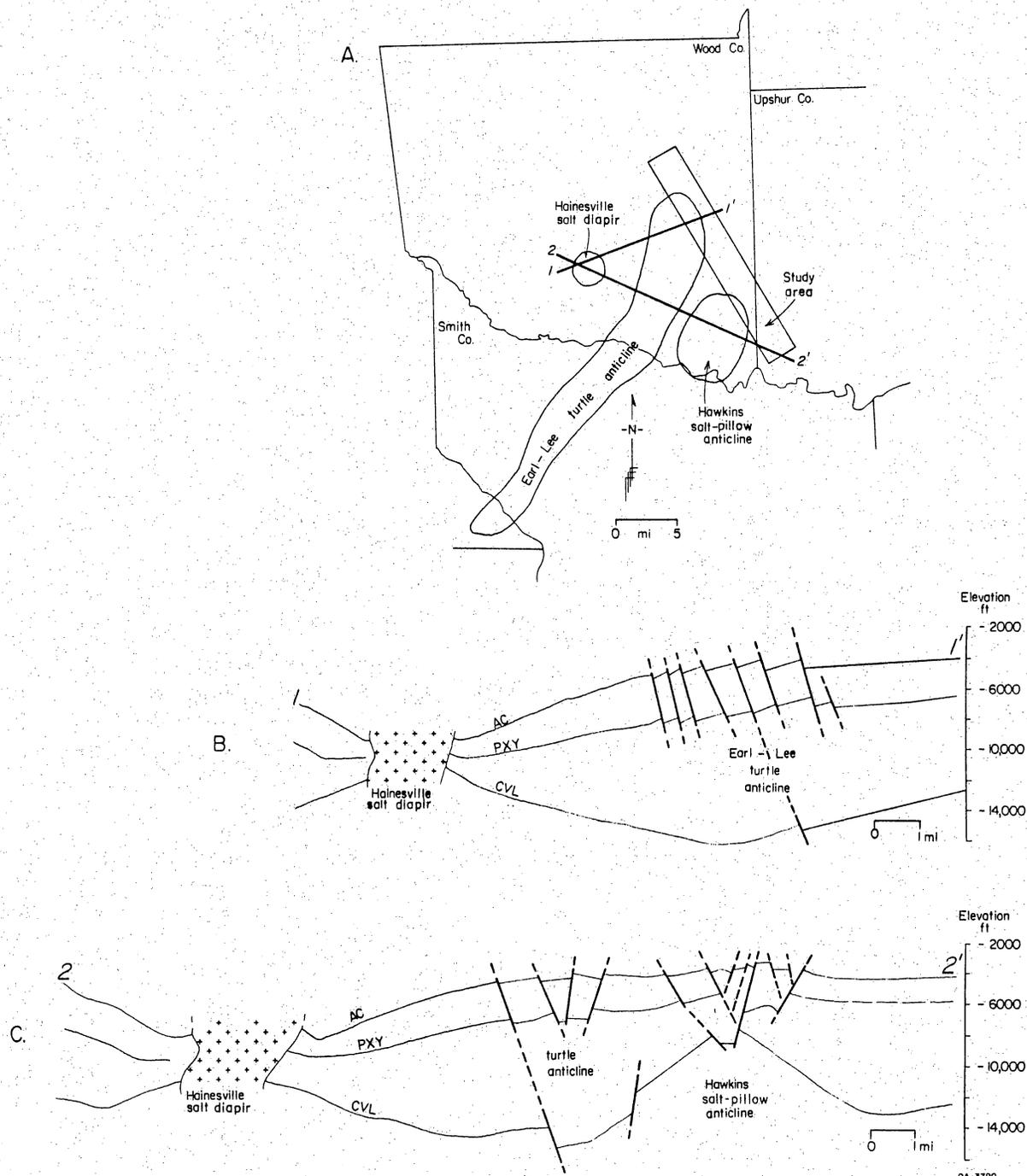


Figure 3. Schematic evolution of salt structures from original salt layer (A), through pillow stage (B and C), diapir stage (D), and postdiapir stage (E) (from Seni and Jackson, 1984; modified from Trusheim, 1960).

strata within the interdome synclines undergo a structural inversion to form anticlines. Trusheim (1960) named these structures "turtle-structure anticlines." During the third stage, following rapid diapir growth (fig. 3E), domes stay near the sediment surface despite continued regional subsidence and deposition (Seni and Jackson, 1984).

The hydrocarbon production from salt-pillow anticlines, turtle-structure anticlines, and diapirs in the East Texas Basin was described by Wood and Giles (1982). Deep-seated, salt-pillow anticlines have accounted for almost 76 percent of the oil and 78 percent of the gas produced from the central East Texas Basin (Wood and Giles, 1982). Hydrocarbons are trapped by structural closure and associated crestal faults in the salt-pillow anticlines. Production from turtle-structure anticlines comprises about 22 percent of the oil and more than 7 percent of the gas in the central East Texas Basin (Wood and Giles, 1982). In turtle-structure anticlines, hydrocarbons are commonly trapped in arching strata with associated normal faults; however, stratigraphic and lithologic variations in porosity and permeability also serve to trap hydrocarbons in these structures. Salt diapir structures account for less than 1 percent of the oil and about 5 percent of the gas production in the central basin areas (Wood and Giles, 1982).

The contract area in Wood County overlies the northeastern flank of the Hawkins salt-pillow anticline and the northern part of the Earl-Lee turtle-structure anticline (fig. 4). Several oil and gas fields are associated with these structures. Within the contract area overlying the Earl-Lee turtle-structure anticline are the Pine Mills, Pine Mills East, Deupree, and Deupree North Fields. The Hawkins and Hawkins Northeast Fields, associated with the Hawkins salt-pillow anticline, are also in the study area. In addition, many dry holes have been drilled within the contract area boundary. Figure 5 and plate 1 show the location of all wells within the potential reservoir site; producing wells are indicated. Sixty-eight wells have been drilled within the 360-ft ground elevation boundary, and only one well is producing within the 340-ft ground elevation boundary. Legal location, total depth, and producing zones of these wells are listed in table 1. All



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Figure 4. A. Location of study area, Hawkins salt-pillow anticline, Earl-Lee turtle-structure anticline, and Hainesville salt diapir. B. Cross section through northern part of Earl-Lee turtle-structure anticline, showing the Earl-Lee structure to be a westward-dipping monocline at this northern part of the structure. The structure has an asymmetric, anticlinal form in the area south of the cross sections. C. Cross section through the Hawkins salt-pillow anticline. AC-Austin Chalk; PXY-Paluxy Formation; CVL-Cotton Valley Limestone.

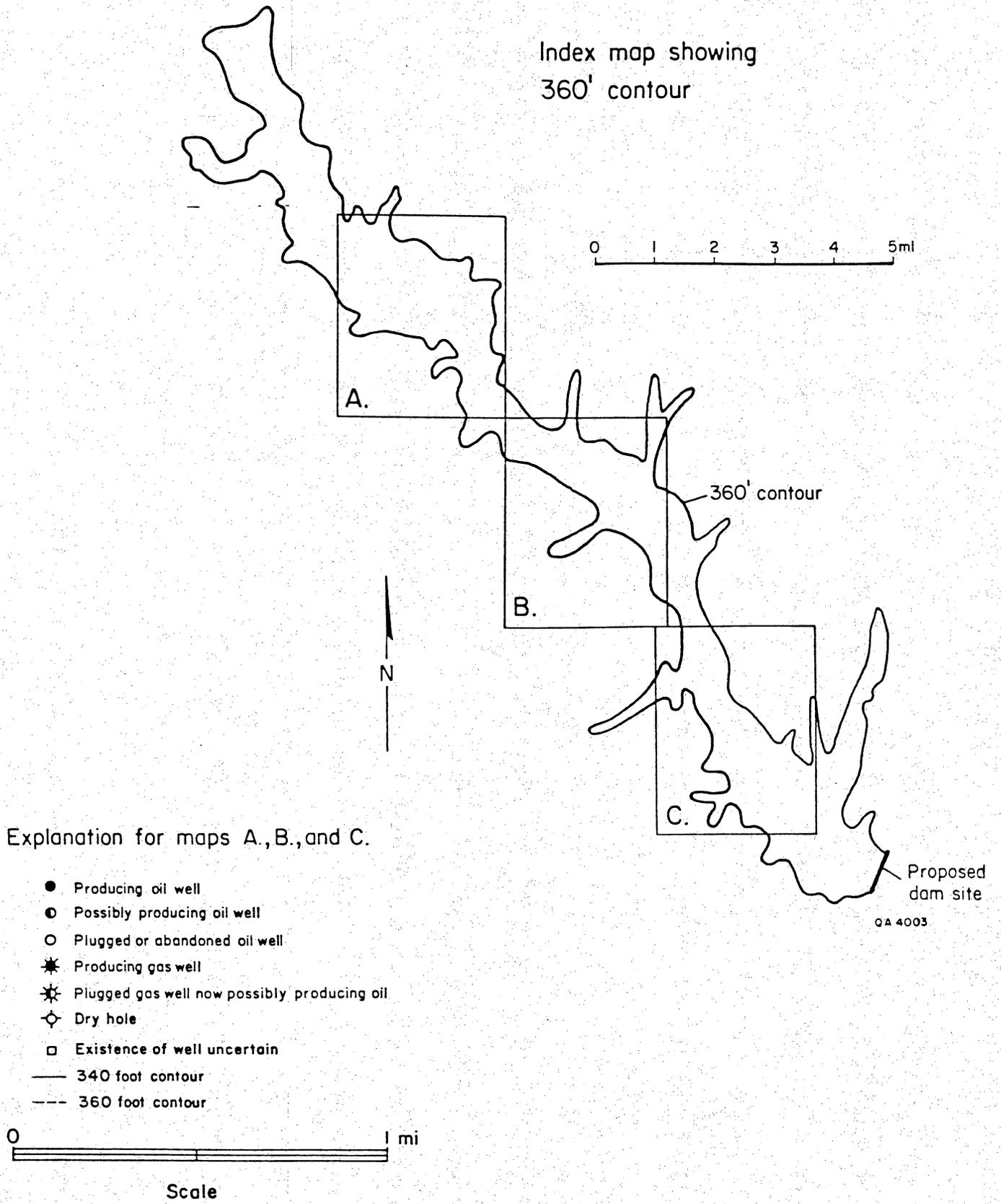


Figure 5. Location map of all wells within the study area.

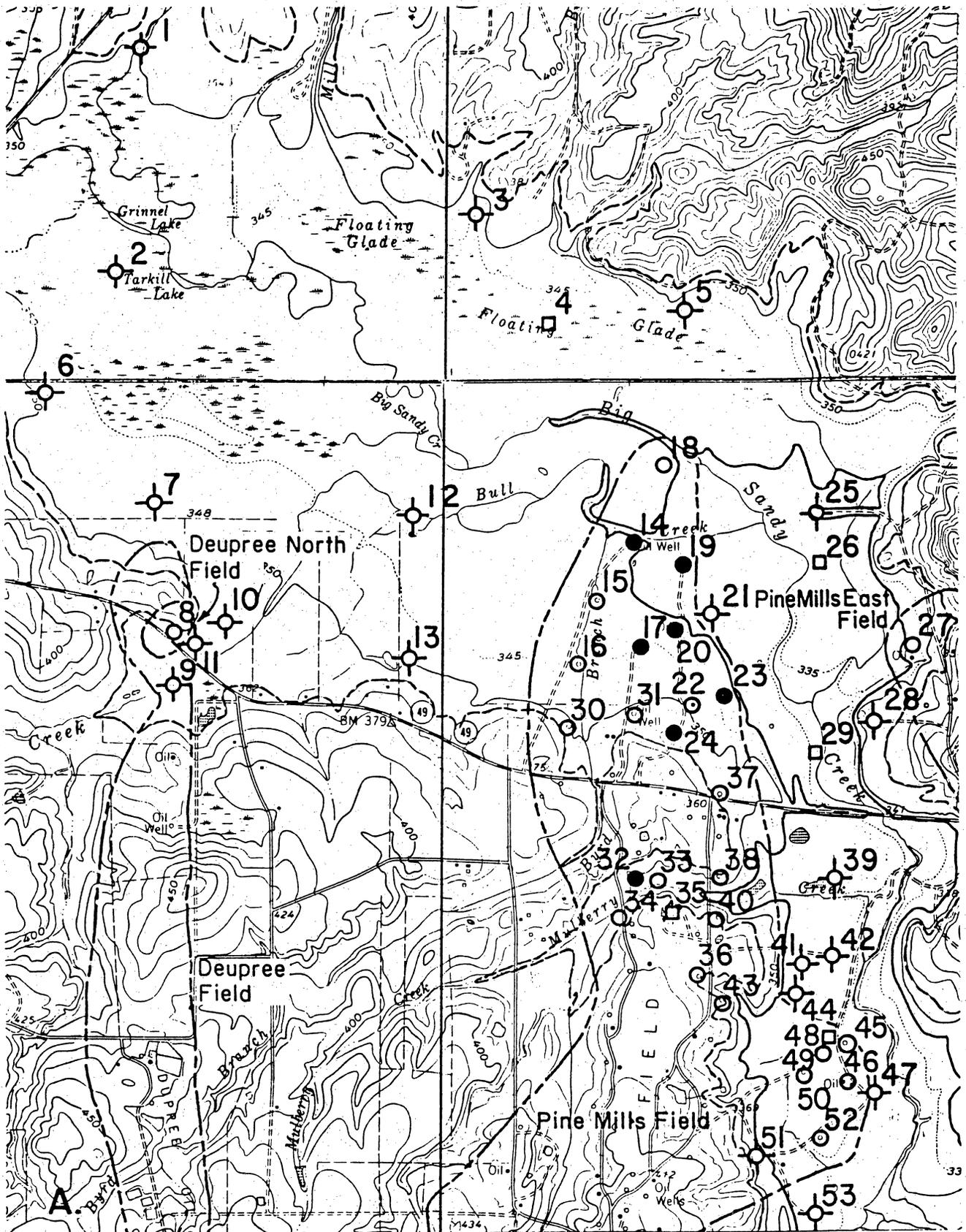


Figure 5 (continued)

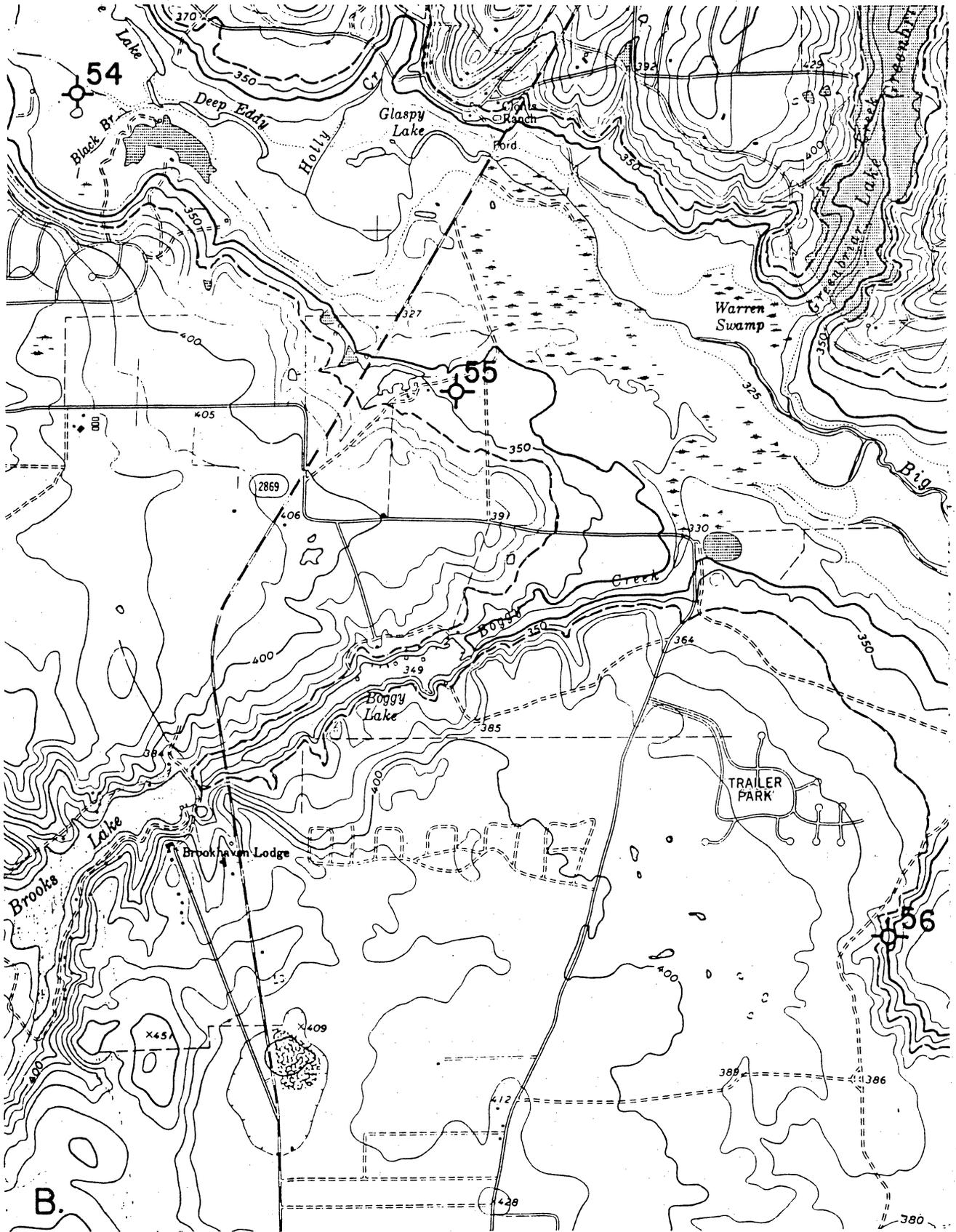


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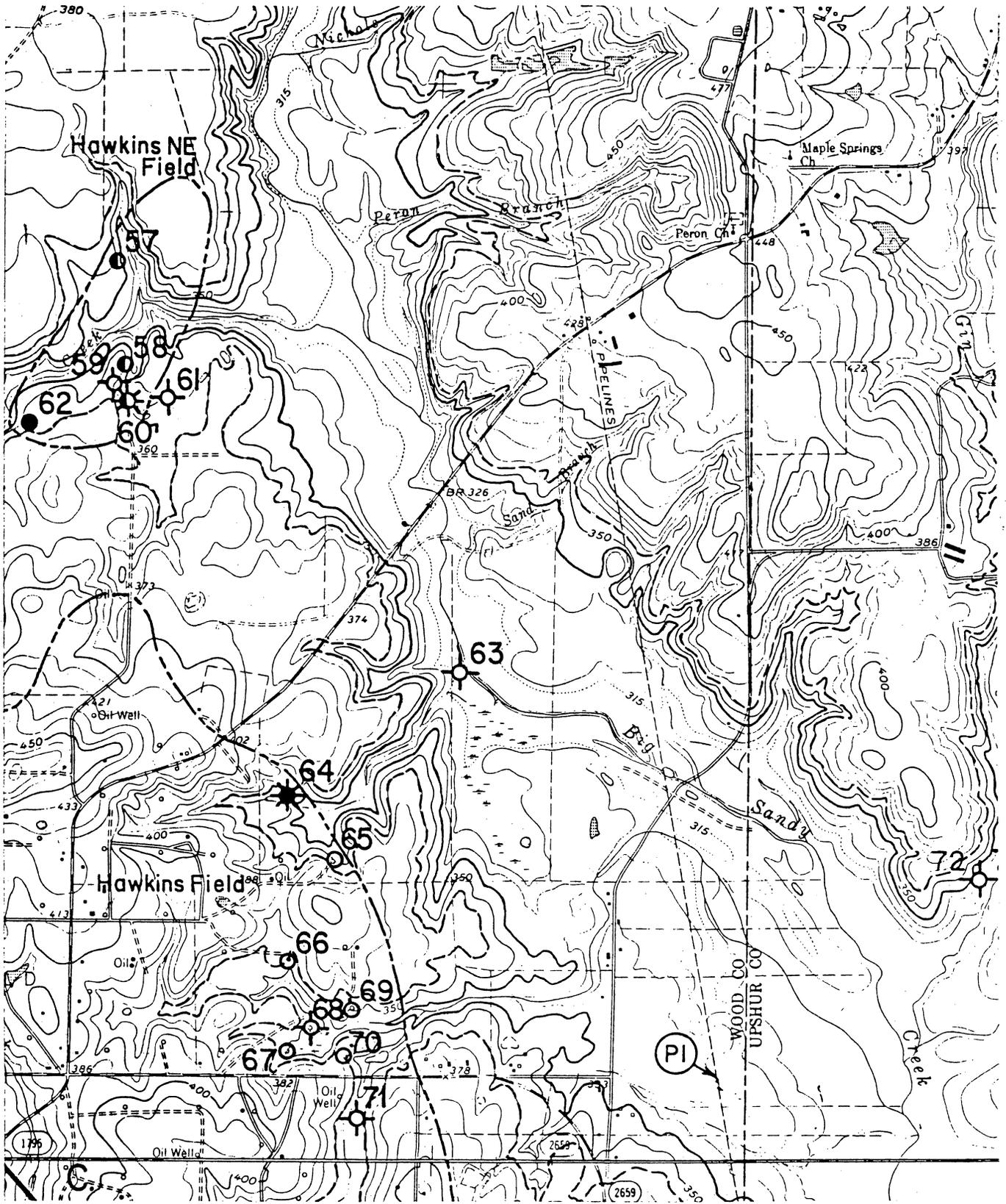


Figure 5 (continued)

Table 1. Well statistics for wells in 340-ft and 360-ft proposed reservoir areas. Dates shown are dates of completion except where indicated. Ground elevations estimated from U.S. Geological Survey topographic maps. Past operators listed in parentheses, most recent first. Map number refers to figure 5 and plate 1; + indicates wells on or below 340-ft contour; - indicates wells between 340-ft and 350-ft contours.

Map no.	Present (and past) operators	Well no.	Lease/Date	Type	Status *	Ground elevation (ft)		Legal description	Prod. zones	T.D. (ft)	Misc.
						Field/Co.	Location Survey				
1-	Robbins Petroleum Corp. & Ralph E. Fair	1	Sallie Lucy Old & L. W. Murphy 10-12-64	Dry	Plugged 10-12-64	343	Wildcat Wood Co.	Mathew Dial A-676	--	6,542	--
2-	Robbins Petroleum Corp. & Ralph E. Fair	2	Sallie Lucy Old & L. W. Murphy 11-27-64	Dry	Plugged 11-27-64	345	Wildcat Wood Co.	Mathew Dial A-676	--	6,440	--
3-	R. J. Caraway, Allen Guiberson & Danciger Oil Refining	1	Sallie Lucy Old 5-24-50	Dry	Plugged 5-24-50	346	Wildcat Wood Co.	M. B. Burnett A-87	--	8,086	--
4-	Humble	1	Sallie Lucy Old --	--	--	343	Wildcat Wood Co.	M. B. Burnett A-87	--	--	Legal description approximate; existence uncertain
5-	R. J. Caraway et al.	1	Sallie Lucy Old 10-3-51	Dry	Aband.	345	Wildcat Wood Co.	W. S. Armstrong A-16	--	6,135	--
6-	Sabine Exploration	1	A. L. Dobbs 10-11-80	Dry	Plugged 10-13-80	349	Wildcat Wood Co.	A. J. Odom A-448	--	5,940	--
7-	Ralph E. Fair	1	Clint Collins et al. 3-17-65	Dry	Plugged 3-17-65	347	Deupree, N. Wood Co.	A. J. Odom A-448	--	6,350	--
8	Ralph E. Fair	1	W. A. Byers 10-9-64	Oil	Plugged 8-30-67	360	Deupree, N. Wood Co.	S. H. Davis A-164	Woodbine	6,333	Discovery well
9	Robbins Petroleum Corp.	2	E. A. Byers 11-6-64	Dry	Plugged 11-6-64	338	Deupree Wood Co.	B. G. Ramsay A-492	--	5,900	--

Table 1. (cont.)

Map no.	Present (and past) operators	Well no.	Lease/Date	Type	Status*	Ground elevation (ft)		Field/Co.	Location	Survey	Legal description	Prod. zones	T.D. (ft)	Misc.
						Type	Status*							
10	The Long Trusts	1	W. I. English 8-21-82	Dry	Plugged 8-22-82	358		Deupree Wood Co.	J. B. West A-703	162' FWL and 700' F most northerly SL of survey	--	5,912	Deepened to 6,205	
11	F. R. Jackson	1	W. I. English 10-30-51	Dry	Plugged 11-26-51	355		Deupree Wood Co.	J. B. West A-703	150' F most westerly WL and 150' F most northerly SL of survey	--	6,317	--	
12-	Robbins Petroleum Corp.	A-1	Sallie Lucy Old 10-27-83	Dry	Plugged 10-27-83	343		Wildcat Wood Co.	W. S. Armstrong A-16	190' FSL and 1,940' FEL of lease	--	5,625	--	
13	Robbins Petroleum Corp.	1	Kepley 8-17-83	Dry	Plugged 11-10-83	350		Pine Mills, W. Wood Co.	Thomas Hunt A-314	467' FSL of survey, 467' FEL of lease	--	4,810	--	
14-	Robbins Petroleum Corp. (Superior Oil Co.)	7	J. M. Byrd et al. 7-7-51	Oil	Prod.	<1' above 340		Pine Mills Wood Co.	Thos. Hunt A-314	330' FEL and 355' FNL of survey	Sub- Clarksville	5,700	--1	
15-	Robbins Petroleum Corp. (Superior Oil Co.)	8	J. M. Byrd et al. 8-8-51	Oil	Aband.	342		Pine Mills Wood Co.	Thos. Hunt A-314	840.9' FEL and 1,142' FNL of survey	Sub- Clarksville	4,925	--1	
16-	Robbins Petroleum Corp. (Superior Oil Co.)	9	J. M. Byrd et al. 8-12-51	Oil	Aband.	345		Pine Mills Wood Co.	Thos. Hunt A-314	2,090.4' FNL and 1,127.2' FEL of survey	Sub- Clarksville	4,775	--1	
17-	Robbins Petroleum Corp. (Superior Oil Co.)	5	J. M. Byrd et al. 5-28-51	Oil	Prod.	345		Pine Mills Wood Co.	Thos. Hunt A-314	230' FEL of survey and 933' from Superior #2 Byrd	Sub- Clarksville, Orr	5,650	Dual completion ¹	
18-	Robbins Petroleum Corp. (F. R. Jackson et al.)	6	Sallie Lucy Old 10-14-65	Oil	Aband.	<1' above 340		Pine Mills Wood Co.	W. S. Armstrong A-16	700' F most easterly SL of survey and 1,280' NNW from Robbins #4 Old	Sub- Clarksville	4,854	--3	
+19	Robbins Petroleum Corp. (F. R. Jackson)	4	Sallie Lucy Old 8-30-51	Oil	Prod.	338		Pine Mills Wood Co.	W. S. Armstrong A-16	330' FWL of survey and 933' NF Robbins #4 Old	Sub- Clarksville	5,525	--3	

Table 1. (cont.)

Map no.	Present (and past) operators	Well no.	Lease/Date	Type	Status*	Ground elevation (ft)	Location		Legal description	Prod. zones	T.D. (ft)	Misc.
							Field/Co.	Survey				
20-	Robbins Petroleum Corp. (F. R. Jackson)	3	Sallie Lucy Old 6-18-51	Oil	Prod.	342	Pine Mills Wood Co.	W. S. Armstrong A-16	330' FWL and 1,823' F most northerly SL of survey	Orr, Woodbine	5,520	Recompleted 1-12-82 to Woodbine 2
+21	Robbins Petroleum Corp.	7	Sallie Lucy Old 10-9-83	Dry	Plugged 10-9-83	338	Pine Mills Wood Co.	W. S. Armstrong A-16	3,550' FWL and 1,225' FEL of lease	--	5,574	--
22-	Robbins Petroleum Corp. (F. R. Jackson)	1	Sallie Lucy Old 10-23-50	Oil	Plugged 3-28-53	349	Pine Mills Wood Co.	W. S. Armstrong A-16	330' FWL and 890' F most northerly SL of survey	Sub- Clarksville, Woodbine	5,603	Dual completion ³
23-	Robbins Petroleum Corp. (F. R. Jackson)	5	Sallie Lucy Old 8-24-60	Oil	Prod.	345	Pine Mills Wood Co.	W. S. Armstrong A-16	930' FWL and 1,080' F most southerly SL of survey	Woodbine	5,700	--2
24	Robbins Petroleum Corp. (F. R. Jackson)	2	Sallie Lucy Old 3-28-51	Oil	Prod.	356	Pine Mills Wood Co.	W. S. Armstrong A-16	230' FWL and 230' F most northerly SL of survey	Sub- Clarksville, Woodbine	5,581	Dual completion; recompleted 6-19-56 to Woodbine and 12-10-79 to Sub-Clarksville ³
25-	A. O. Phillips et al.	1	Mary Saner 3-28-52	Dry	Aband.	<5' above 340	Wildcat Wood Co.	M. Polk A-454	330' FWL and 3,649' FSL of survey	--	8,250	--
+26	L. A. Grelling	1(A)	Mary Saner permitted date 2-4-52	--	--	337	Pine Mills Wood Co.	M. Polk A-454	3,019' FSL and 5,077' FEL of survey	--	--	Proposed depth 8,500'; existence uncertain
27-	Largo Oil Co. (Production Lease Service, Inc.) (B. M. Lloyd) (L. A. Grelling)	6	Mary Saner 3-4-56	Oil	Aband.	342	Pine Mills, E. Wood Co.	M. Polk A-454	1,610' FWL and 1,757' FSL of survey	Sub- Clarksville	5,777	Plugged back 7-20-60 for salt-water disposal

Table 1. (cont.)

Map no.	Present (and past) operators	Well no.	Lease/Date	Type	Status *	Ground elevation (ft)		Legal description	Prod. zones	T.D. (ft)	Misc.	
						Field/Co.	Location Survey					
28	L. A. Grelling	4	Mary Saner 12-21-54	Dry	Plugged 12-27-54	352	Pine Mills, E. Wood Co.	M. Polk A-454	660' FSL and 930' FWL of survey	--	8,168	--
+29	L. A. Grelling	2(A)	Mary Saner permitted date 2-4-52	--	--	335	Pine Mills Wood Co.	M. Polk A-454	330' FWL and 330' FSL of survey	--	--	Proposed depth 8,500'; existence uncertain
30	Robbins Petroleum Corp. (Superior Oil Co.)	6	J. M. Byrd et al. 6-26-51	Oil	Plugged 3-16-77	350	Pine Mills Wood Co.	West Walker A-642	378.4' FNL and approx- imately 1,260' FEL of survey	Sub- Clarksville	6,203	--1
31	Robbins Petroleum Corp. (Superior Oil Co.)	2	J. M. Byrd et al. 9-5-50	Oil	Aband.	352	Pine Mills Wood Co.	West Walker A-642	330' FEL and approx- imately 100' FNL of survey	Sub- Clarksville	5,700	--1
32	Largo Oil (Production Lease Service) (B. B. Orr)	1	O. M. Childress 4-15-50	Oil	Prod.	350	Pine Mills Wood Co.	West Walker A-642	330' FEL and 220' FSL of survey	Sub- Clarksville, Orr	5,558	Plugged back to Sub- Clarksville
33-	Largo Oil (Production Lease Service) (B. B. Orr)	2	O. M. Childress 12-20-50	Oil	Plugged 5-12-63	345	Pine Mills Wood Co.	West Walker A-642	100' FEL and 100' FSL of survey	Orr	4,811	--
34	Largo Oil (Production Lease Service) (B. M. Lloyd) (B. B. Orr)	1	J. W. Stagner 5-20-50	Oil	Prod.	352	Pine Mills Wood Co.	J. Morrison A-409	330' FEL and 100' FNL of survey	Sub- Clarksville, Orr	5,490	Discovery well for Orr; plugged back from Orr to Sub-Clarksville 3-8-51
35	Robbins Petroleum Corp. (Superior Oil Co.)	2	D. Wagoner --	--	--	360	Pine Mills Wood Co.	David Gilliland A-229	330' FWL and 214' FSL of West Walker survey	--	--	existence uncertain

Table 1. (cont.)

Map no.	Present (and past) operators	Well no.	Lease/Date	Type	Status *	Ground elevation (ft)		Location	Legal description	Prod. zones	T.D. (ft)	Misc.
						Field/Co.	Survey					
36	Robbins Petroleum Corp. (Superior Oil Co.)	8	D. Vagoner 1-26-51	Oil	Aband.	360	Pine Mills Wood Co.	David Gilliland A-229	59½ FSL and 150' FEL of lease	Woodbine	5,650	--4
37	Robbins Petroleum Corp. (Superior Oil Co.)	14	D. V. Wagoner 5-25-51	Oil	Plugged 2-25-77	358	Pine Mills Wood Co.	J. R. Jordan A-344	1,774.8' FEL and 330' FNL of survey	Woodbine	5,650	Also used as an injection well; reperfom- ated for oil in 1975 ⁴
38	Robbins Petroleum Corp. (Superior Oil Co.)	12	D. V. Wagoner 4-19-51	Oil	Aband.	359	Pine Mills Wood Co.	J. R. Jordan A-344	286' FSL and 150' FWL of lease	Woodbine	5,444	--4
+39	Superior Oil Co.	16	D. V. Wagoner 3-28-52	Dry	Aband.	336	Wildcat Wood Co.	J. R. Jordan A-344	330' FSL and 330' FEL of lease	--	8,162	--
40	Robbins Petroleum Corp. (Morris N. Palmer)	3	O. M. Childress 1-21-51	Oil	Prod.	360	Pine Mills Wood Co.	J. R. Jordan A-344	150' FWL and 1,305' FSL of survey	Woodbine	5,441	--5
+41	Morris N. Palmer	4	O. M. Childress 8-53	Dry	Aband.	338	Pine Mills Wood Co.	J. R. Jordan A-344	675' FEL and 880' FSL of survey	--	7,885	Legal description approximate
+42	L. A. Greiling (J. L. Phillips Co.)	1	Florence 4-11-50	Dry	Aband.	337	Pine Mills Wood Co.	J. R. Jordan A-344	250' FEL and 940' FSL of survey	--	7,875	Legal description approximate ⁷
43	Robbins Petroleum Corp. (Morris N. Palmer)	1	O. M. Childress 10-22-50	Oil	Shut-in	360	Pine Mills Wood Co.	J. R. Jordan A-344	150' FWL and 150' FSL of survey	Woodbine	5,450	Wellhead pressure 60 psi on 2-18-85 ⁵
+44	Scurlock Oil Co.	4	O. M. Childress 8-3-53	Dry	Aband.	338	Pine Mills Wood Co.	J. R. Jordan A-344	330' FSL of survey and 330' FEL of 20 ac. lease	--	7,885	--

Table 1. (cont.)

Map no.	Present (and past) operators	Well no.	Lease/Date	Type	Status*	Ground elevation		Location	Legal description	Prod. zones	T.D. (ft)	Misc.
						(ft)	Field/Co.						Survey
+45	R. McKay Moore (M. L. Mayfield) (Ralph Massad)	1	D. B. Clounts 10-19-54	Oil	Plugged 5-17-83	335	Pine Mills Wood Co.	L. B. Henderson A-279	100' FWL and 350' F most westerly NL of 40 ac. lease	Paluxy	7,875	--
+46	R. McKay Moore (M. L. Mayfield)	1	J. P. Hester 4-5-56	Oil	Plugged 5-23-83	336	Pine Mills Wood Co.	L. B. Henderson A-279	1,850' FSL and 150' FWL of survey	Paluxy	7,871	--
+47	R. McKay Moore (M. L. Mayfield) (Sohio)	1-W	J. P. Hester 6-30-52	Dry	Plugged 5-14-83	335	Pine Mills Wood Co.	L. B. Henderson A-279	330' F westerly WL and 2,350' FSL of survey	--	8,275	Plugged back 7-8-69 for injection in Woodbine; salt-water disposal well
+48	F. A. Adair	1	McCallister permitted date 8-30-54	--	--	337	Pine Mills Wood Co.	David Gilliland A-229	32.5' FEL and 47.5' F most easterly NL of survey	--	--	existence uncertain
+49	Clemco (R. P. Lewelling) (L. A. Grelling)	4	O. M. Childress 3-12-55	Oil	Aband.	337	Pine Mills Wood Co.	David Gilliland A-229	230' FEL and 47.5' F most easterly NL of survey	Paluxy	7,928	Drilled diagonally to the northeast
+50	Clemco (R. P. Lewelling) (L. A. Grelling)	1	O. M. Childress 1-5-52	Oil	Plugged 2-17-77	337	Pine Mills Wood Co.	David Gilliland A-229	514' FEL and 740' F most easterly NL of survey	Paluxy	7,902	Discovery well
+51	Clemco? (L. A. Grelling)?	5	O. M. Childress 1-7-60	Dry	Aband.	340	Pine Mills Wood Co.	David Gilliland A-229	1,760' F most easterly NL and 500' F most easterly WL of lease	--	2,408	Salt-water disposal well
+52	Clemco? (L. A. Grelling)?	2	O. M. Childress 3-10-52	Oil	Aband.	336	Pine Mills Wood Co.	David Gilliland A-229	1,560' F most easterly NL and 330' FEL of survey	Paluxy	7,997	--
+53	L. A. Grelling	3	O. M. Childress 4-19-52	Dry	Aband.	337	Pine Mills Wood Co.	David Gilliland A-229	2,600' F most easterly NL and 330' F most easterly EL of survey	--	8,028	--

Table 1. (cont.)

Map no.	Present (and past) operators	Well no.	Lease/Date	Type	Status *	Ground elevation (ft)	Location		Legal description	Prod. zones	T.D. (ft)	Misc.
							Field/Co.	Survey				
54	F. R. Jackson	1	Don Roberts 6-3-54	Dry	Plugged 6-3-54	327	Wildcat Wood Co.	B. Hearn A-309	330' FNL and 330' FWL of 20 ac. lease	--	5,942	--
55	Jack W. Trantham	1	T. J. Bailey 2-6-67	Dry	Plugged 2-6-67	348	Wildcat Wood Co.	William Dobson A-170	467' FNL and 467' FEL of survey	--	5,150	--
56	Hedge Oil Co.	1	Welby and Carlock et al. 6-21-73	Dry	Aband.	350	Wildcat Wood Co.	Wiley Davis A-171	467' FNL and 403' FEL of survey	--	5,500	--
57	Clemco	3	Paul H. McKnight 4-2-80	Oil	--6	349	Hawkins, N. E. Wood Co.	W. R. James A-335	150' FWL and 2,200' FSL of survey	Sub- Clarksville	4,750	--
58	Clemco	2	Paul H. McKnight 11-26-78	Oil	--6	345	Hawkins, N. E. Wood Co.	W. R. James A-335	467' FWL and 1,000' FSL of survey	Sub- Clarksville	4,700	--
59	E. Hollandsworth	1	Paul H. McKnight 11-21-49	Dry	Aband.	350	Hawkins, N. E. Wood Co.	W. R. James A-335	800' FSL and 467' FWL of survey	--	4,815	--
60	Clemco (Humble Oil & Refining Co.)	1-R (1)	Paul H. McKnight et al. 7-18-47	Oil (Gas)	--6	349	Hawkins, N. E. Wood Co.	W. R. James A-335	467' FWL and 467' FSL of lease	Rodessa, Sub- Clarksville	14,629	Gas well plugged 1965; re-entered 3-15-77 as #1-R for oil discovery in Sub-Clarksville
61	Clemco	1	Paul H. McKnight 2-23-77	Dry	Plugged	349	Hawkins, N. E. Wood Co.	W. R. James A-335	1,000' FWL and 467' FSL of survey	--	5,330	--
62	Clemco	1	Richey-Davis 4-6-80	Oil	Prod.	355	Hawkins, N. E. Wood Co.	A. V. Sharp A-567	950' FWL and 150' FSL of survey	Sub- Clarksville	4,950	--

Table 1. (cont.)

Map no.	Present (and past) operators	Well no.	Lease/Date	Type	Status *	Ground elevation (ft)		Legal description	Prod. zones	T.D. (ft)	Misc.	
						Field/Co.	Location Survey					
+63	Millican Oil	1	Allar Co. et al. 10-26-71	Dry	Plugged 10-26-71	313	Wildcat Wood Co.	G. D. Tucker A-589	1,330' FNL and 970' FEL of survey	--	5,398	--
64-	Exxon (Humble Oil & Refining Co.)	1	Florence M. Farmer 7-24-60	Gas	Prod.	345	Hawkins Wood Co.	J. B. Crain A-137	330' FWL and 330' FSL of lease	Woodbine	4,963	Location uncertain ⁸
65	Harry Harrington, Jr. (R. W. Fair (Hal Co.))	2	Tom B. Blackstone 5-31-58	Oil	Plugged 8-10-65	350	Hawkins Wood Co.	J. B. Crain A-137	330' FSL and 1,260' FWL of lease	Woodbine	4,850	--
66	Exxon (Humble Oil & Refining Co.)	10	J. C. Snow 3-8-52	Oil	Shut-in	360	Hawkins Wood Co.	J. B. Crain A-137	2,050' FEL and 1,600' FSL of survey	Woodbine	4,928	Hawkins Field Unit #0310
57	Exxon (Texaco) (The Texas Co.)	3	R. F. Green tract 2 & 3 5-29-44	Oil	Aband.	350	Hawkins Wood Co.	J. B. Crain A-137	467' FSL and 1,763' FWL of tract 2	Woodbine	4,855	#2203; plugged back 9-14-73 to 4758
68	Exxon (Texaco) (The Texas Co.)	1	R. F. Green tract 2 & 3 4-7-59	Dry	Plugged 10-20-76	350	Hawkins Wood Co.	J. B. Crain A-137	1,702' FWL and 794' FSL of tract 2	--	2,660	Salt-water disposal well #2201
69	The Texas Co. (now W. & L. Oper. #2)	4	R. F. Green 8-14-44	Oil	Plugged 2-6-50	351	Hawkins Wood Co.	J. B. Crain A-137	550' F most southerly NW corner and 1,001' FSL of tract 3	Woodbine	4,965	--
69	W. & L. Operators (The Texas Co.)	2	R. F. Green 10-30-51	Oil	Plugged 11-10-63	351	Hawkins Wood Co.	J. B. Crain A-137	top of hole at Texas #4 Green	Woodbine	4,826	Drilled on same site as Texas #4 Green; drilled diagonally to the southwest
70	W. & L. Operators	1	R. F. Green 10-8-50	Oil	Plugged 11-5-63	360	Hawkins Wood Co.	J. B. Crain A-137	275' FSL and 330' FWL of tract 3	Woodbine	4,827	--

Table 1. (cont.)

Map no.	Present (and past) operators	Well no.	Lease/Date	Type	Status *	Ground elevation (ft)		Legal description	Prod. zones	T.D. (ft)	Misc.	
						Field/Co.	Location Survey					
71	Key Production Co.	1	J. M. Green 5-17-72	Dry	Plugged 5-17-72	357	Hawkins Wood Co.	John P. Mosley A-384	467' F westerly NL and 6,100' F westerly WL of survey	--	4,900	--
+72	Trumter Petroleum Corp. et al.	1	Wanie Green et al. 7-30-59	Dry	Aband.	330	Wildcat Upshur Co.	M. Caffey A-116	90' FEL and 330' FNL of survey	--	5,353	--

* Aband. = abandoned or shut-in; Prod. = producing

1 Current lease is 2nd Sub-Clarksville Formation Unit 3

2 Current lease is Woodbine Wagoner Formation Unit 2

3 Current lease is 2nd Sub-Clarksville Formation Unit 2

4 Current lease is Woodbine Wagoner Formation Unit 18

5 Current lease is Woodbine Wagoner Formation Unit 19

6 A maximum of two and a minimum of one of the Cleimco McKnight wells are producing

7 Recompleted 1-23-55 to 6,010-ft, drilled diagonally to the south

8 Current lease is Hawkins Field Unit, well no. 217; Hawkins Oil Unit no. 44, Hawkins Gas Unit no. 13

production and well statistics in this report are from Railroad Commission of Texas records and Railroad Commission of Texas (1982).

Pine Mills Field

The Pine Mills Field was discovered in 1949 and has produced oil from the 2nd Sub-Clarksville sand, Orr sand (sometimes referred to as the 3rd Sub-Clarksville sand), Woodbine Group sands (the major producing sand is the Woodbine Wagoner), and upper Paluxy Formation sands (fig. 6). The regional dip of the producing strata is about 300 ft per mi westward, and a normal fault provides the primary trap (fig. 7). Stratigraphic pinch-outs of some of the upper Woodbine Group sands are also trapping mechanisms. Normal fault traps and stratigraphic pinch-outs are typical of the other fields associated with the northern part of the Earl-Lee turtle-structure anticline. The drive mechanism for the Pine Mills Field is probably water, solution gas, or a combination of the two.

Figure 8 shows the structure on the base of the 2nd Sub-Clarksville sand for the Pine Mills Field within the contract area. Only one producing well from this reservoir (well no. 19, table 1) occurs below the 340-ft ground elevation contour. Four additional wells produce from Sub-Clarksville sands within the 360-ft contour boundary.

The production history of the Pine Mills 2nd Sub-Clarksville reservoir is summarized in figure 9. Production rose after 1965 due to secondary recovery; the reservoir has decreased in production since 1970. The estimated value of the 4,988,953 barrels (bbl) of oil produced from this reservoir as of December 1984 is \$134,701,731 (all dollars in this report are 1985 dollars unless otherwise noted). This amount represents the total amount of oil produced from the reservoir multiplied by the 1985 price of oil per bbl, about \$27. Because oil has been produced over many years, this value does not represent the price at which the oil was sold. These assumptions were made for all calculations in this report.

Table 2 provides the procedure for estimating remaining oil that is available for secondary and tertiary recovery. Estimates for the Pine Mills 2nd Sub-Clarksville

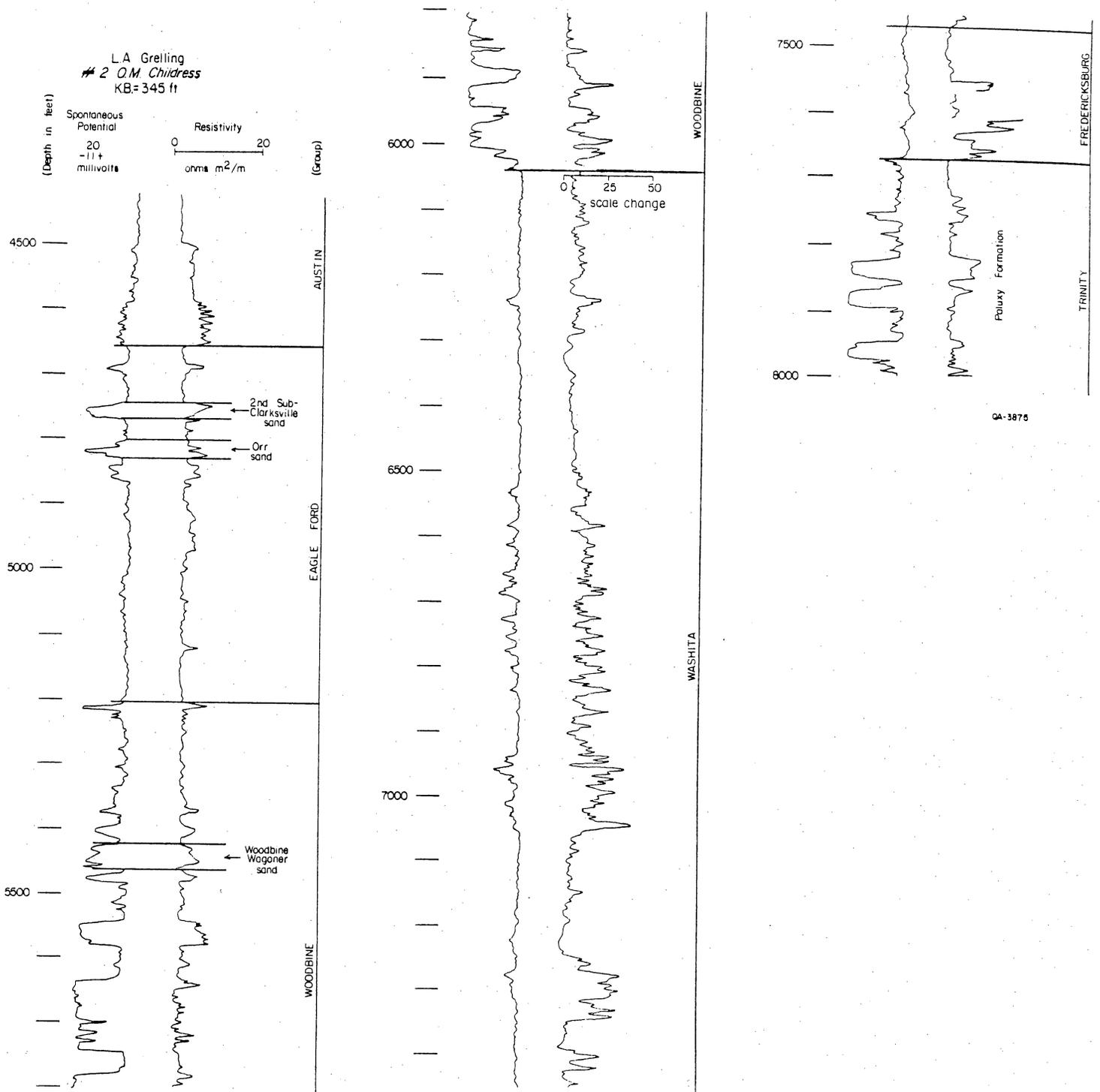


Figure 6. Typical geophysical log for the Pine Mills Field area, Wood County, Texas. K.B. = Kelly bushing; Depth = depth of well below Kelly bushing. Oil production in the Pine Mills and nearby fields is from Paluxy Formation sands (7,670-ft depth on log), the Woodbine Wagoner Unit (5,420-ft depth on log) as well as other younger Woodbine Group sandstones, and the Eagle Ford Group Orr sand (4,805-ft depth on log) and 2nd Sub-Clarkville sand (4,745-ft depth on log).

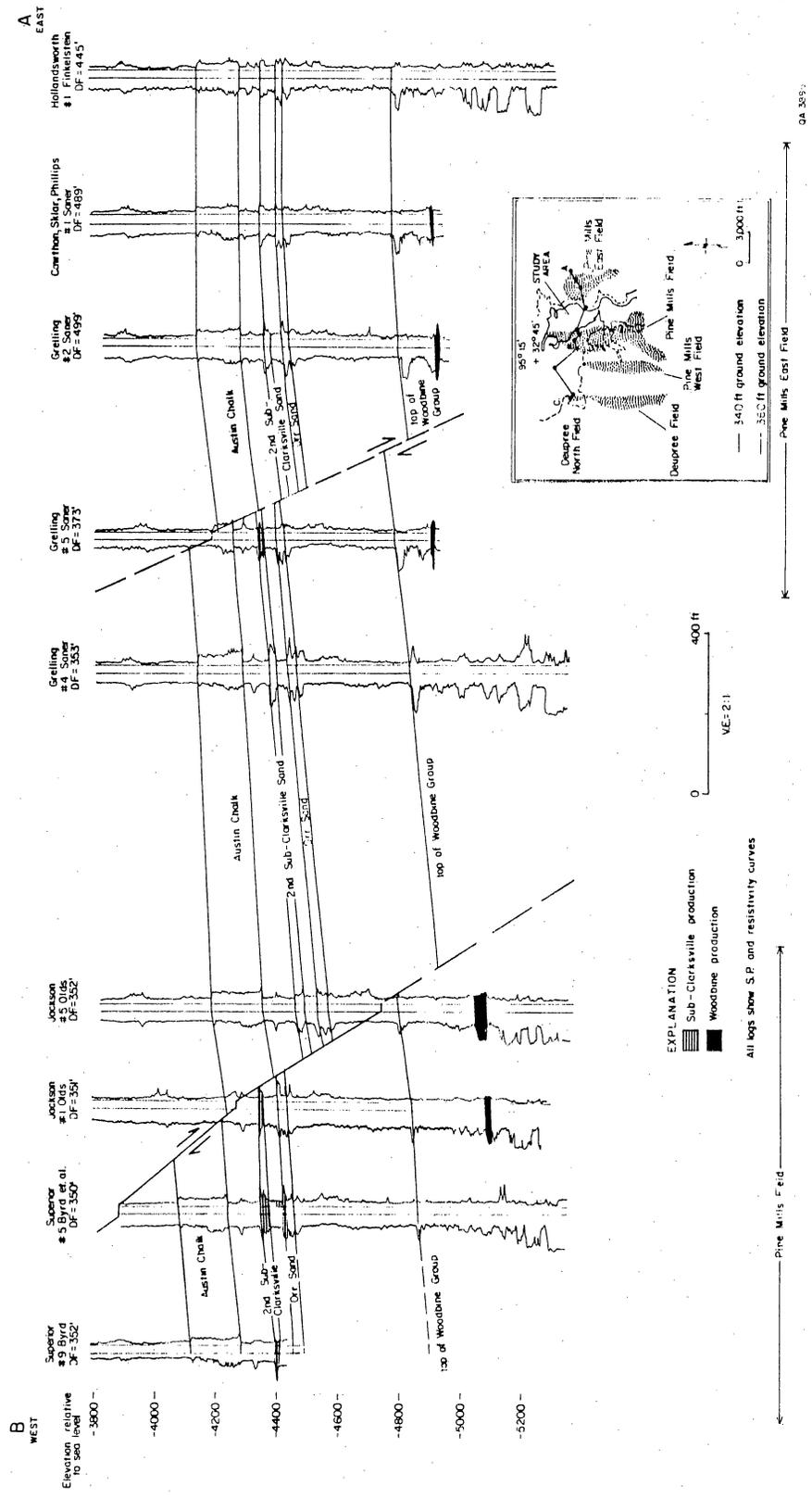


Figure 7. Cross section A-B through the Pine Mills East and Pine Mills Fields.

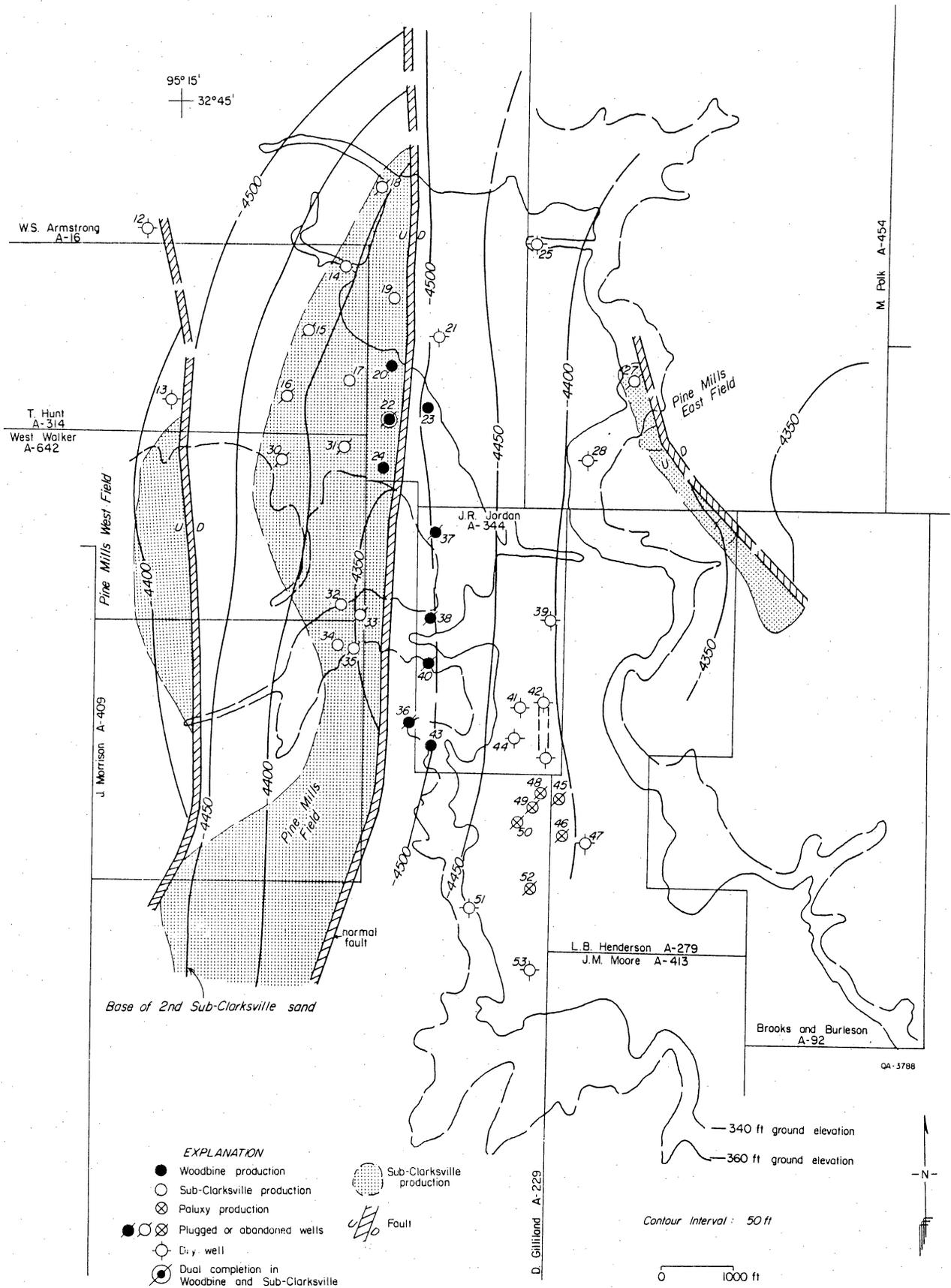


Figure 8. Structure map on the base of the 2nd Sub-Clarksville sand at the Pine Mills, Pine Mills East, and Pine Mills West Fields. Structure contours are at sub-sea-level elevations. Wells shown are within the study area, and well numbers correspond to numbers in table 1. Data are from Moore (1951), Railroad Commission of Texas files, and selected geophysical logs.

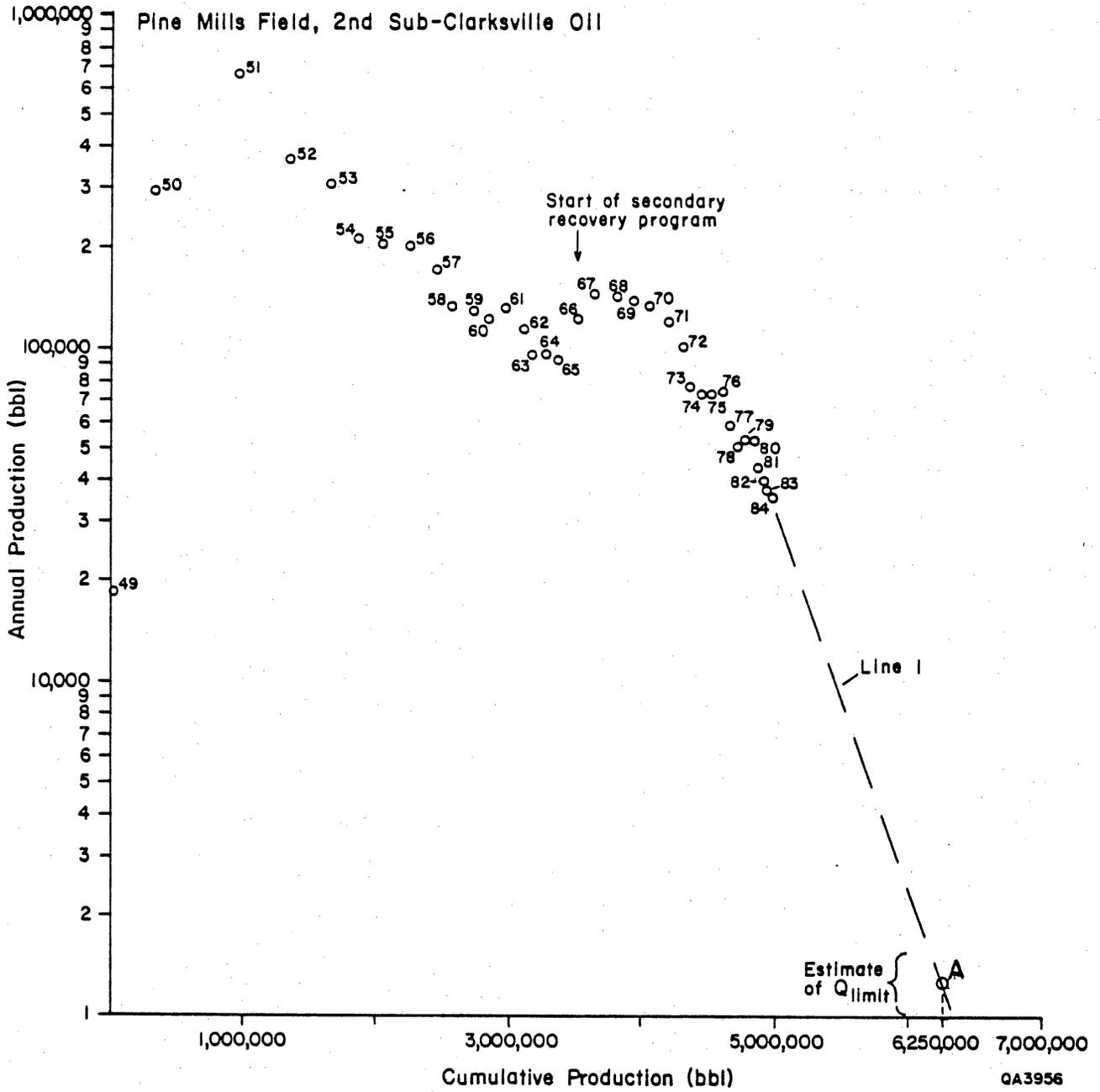


Figure 9. Production decline for the Pine Mills Field, 2nd Sub-Clarksville reservoir. For further explanation of graph see table 2.

Table 2. Example of procedure for estimating remaining oil that is available to secondary and tertiary recovery in a given reservoir.

Estimation of remaining oil involves three steps, outlined below.

1. Estimation of the economic limit of production.

$$Q_{\text{limit}} = \frac{C}{(P)(W)(1-T)}$$

where

Q_{limit} = value of bbl/yr below which it is not economically feasible to operate a well

C = operating cost of a well per year

P = current price of oil per bbl, estimated at \$27

W = working interest, about 0.75

T = State tax rate, 0.41

2. Estimation of remaining oil available to secondary recovery methods (ultimate recovery).

An estimate of the remaining oil in a reservoir is made on production decline graphs (annual production vs. yrs) by extending a straight line from the trend in production down to the x-axis (here designated "line 1"). Then an estimate of Q_{limit} from step 1, above, is measured on the y-axis (annual production). A point of intersection (A) of the Q_{limit} value with line 1 is chosen in the middle of the Q_{limit} range to represent an average value. A straight line extended down from point A hits the x-axis at a certain value. This value is an estimate of ultimate recovery from the reservoir using secondary recovery methods.

3. Estimation of oil available to tertiary recovery methods (target and residual oil).

a. amount left in reservoir (secondary recovery) = ultimate recovery (from step 2) - amount produced to date

Table 2 (continued)

b. OOIP (original oil in place) = $\frac{\text{ultimate recovery}}{\text{recovery efficiency}}$
(estimated from Galloway and others, 1983)

c. target oil = $(\% \text{ unrecovered oil} - \frac{\% \text{ residual oil}}{1 - W_s}) \times \text{OOIP}$

where

$\% \text{ unrecovered oil} = 1 - \text{recovery efficiency}$

$\% \text{ residual oil}$ and W_s ($\% \text{ water saturation}$) are estimated from Galloway and others (1983)

d. total movable oil = target oil + ultimate recovery

e. residual oil = OOIP - total movable oil

f. Target oil and residual oil are both available to tertiary recovery methods. From 25 to 50 percent of this oil might be recovered; however, it is likely that less than 10 percent could be recovered.

g. $(\text{target oil} + \text{residual oil}) (\$27/\text{bbl}) =$ the cost of oil available to tertiary recovery
(see step 1)

reservoir are not shown because only one of the Sub-Clarksville producing wells (well no. 19, table 1) occurs within the +340-ft contour boundary. Production data was not available for this well.

Production history of the Pine Mills Orr reservoir is summarized in figure 10. The Orr reservoir has experienced a sharp decline in production in the past 7 years; however, a slight increase occurred in 1984. There has been no secondary recovery in this reservoir. The estimated cost of the 845,108 bbl of oil produced from this reservoir as of December 1984 is \$22,817,916.

Figure 11 shows the structure on the top of the Woodbine Group at the Pine Mills Field. Currently no wells are producing from Woodbine sands in the contract area below the 340-ft ground elevation, although there are four active wells below the 360-ft ground level contour.

The production history of the Pine Mills Woodbine and Woodbine Wagoner reservoirs is summarized in figures 12 and 13. The Woodbine Wagoner reservoir was officially separated from the Woodbine reservoir in 1966, coincident with the start of the secondary recovery program. Production has been generally declining since then. Production totaled 1,330,150 bbl of oil at the end of 1984, with an estimated value of \$35,914,050. Production from the Woodbine reservoir appears to have stabilized since 1978. The estimated value of the 5,463,321 bbl of oil produced from this reservoir as of December 1984 is \$147,509,667.

The structure on the top of the Paluxy Formation is shown in figure 14. The entire Paluxy reservoir is within the contract area; however, all of the producing wells have been plugged or abandoned. The production history of the Pine Mills Paluxy reservoir is shown in figure 15. Rise in production in 1966 indicates a secondary recovery program; however, no official record of secondary recovery has been found in data from the Railroad Commission of Texas.

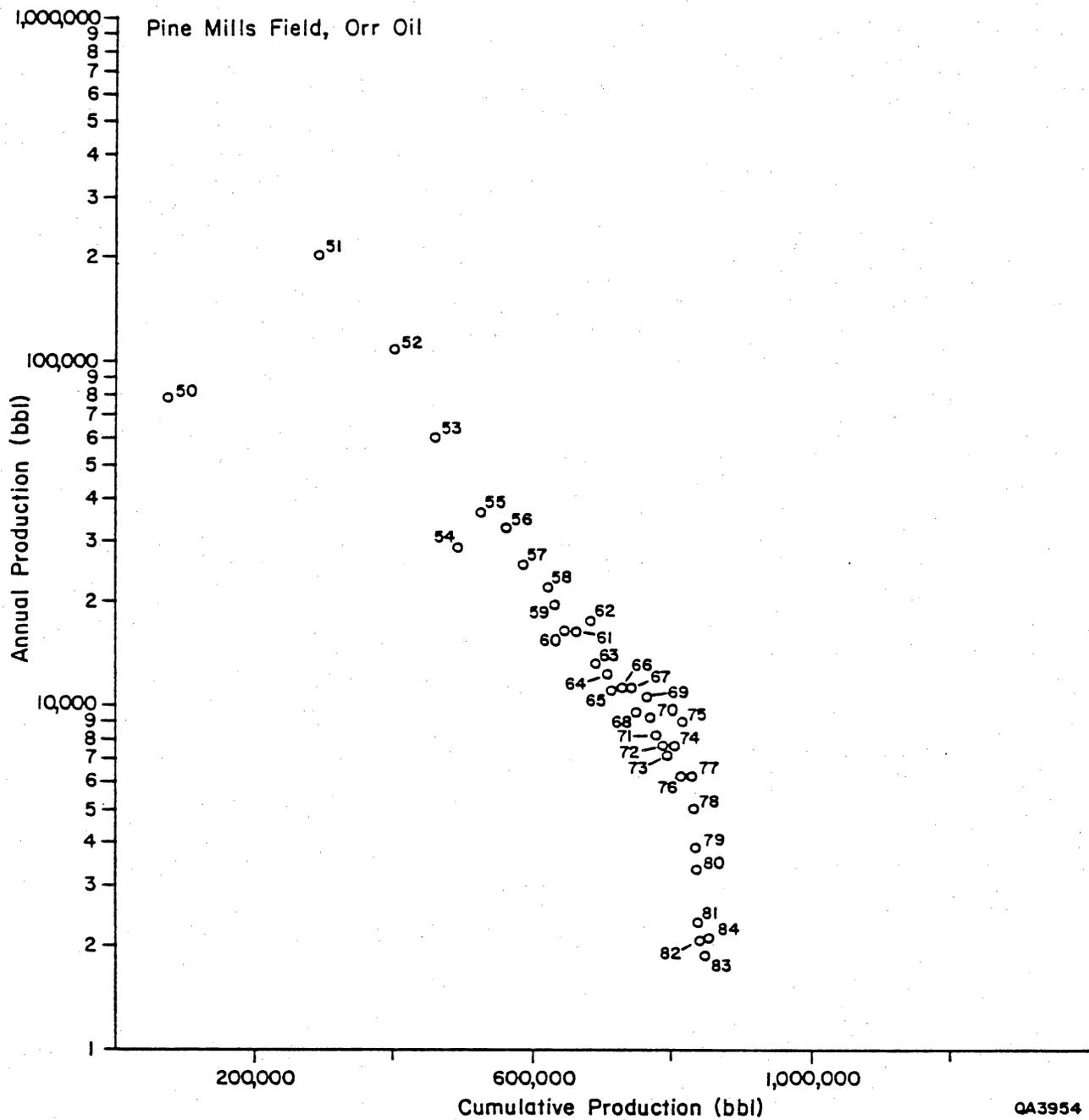


Figure 10. Production decline for the Pine Mills Field, Orr reservoir.

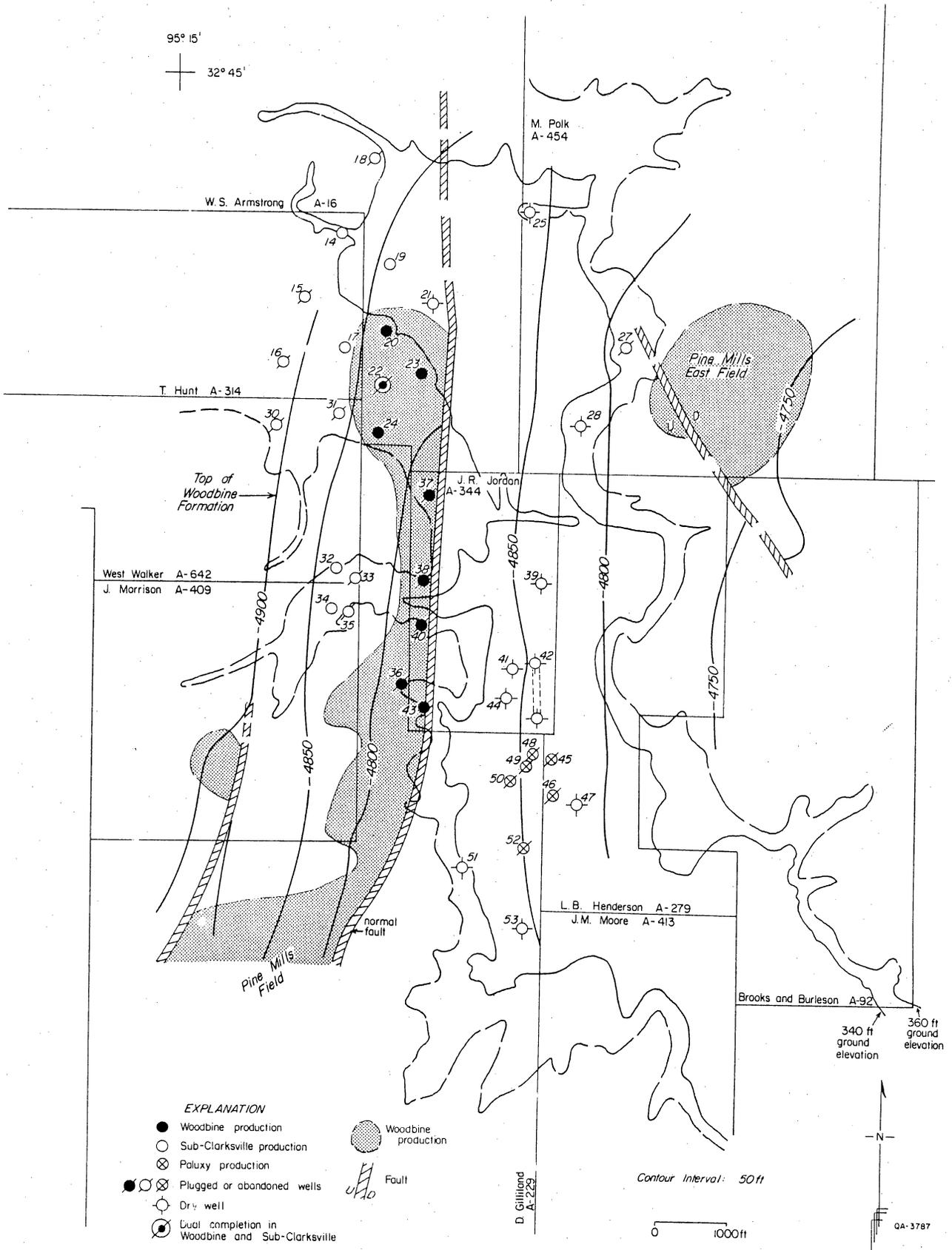


Figure 11. Structure map on the top of the Woodbine Group and Pine Mills and Pine Mills East Fields. Structure contours are at sub-sea-level elevations. Wells shown are within the study area, and well numbers correspond to numbers in table 1. Data are from Moore (1951), Railroad Commission of Texas files, and selected geophysical logs.

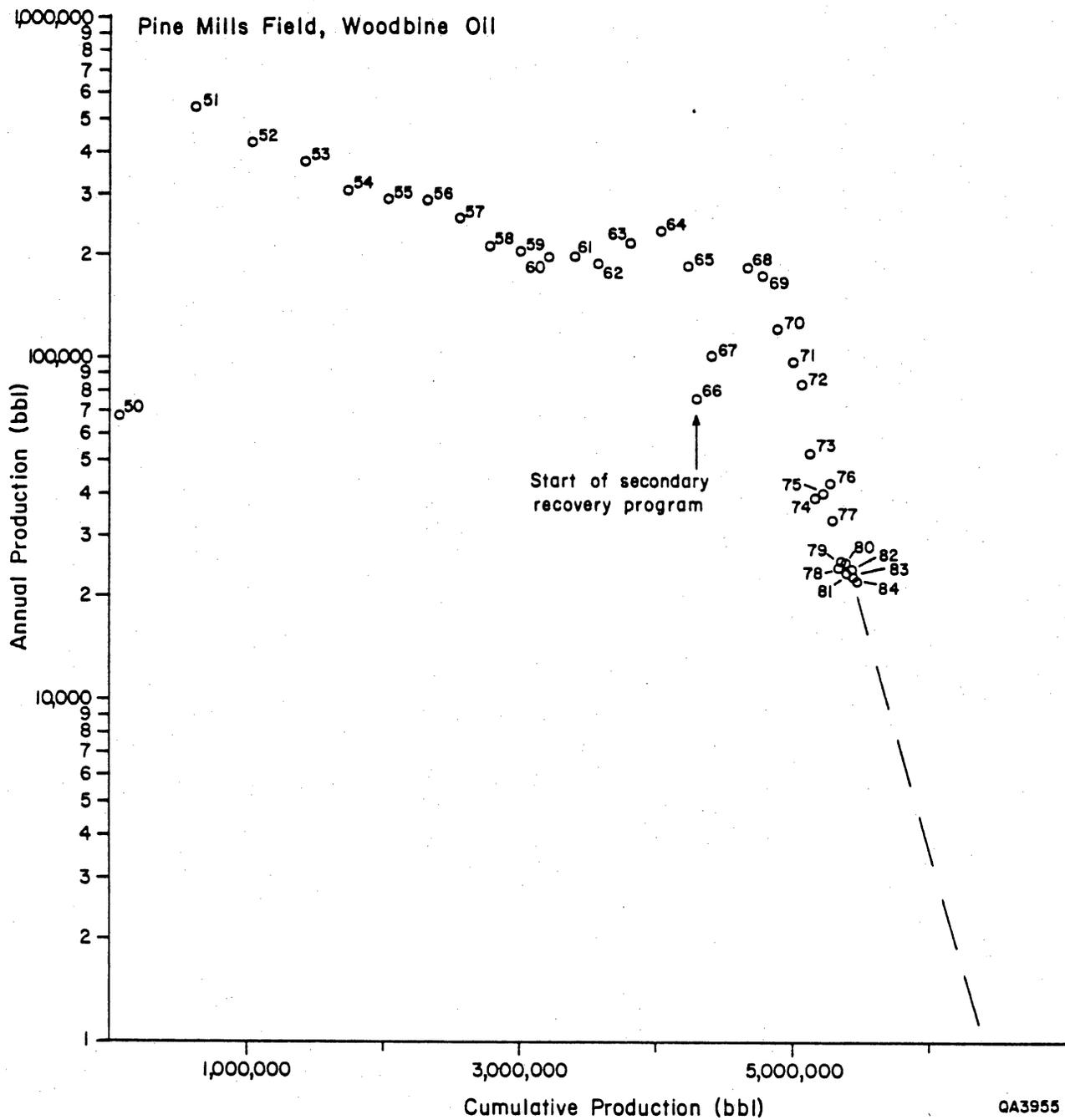


Figure 12. Production decline for the Pine Mills Field, Woodbine reservoir.

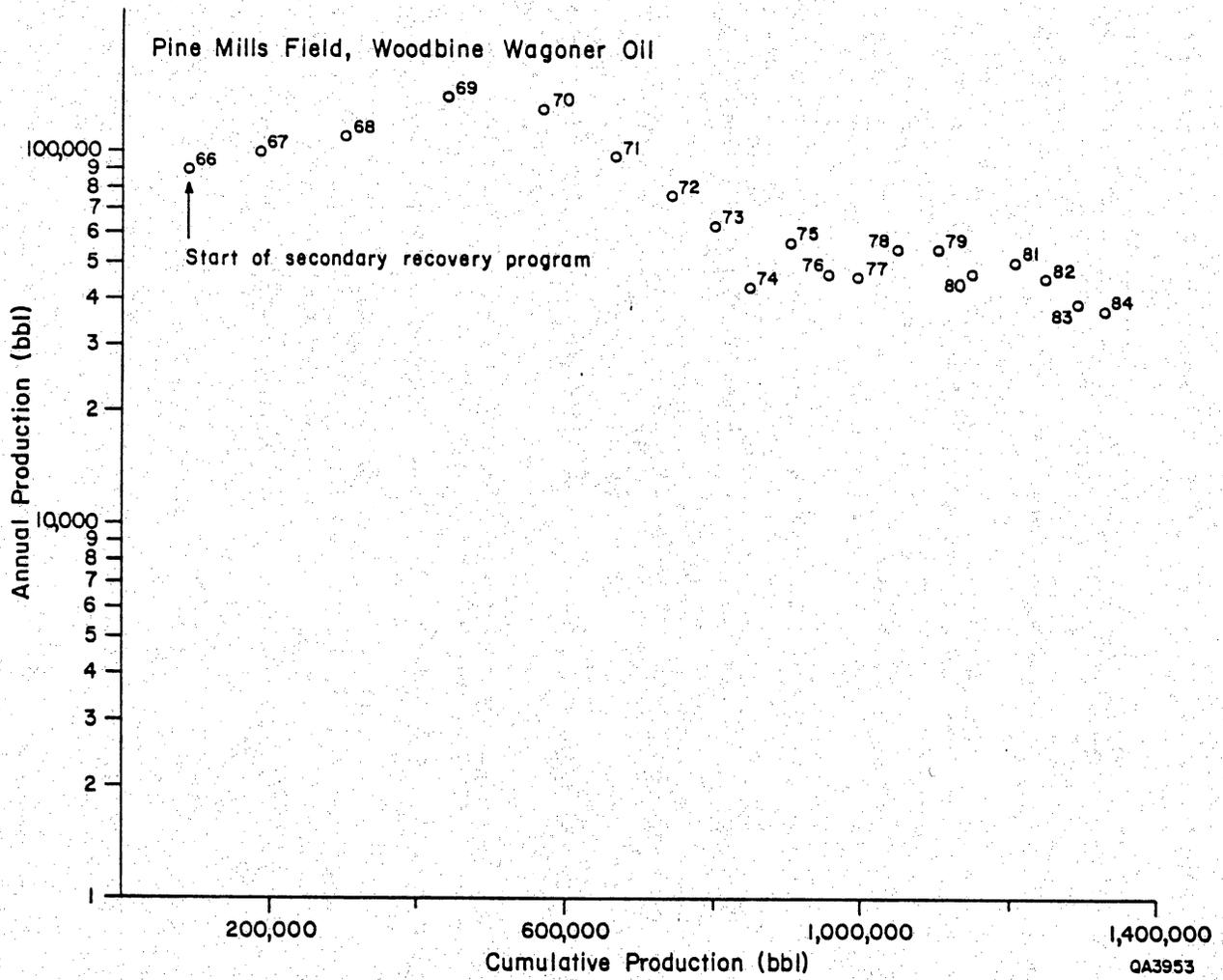


Figure 13. Production decline for the Pine Mills Field, Woodbine Wagoner reservoir. The Woodbine Wagoner reservoir was officially separated from the Woodbine reservoir in 1966, coincident with the start of the secondary recovery program.

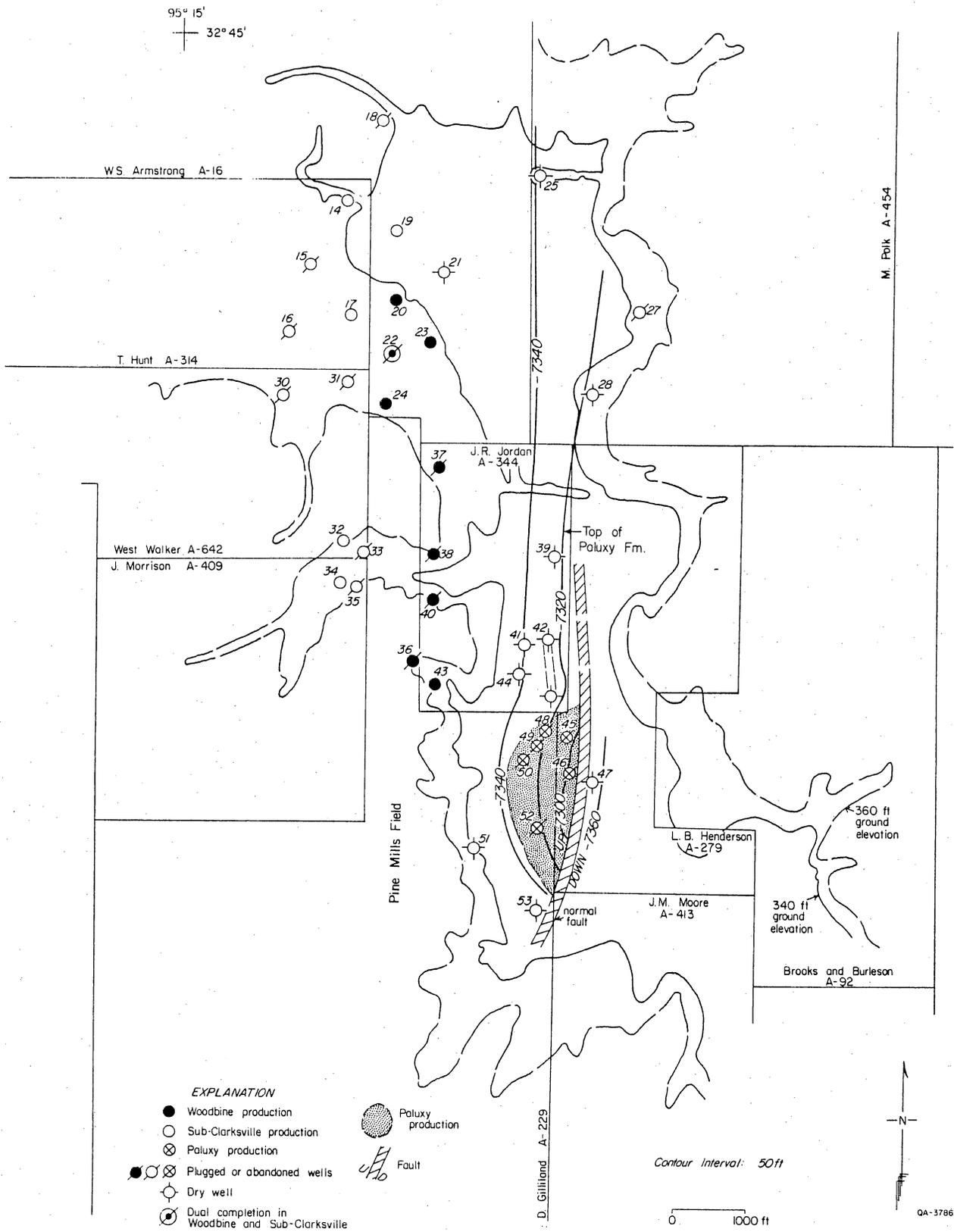


Figure 14. Structure map on the top of the Paluxy Formation at the Pine Mills Field. Structure contours are at sub-sea-level elevations. Wells shown are within the study area, and well numbers correspond to map numbers in table 1. Data are from Railroad Commission of Texas files and selected geophysical logs.

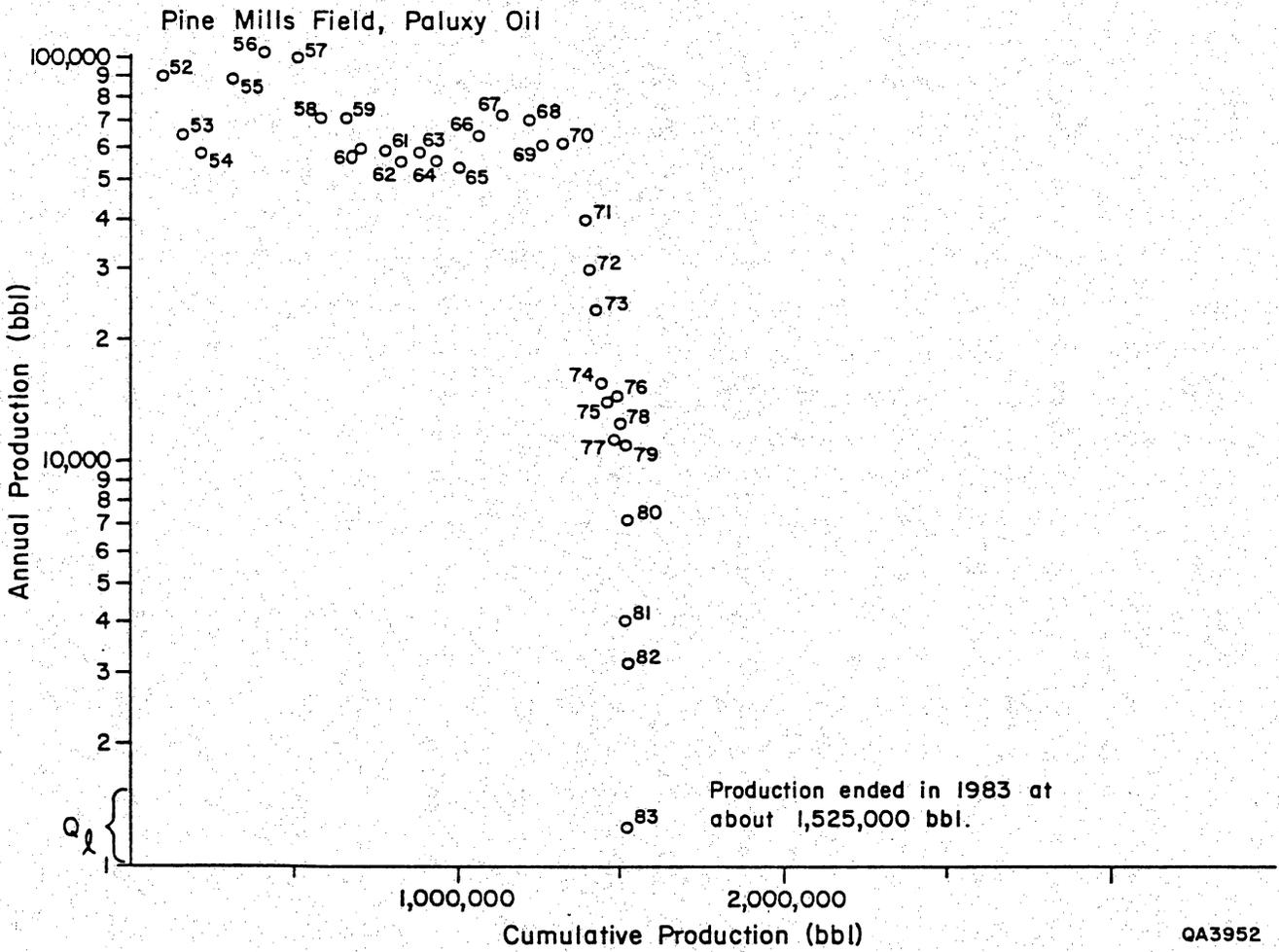


Figure 15. Production decline for the Pine Mills Field, Paluxy reservoir.

Pine Mills East Field

The Pine Mills East Field was discovered in 1952 and has produced oil from the 2nd Sub-Clarksville sand and Woodbine Group sands (fig. 6). Several wells east of the potential reservoir site still produce from Woodbine strata, but Sub-Clarksville production has almost ceased. The field is above the 340-ft ground elevation, and only one plugged well that previously produced from the 2nd Sub-Clarksville sand is below the 360-ft contour elevation. The trapping mechanism and drive for this field are similar to those in the Pine Mills Field (fig. 7). Production in the Pine Mills East Sub-Clarksville reservoir has declined rapidly in recent years and is near the economic limit of production (fig. 16). Production totaled 259,986 bbl at the end of 1984, with an estimated value of \$7,019,622.

Deupree and Deupree North Fields

The Deupree and Deupree North Fields were discovered in 1951 and 1964, respectively. The Deupree Field is above the 360-ft study site boundary and produces from Sub-Clarksville and Woodbine sands (fig. 6). The Deupree North Field had only one producing well, which is at a ground elevation of 360 ft. It produced from Woodbine sands until it was plugged in 1967. In the early 1980's two wells were drilled several hundred feet north of the Deupree North discovery well; however, Railroad Commission of Texas files list the wells in the Deupree Field. These two wells produce from Woodbine sands but they are outside the study site boundary. The structure at the top of the Woodbine producing zone is shown in figure 17. A normal fault acts as the trapping mechanism (fig. 18), and the drive mechanism is probably similar to that of the Pine Mills Field.

Production history of the Deupree and Deupree North Woodbine reservoirs is shown in figures 19 and 20. The estimated value of the 22,013 bbl of oil produced from the Deupree North Field as of December 1984 is \$594,351.

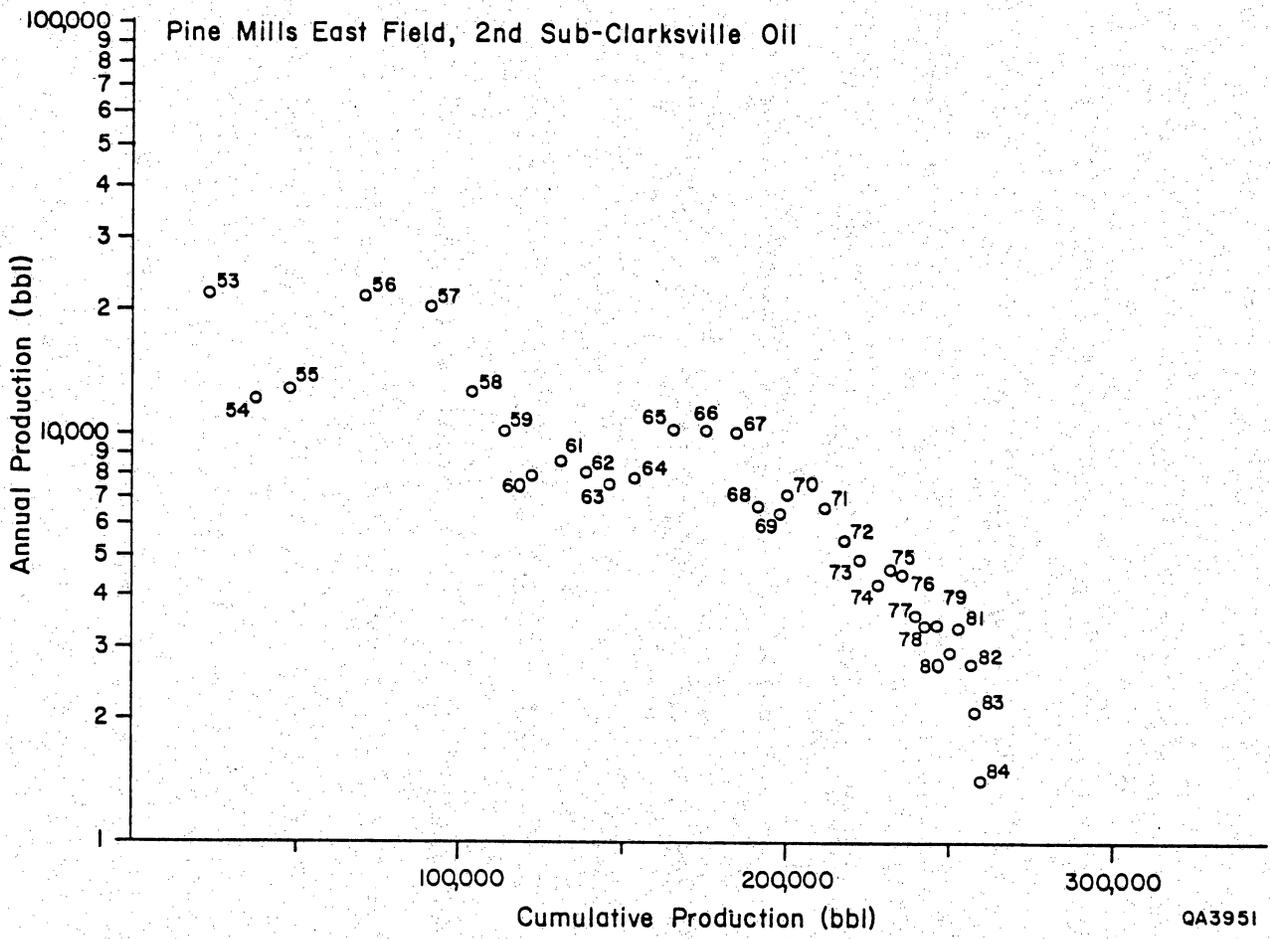


Figure 16. Production decline for the Pine Mills East Field, 2nd Sub-Clarksville reservoir.

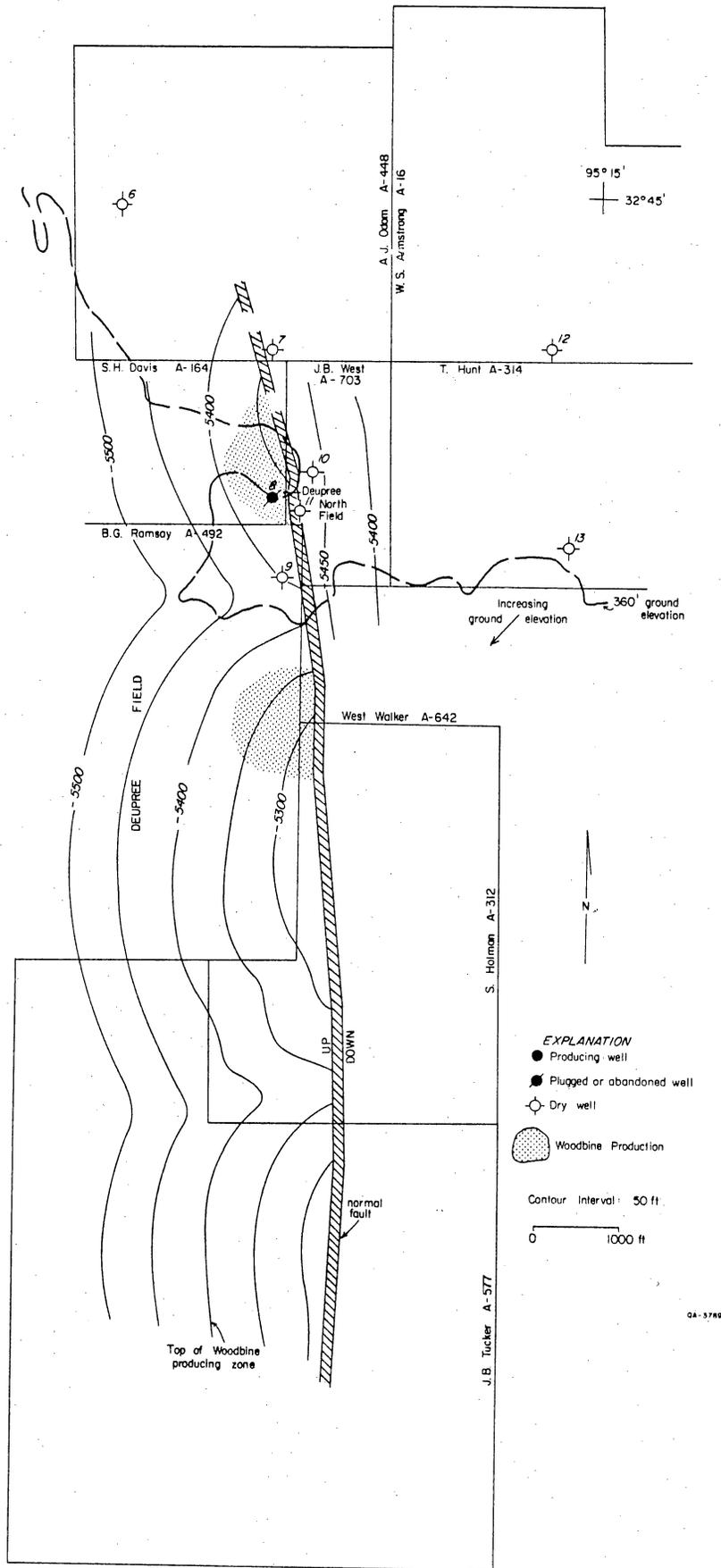


Figure 17. Structure map of the Deupree North and Deupree Fields. Sub-sea-level contours are on top of the Woodbine producing zone. Wells shown are within the study area, and well numbers correspond to map numbers in table 1. Data are from Railroad Commission of Texas files and selected geophysical logs.

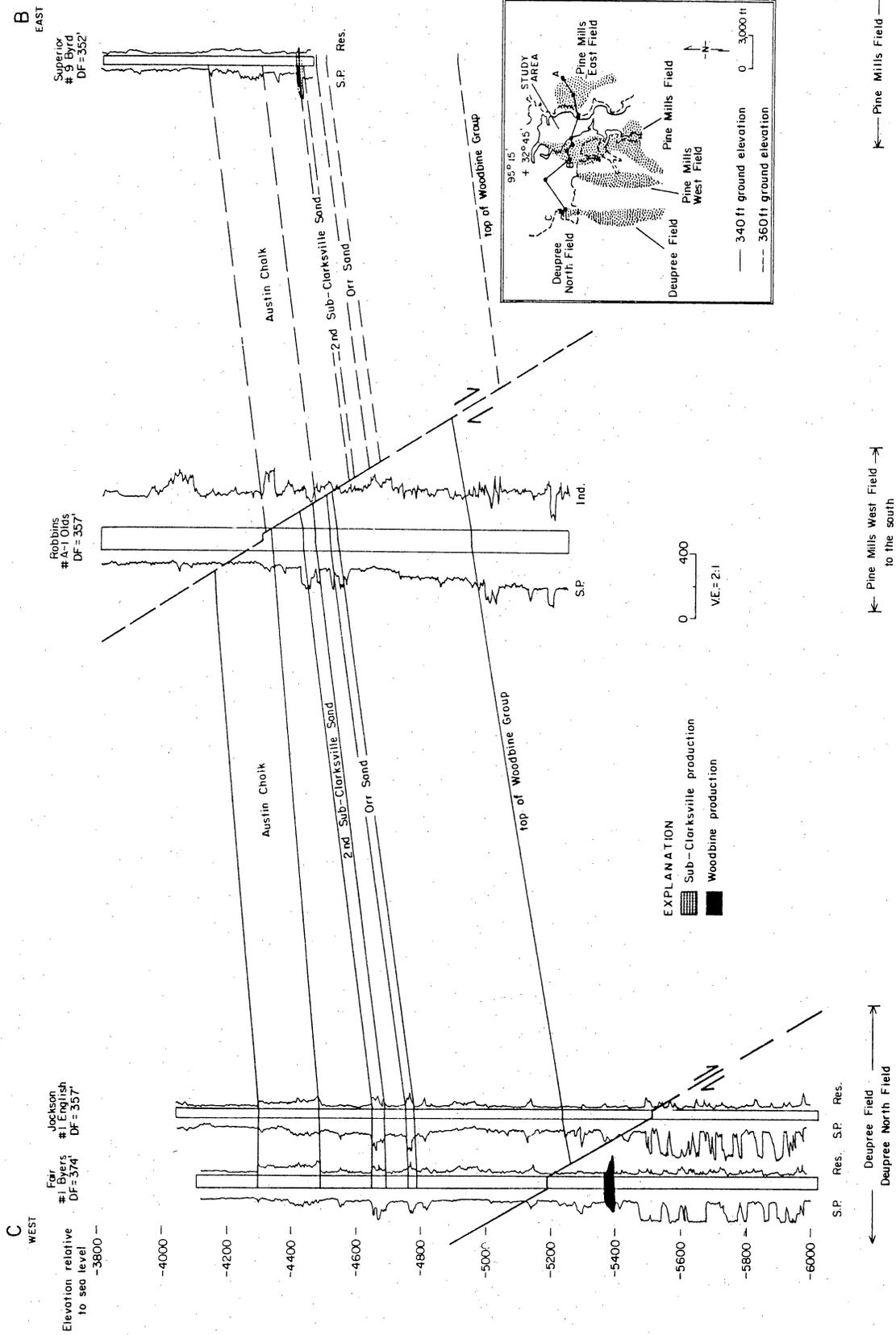


Figure 18. Cross section B-C through Pine Mills and Deupree North Fields.

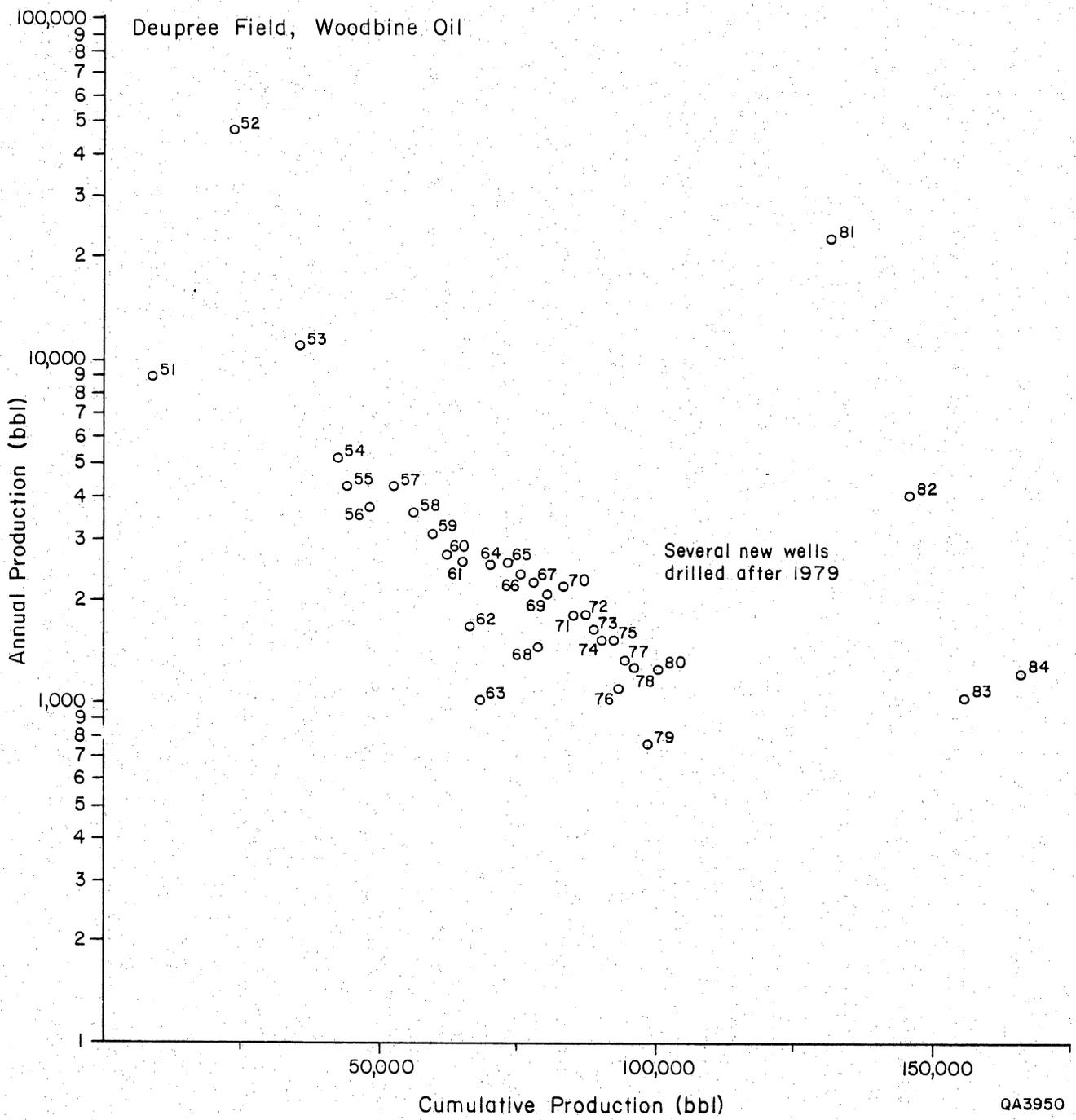


Figure 19. Production decline for the Deupree Field, Woodbine reservoir.

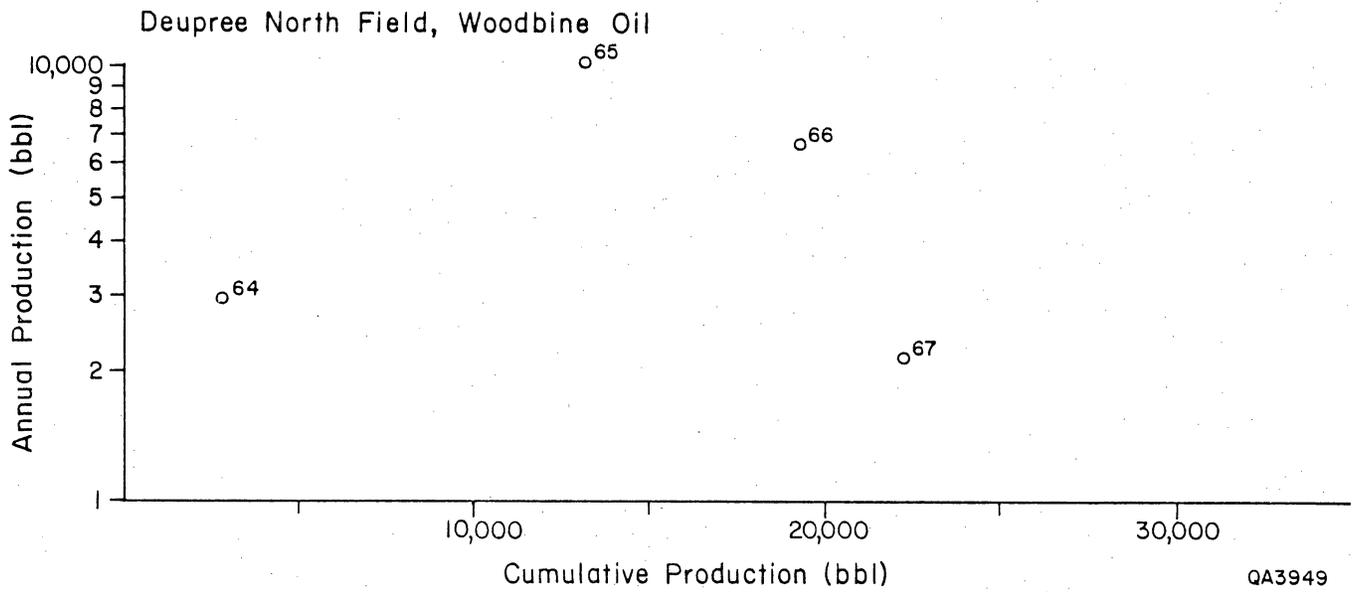


Figure 20. Production decline for the Deupree North Field, Woodbine reservoir.

Hawkins Field

Oil was discovered at the Hawkins salt pillow in 1940. Oil is produced from Woodbine and Paluxy sands, whereas gas production is from Woodbine and Rodessa sands (fig. 21). The Hawkins Field is above the 340-ft contract area boundary, however the northeastern part of the field is within the 360-ft contour interval (fig. 22, plate 1). Paluxy production is outside the contract site. Hydrocarbons are trapped primarily by structural closure (fig. 22) and driven out by (1) water drive plus solution gas and (2) gravity drainage (Galloway and others, 1984).

The oil production history of the Hawkins Woodbine reservoir is summarized in figure 23. Estimated value of the 767,529,086 bbl of oil produced from this reservoir as of December 1984 is \$20,723,285,322. Secondary recovery began in 1969.

Figure 24 shows the Hawkins Woodbine gas production history. Production has declined slightly in recent years. Production from the Woodbine gas reservoir has totaled 8,636,083 thousand cubic feet (Mcf) as of December 1984, with an estimated value of \$22,885,619. Hawkins Rodessa gas production increased somewhat in the late 1970's and has moderately declined since then (fig. 25). The estimated value of the 2,202,417 Mcf of gas produced from the Rodessa reservoir as of December 1984 is \$5,836,405.

Hawkins Northeast Field

The Hawkins Northeast Field, discovered in 1977, is located at the northern flank of the Hawkins salt pillow. Production is from Sub-Clarksville sands (fig. 21). The producing wells of this field are above the 340-ft ground elevation, however four wells are below the 360-ft ground elevation boundary (fig. 22 and plate 1). The trapping mechanism appears to be a fault along the flank of the anticline. Drive for this reservoir may be similar to that of the Hawkins Field.

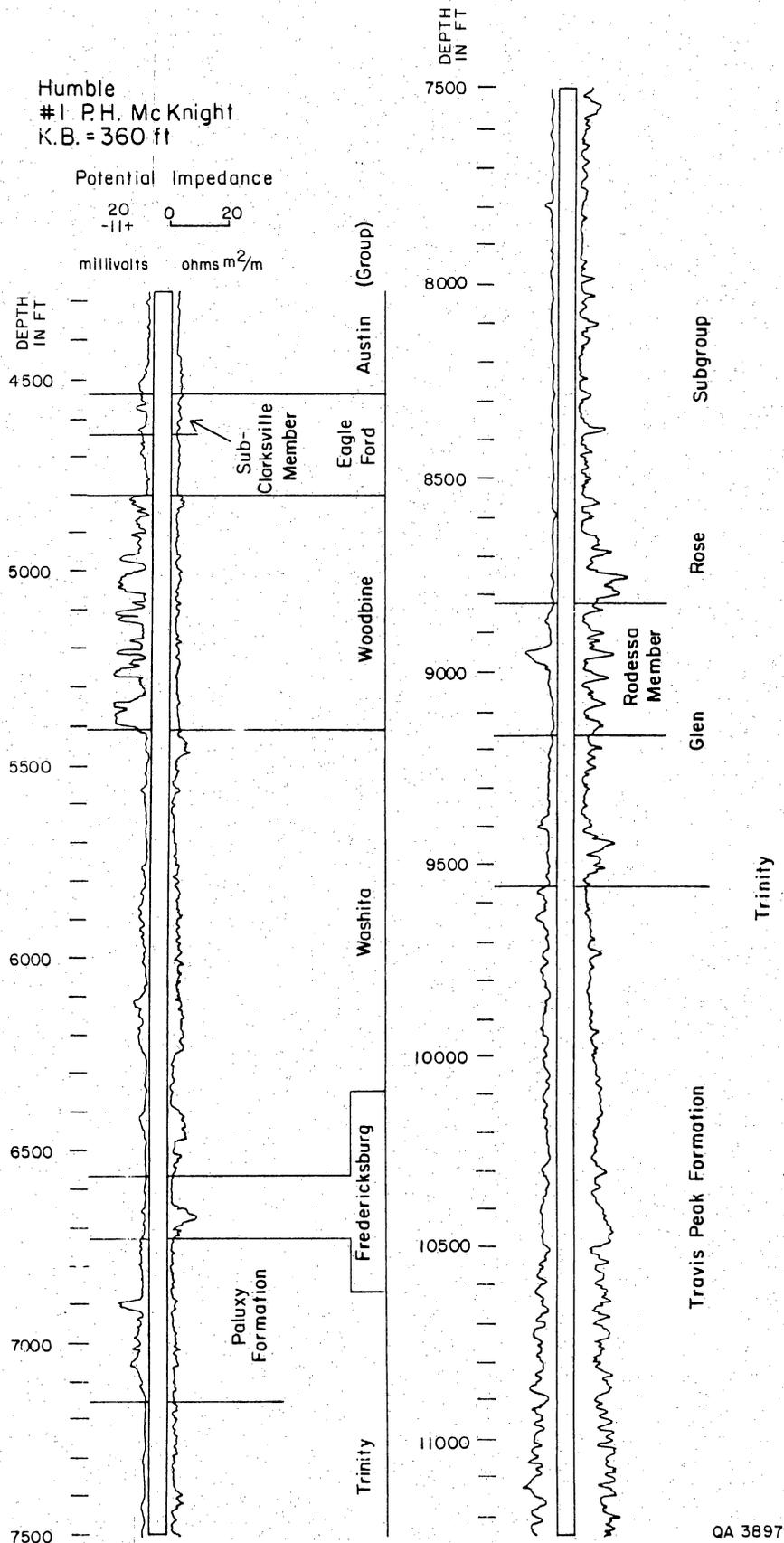


Figure 21. Typical geophysical log for the Hawkins and Hawkins Northeast Fields, Wood County, Texas. K.B. = Kelly bushing; Depth = depth of well below Kelly bushing. Oil production at the Hawkins field is primarily from Woodbine Group sands (4,800- to 5,400-ft depth on log) although Paluxy sands have also produced lesser amounts of oil. Gas production at Hawkins Field is from Woodbine Group sands and Rodessa sands (8,950-ft depth on log). Oil production at the Hawkins Northeast Field is from Sub-Clarksville sands (4,570-ft depth on log).

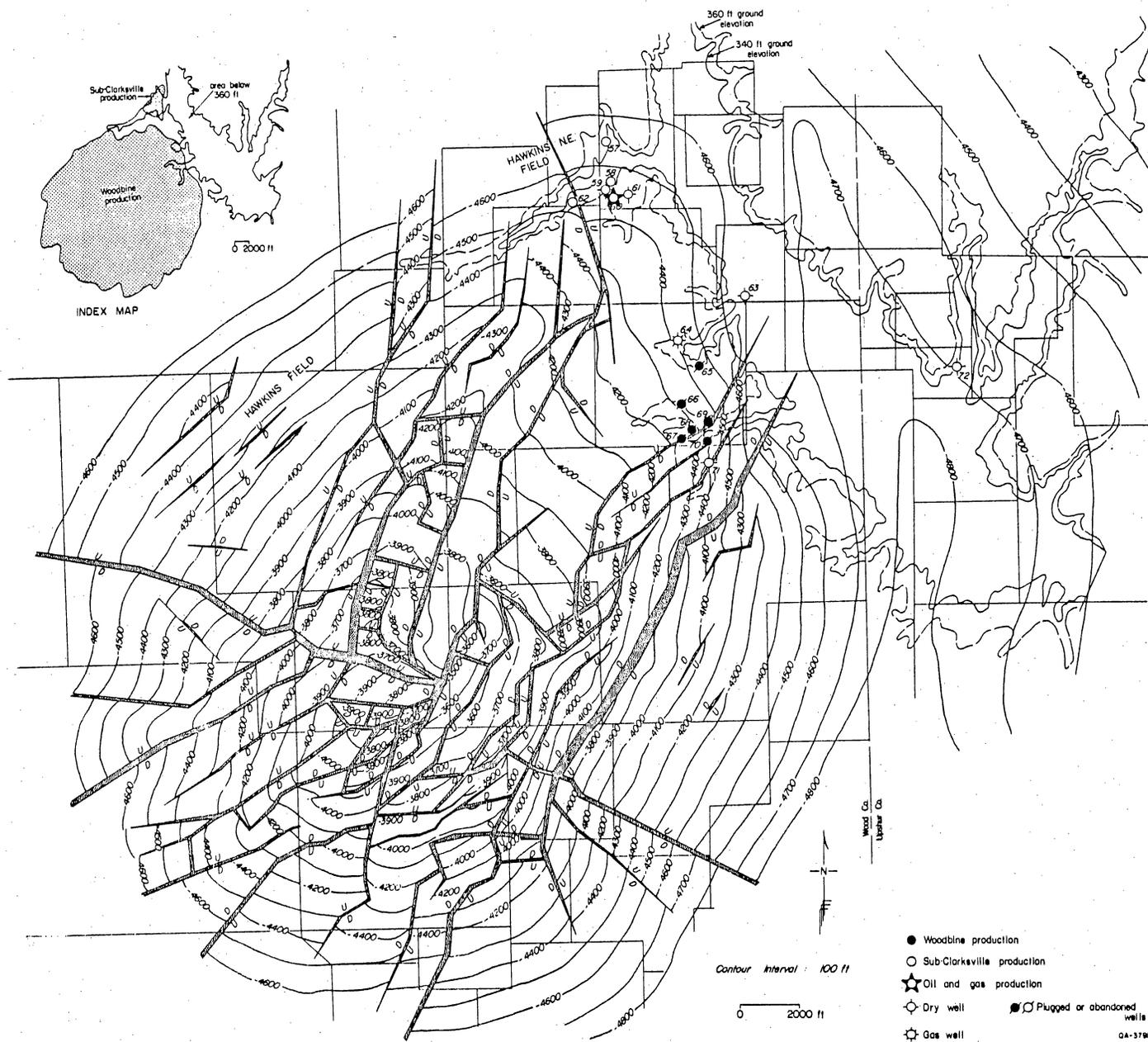


Figure 22. Structure map on the top of the Woodbine Group at Hawkins and Hawkins Northeast Fields. Structure contours are at sub-sea-level elevations. Wells shown are within the study area, and well numbers correspond to map numbers in table 1. Data are from map by Wendlandt (1951), Railroad Commission of Texas files, and selected geophysical logs.

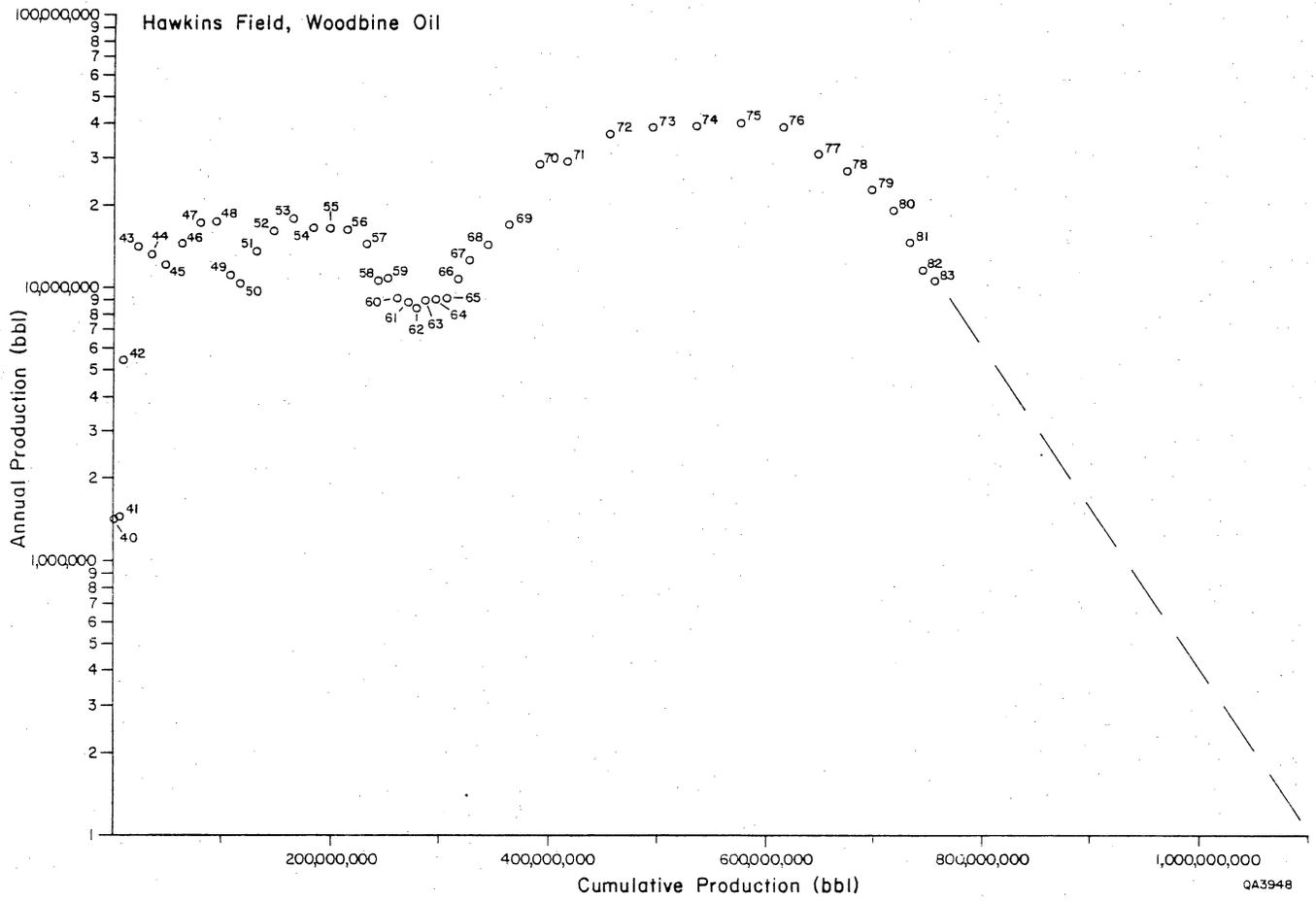


Figure 23. Production decline for the Hawkins Field, Woodbine reservoir.

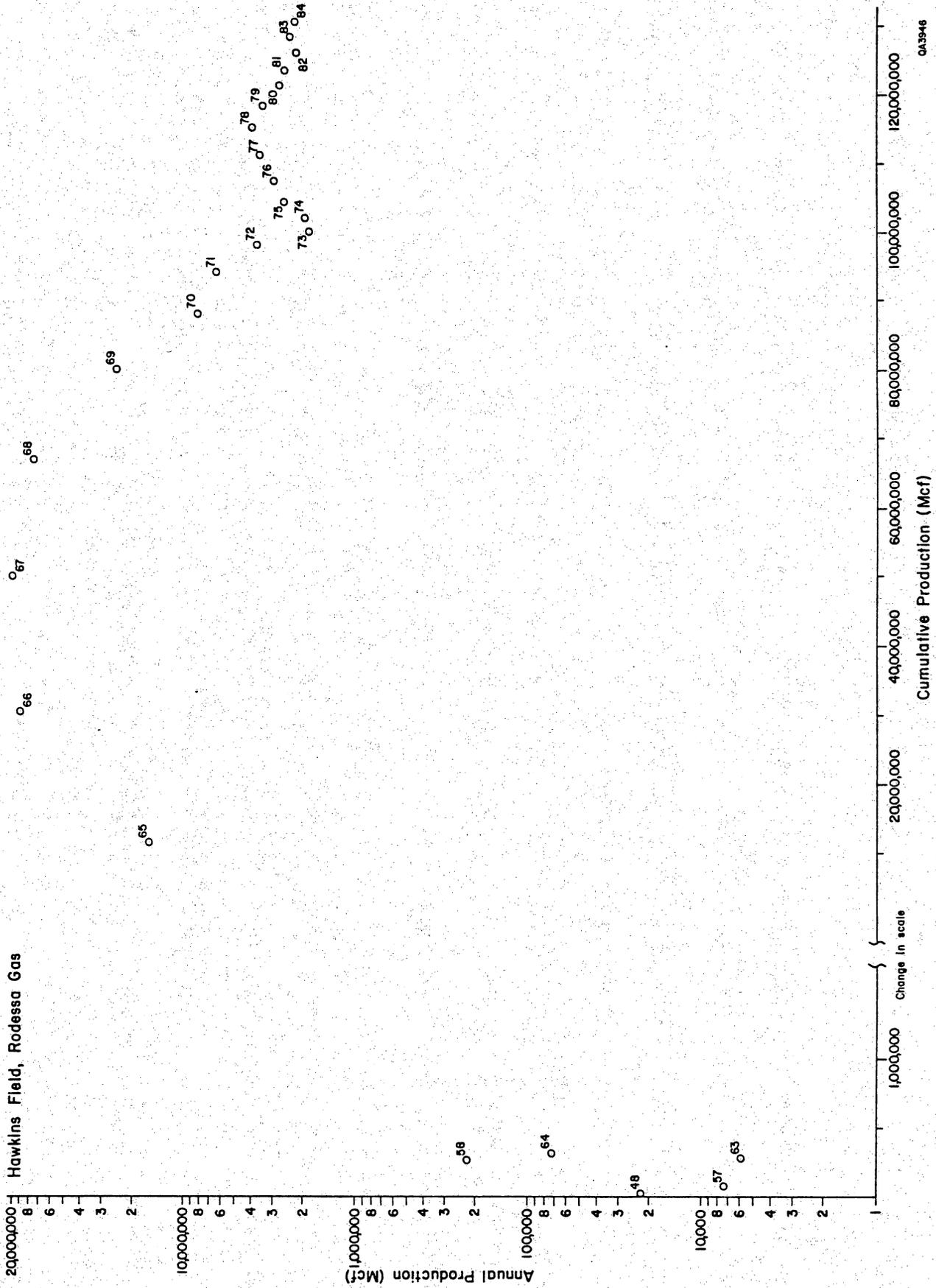


Figure 24. Production decline for the Hawkins Field, Rodessa reservoir.

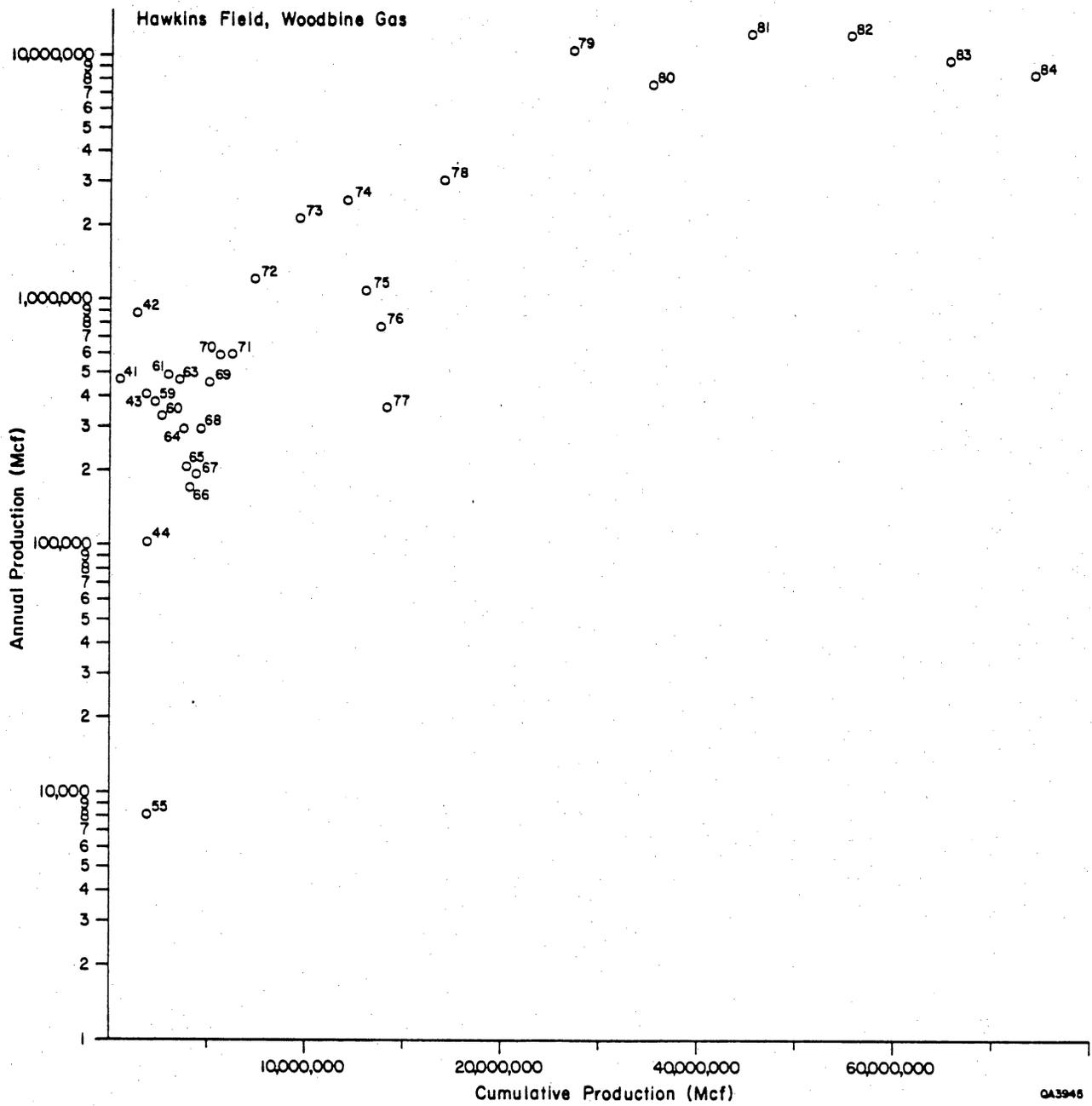


Figure 25. Production decline for the Hawkins Field, Woodbine reservoir.

Production in the Hawkins Northeast Field increased in the late 1970's and is now declining (fig. 26). Production totaled 24,251 bbl at the end of 1984, with an estimated value of \$654,777.

Hydrocarbon Potential

Woodbine and Sub-Clarksville strata appear to have been thoroughly tested for hydrocarbons within parts of the contract area that coincide with the Hawkins salt-pillow anticline and the Earl-Lee turtle-structure anticline. The most recent discovery near the contract area is the Pine Mills West Field in 1982. In this field, production from Woodbine and Sub-Clarksville sands occurs immediately south of the contract area and west of the Pine Mills Field. Away from the regional anticlines, several dry holes have been drilled to Woodbine strata, which suggests low hydrocarbon potential in those areas.

Paluxy sands appear to have been thoroughly tested only in the Pine Mills Field. Few wells have been drilled to the Paluxy or other deeper strata in the contract area. Since 1979, the significant hydrocarbon discoveries made in the northern part of the East Texas Basin have been associated with the Smackover Formation and Cotton Valley Limestone of the Louark Group, Cotton Valley Group sandstones, the Rodessa Member of the Lower Glen Rose Formation, and the Paluxy Formation (Tsoukalas and others, 1984; Cambre and others, 1983; Cambre and others, 1982; Cambre and others, 1981; Collins and others, 1980). The economic potential of these deeper strata in the contract area will remain uncertain until they are tested for hydrocarbons.

Lease Values

Private sources indicate a possible lease value of up to \$300 to \$500 per acre in the vicinity of the Hawkins and Pine Mills Fields in southwestern Wood County. Lease values depend upon several factors, including the production history of an area and the existing market values of hydrocarbons as well as other minerals.

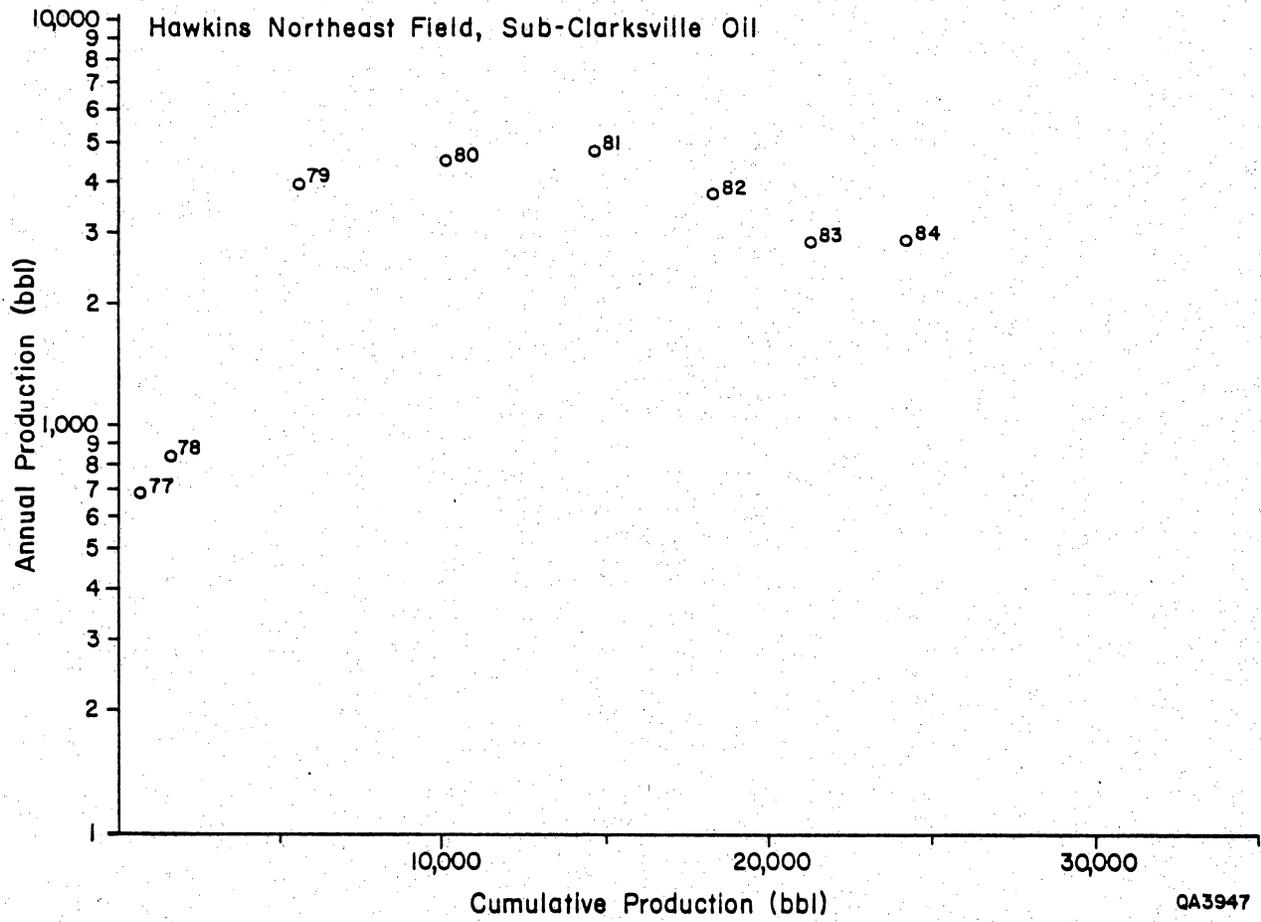


Figure 26. Production decline for the Hawkins Northeast Field, Sub-Clarksville reservoir.

Pipelines

Two principal pipelines cross the contract area (plate 1). Table 3 lists the operating companies, addresses, phone numbers, and pipe sizes. Scurlock Oil Company operates three 8-inch-diameter pipes that trend approximately north-south across the contract area. Exxon Gas System operates an east-west-trending, 20-inch-diameter pipeline that crosses the contract area.

Estimates for Slant and Raised Drilling

The cost of drilling a well in the vicinity of the study area (excluding completion costs) is approximately \$90 per ft (Railroad Commission of Texas). Slant hole drilling can cost up to twice as much per hole as vertical drilling; the steeper the slant angle, the higher the cost. Slant angles drilled to a target beneath the proposed Big Sandy reservoir would not be more than 30 degrees from vertical for a 5,000-ft well drilled on the perimeter of the reservoir. All areas under the proposed reservoir are accessible by slant drilling technology in use today. No estimate for the cost of raised drilling was available. Platforms built would be 30 ft tall at the most.

SAND AND GRAVEL

No sand and gravel mining operations exist in the contract area. However, sand is mined near the proposed reservoir site at localities 2 mi northeast of Big Sandy and 6 mi north of the town of Hawkins. Production costs are determined partly by the following factors: (1) size and type of operation, (2) location and availability of power, water, and labor, as well as length of haul from the pit, (3) nature of the raw material, and (4) miscellaneous factors such as royalties, taxes, and environmental regulations (Fisher, 1965).

Table 3. Operating companies and pipe sizes of pipelines that cross the proposed Big Sandy reservoir site.

Map Number	Operator	Address/Phone	Number of pipelines and pipe sizes
P1	Scurlock Oil Co.	P. O. Box 4648 Houston, Texas 77210 (713) 228-9561	Three 8-inch pipes
P2	Exxon Gas System	P. O. Box 2180 Houston, Texas 77001 (713) 224-0429	One 20-inch pipe

LIGNITE

The Wilcox Group contains lignite of economic thickness (equal to or greater than 5 ft) in northeast Texas; however, no near-surface resources of economic value have been identified by Kaiser and others (1980) in the study area. Forty-four electric logs in and adjacent to the proposed reservoir site were examined and showed no lignite seams as thick as 5 ft. One to two lignite seams underlie the Pine Mills East Field in the M. Polk survey. To the southwest, one to two seams underlie the Pine Mills Field in the Gilliland survey and adjacent surveys to the north. Available logs on the northeastern edge of the Hawkins Field show two to four seams in this region. All seams are deep-basin resources, lying at depths below 200 ft but above 2,000 ft. Prediction of the extent of these seams across the small size of the contract area is unreliable with the sparse well control available.

With current technology, there is no economically mineable lignite in the contract area. The current market price of lignite is about \$14 a ton for surface-mined lignite. Deep-basin lignite recovery methods and products vary; expenses are considerably higher, and recovery is less than for near-surface mining. Development of deep seams less than 6 ft thick is impractical with present in situ gasification technology because of the excessive heat loss that would be encountered and the difficulty of completion in thin seams. No deep-basin resources are currently mined in Texas.

SUMMARY

1. Sixty-eight wells have been drilled within the 360-ft ground elevation boundary of the proposed Big Sandy reservoir site. All of these oil, gas, and dry wells, plus five wells of uncertain status, are shown in plate 1 and described in table 1.

2. Only one well is producing within the 340-ft ground elevation boundary of the contract site. Within the 360-ft ground elevation are 12 producing oil wells (including the well below 340 ft), 2 shut-in wells, 22 plugged or abandoned oil wells, 1 producing gas well,

1 plugged gas well, 30 dry holes, and 5 wells for which the status is unknown, except that they are not producing wells (table 1).

3. The 360-ft ground elevation boundary for the proposed reservoir site crosses five oil and gas fields. They are the Pine Mills, Pine Mills East, Deupree North, Hawkins, and Hawkins Northeast Fields. The Pine Mills Field has produced oil from the 2nd Sub-Clarksville sand, Orr sand, Woodbine Group sands, Woodbine Wagoner sand, and upper Paluxy Formation sands (fig. 6). The production history for these units is summarized in figures 9, 10, 12, 13, and 15. The Pine Mills East Field has produced oil from the 2nd Sub-Clarksville sand and Woodbine Group sands although Woodbine production is outside of the contract area. The 2nd Sub-Clarksville production history is shown in figure 16. The Deupree North Field had only one well, which produced from the Woodbine before it was plugged in 1967. The production history of this field is described in figure 20. In the Hawkins Field, oil is produced from the Woodbine and Paluxy sands (fig. 21), although only the Woodbine production is within the contract area (fig. 23). Gas production in the Hawkins Field is from Woodbine and Rodessa sands (fig. 21), and production from these reservoirs is shown in figures 24 and 25. Oil production history from the Hawkins Northeast Field (Sub-Clarksville reservoir, fig. 21) is analyzed in figure 26.

4. The one producing well below the 340-ft ground elevation is Robbins Petroleum Corp. no. 4 Sallie Lucy Old; it is in the Pine Mills Field (table 1, plate 1). The production is from the 2nd Sub-Clarksville; secondary recovery began after 1965.

5. Private sources indicate possible oil and gas lease values of up to \$300 to \$500 per acre in the vicinity of the contract area.

6. Two principal pipelines cross the contract area (plate 1, table 3). One pipeline system comprises three 8-inch-diameter pipes that are operated by Scurlock Oil Company. The other pipeline, operated by Exxon Gas System, is a 20-inch-diameter pipe.

7. Any potential hydrocarbon reservoirs beneath the proposed Big Sandy reservoir site are believed to be accessible by slant drilling techniques available today. Slant hole

drilling can cost up to twice as much per hole as vertical drilling; the steeper the slant angle, the greater the cost. The average cost to drill a vertical well in the vicinity of the study area is estimated to be \$90 per ft. This does not include completion costs.

8. No sand and gravel mining operations exist in the contract area.

9. Available electric logs show that no lignite seams greater than 5 ft in thickness underlie the study area. Several seams exist at depths below 200 feet; these are deep-basin resources. No deep-basin lignite is now being mined in Texas.

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