1984

Remote Sensing Analysis of the Hollandale Area, Washington County, Mississippi

Walter O'Niell

Open-File Report 84-11

Remote Sensing Analysis of the Hollandale Area, Washington County, Mississippi

Walter L. O'Niell

1984

The Mississippi Mineral Resources Institute
University, Mississippi 38677

REMOTE SENSING ANALYSIS OF THE HOLLANDALE AREA

WASHINGTON COUNTY, MISSISSIPPI

By

Walter O'Niell

September, 1984

INTRODUCTION

The Hollandale area is located primarily in Washington County, Mississippi, covering approximately 400 square miles in the northwestern part of the state adjacent to the Mississippi River. The geologic setting of this region is thought favorable for hydrocarbon accumulations in rocks of Paleozoic and Mesozoic age (Figure 1).

Of the 49 wells located in Washington County, none have been producers and there have been no shows of either oil or gas. However, this does not rule out the possibility of hydrocarbon accumulations. "Igneous rock" or "Volcanics" have been encountered in at least seven wells, indicating uplift may have taken place. Faulting and fracturing, both effective trap forming machanisms, have also affected this area.

Visual examination of a Band 7 (infrared) LANDSAT 3 image (path 24,row 37) aided identification of possible petroleum exploration targets. This involved discrimination of circular tonal anomalies and regional patterns of fracturing and faulting. Subsurface maps were constructed to guide further exploration.

GENERAL GEOLOGY

The area of study is within the alluvial plain of the Mississippi River. Jurassic to Eocene sediments, encountered in wells here, dip to the southwest at less than one degree and are overlain by about 200 feet of alluvium. A stratigraphic column of this region is shown in Figure 2.

Structural features influencing the geology of this region include the Catahoula Lake Fault Zone, the Desha Basin, the Sharkey Uplift, and the Mississippi Embayment (Figures 3 and 4). It has been suggested by several authors that the Mississippi Embayment is an aulocogen, a rift zone where faulting causes a graben to form. Recent aeromagnetic and Bouguer gravity data support this hypothesis (Kane, et al, 1981).

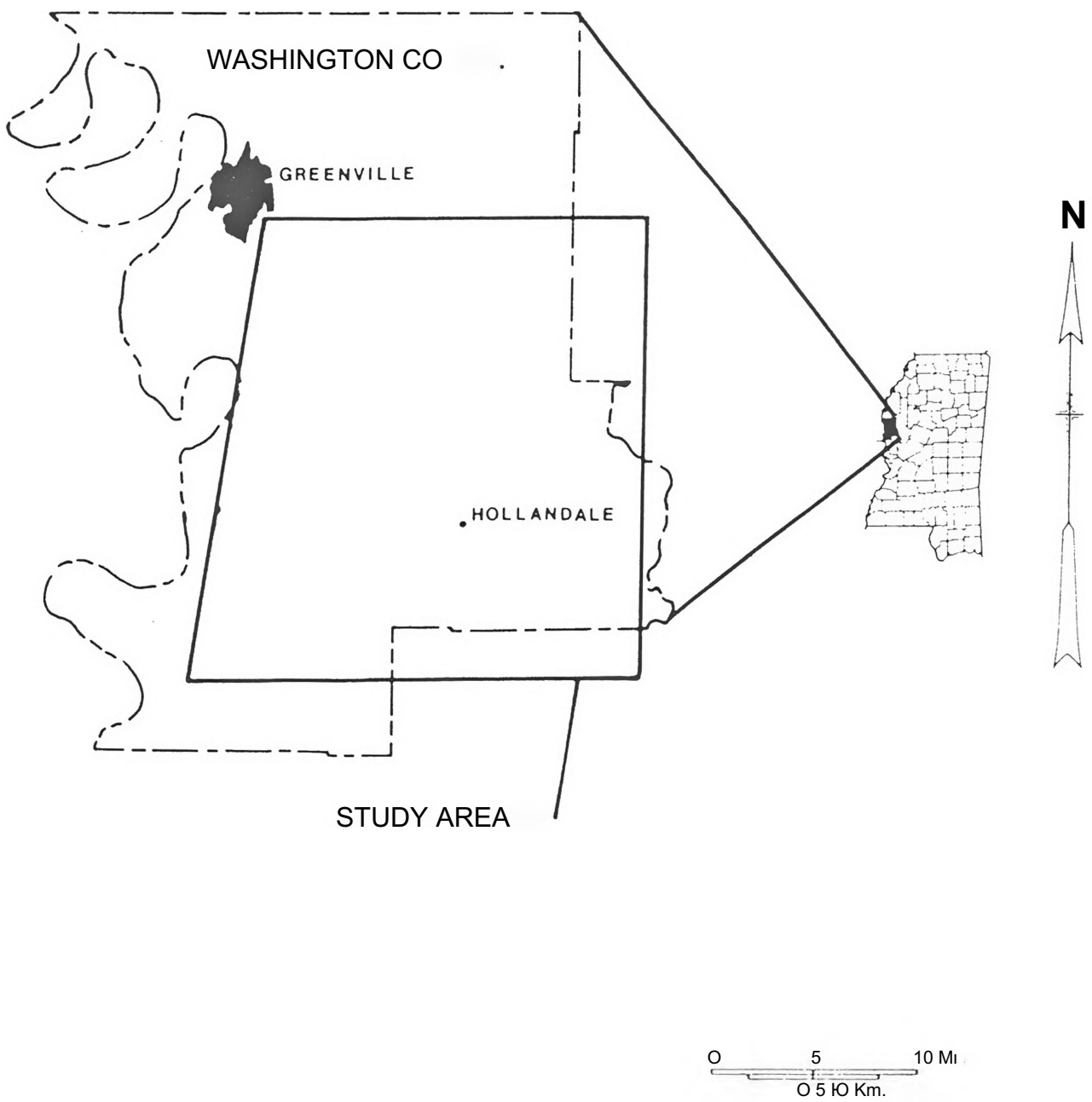

FIGURE 1. LOCATION OF THE STUDY AREA.

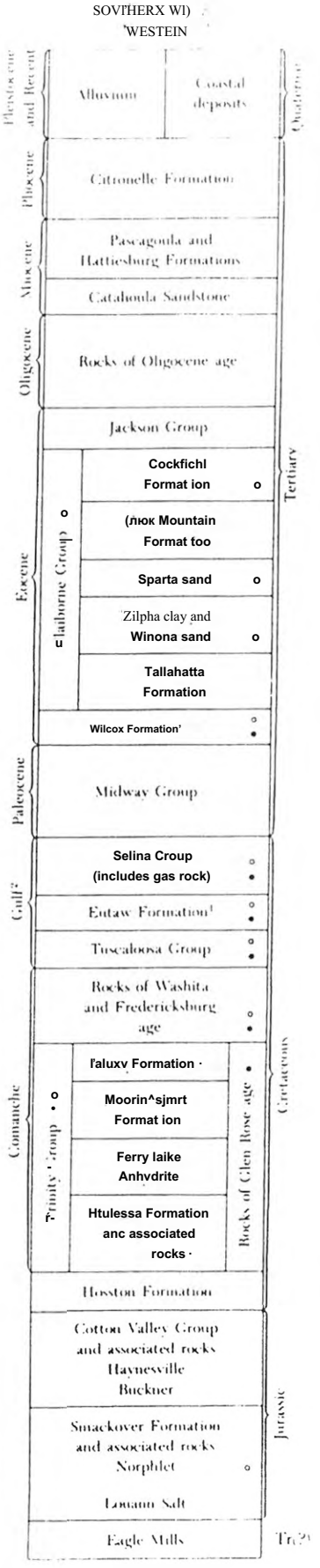

FIGURE 2 . STRATIGRAPHIC COLUMN OF NORTHERN MISSISSIPPI (From Landes, 1970).

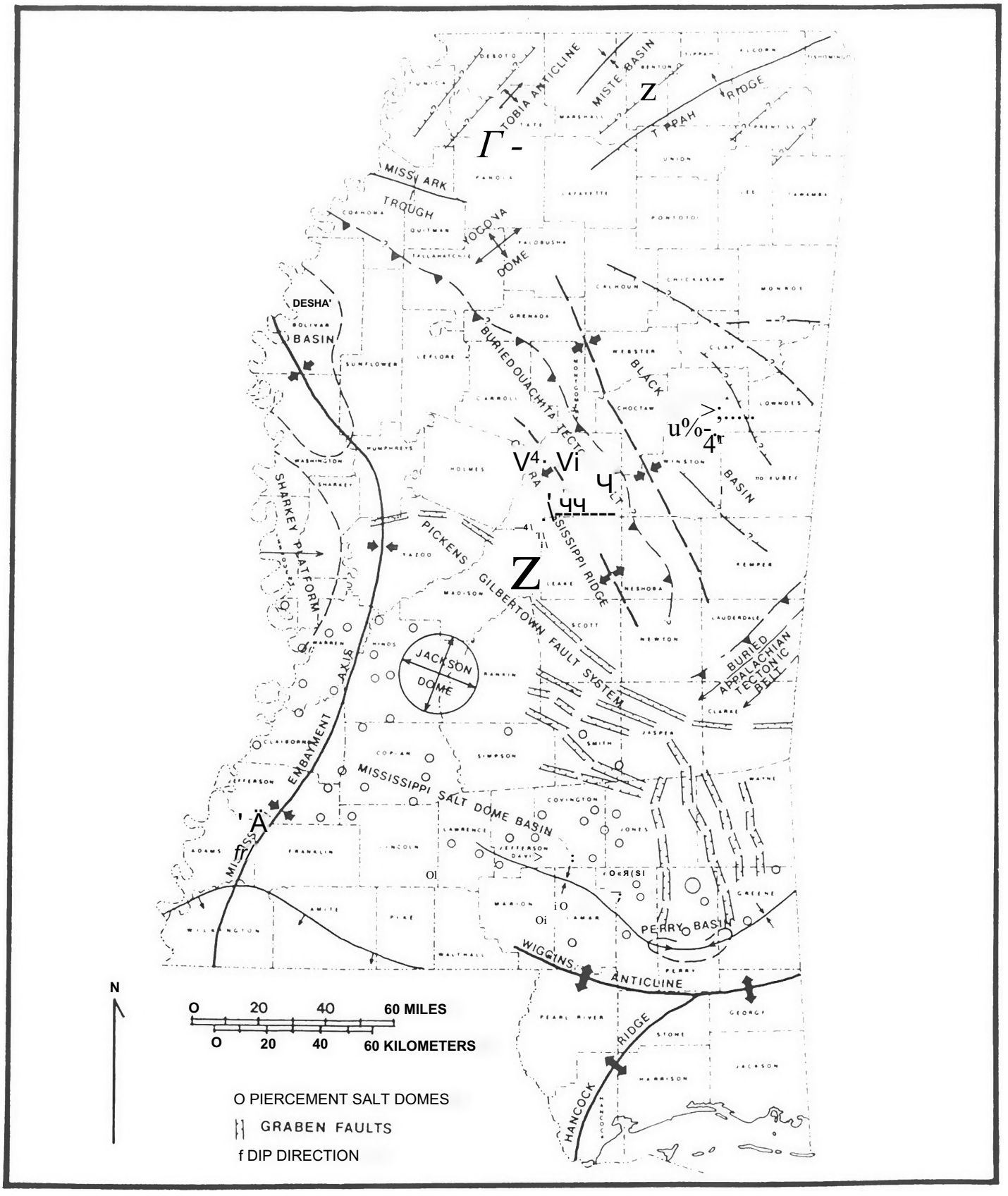

FIGURE 3. MAJOR STRUCTURAL ELEMENTS OF MISSISSIPPI
(From Mississippi Geological Survey).

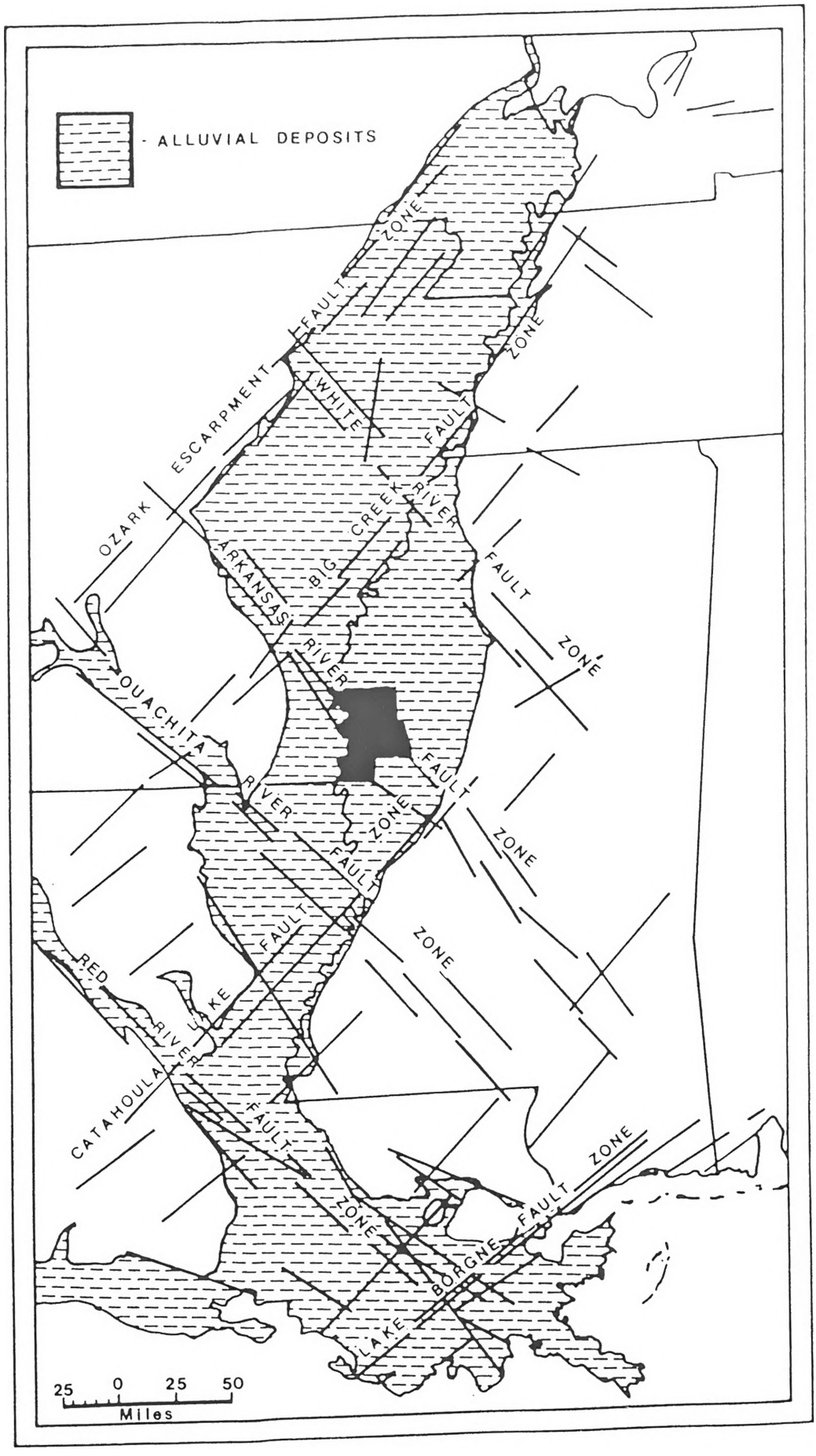

FIGURE 4. MAJOR FAULT ZONES OF THE MISSISSIPPI EMBAYMENT (after Fisk, 1944).

Kane proposed that rifting began in Late Precambrian time. Subsequently a basin developed. Then the rift reactivated in the Mesozoic Era. The later episode of rifting resulted in faulting, igneous intrusion, and development of sedimentary basins in this region. The Desha Basin and Sharkey Uplift are structures which resulted from the activity.

The location of the Sharkey Uplift and sites of individual igneous intrusions are shown in Figure 5. Emplacement of these bodies occurred from Late Miocene (Harned, 1960), during the later phase of rifting as postulated by Kane et al (1981).

The Sharkey Uplift, an eastward continuation of the Monroe Uplift of north Louisiana, is overlain by the Monroe Gas Rock (Figure 6). This rock, which also overlies the Monroe Uplift, is an Upper Cretaceous limestone deposit as much as 100 feet thick. It formed after emplacement of igneous bodies caused uplift, doming, and subsequent erosion of the overlying sediments. A "reef-like" unit (the gas rock) formed over the eroded beds then was sealed by deposition of the Midway Group. Later uplift arched these deposits producing traps for hydrocarbons (Harned, 1960).

LANDSAT ANALYSIS

The LANDSAT image is displayed at a scale of 1:125,000 on a high resolution video monitor in either a black and white or color enhanced mode. Initial analysis of the Hollandale scene revealed the presence of two circular anomalies and numerous lineaments (Figure 7). The circular anomalies are in the eastern half of the scene (Figure 7, Numbers 1 and 2). Major directions of the lineaments are northwesterly and northeasterly. The northwesterly linears are thought to be related to the Arkansas River Fault Zone and the Mississippi Embayment, which follow the same trend locally. Other lineaments, trending northeasterly, are parallel to the direction of the Big Creek and Catahoula Lake Fault Zones (Figures 3 & 4).

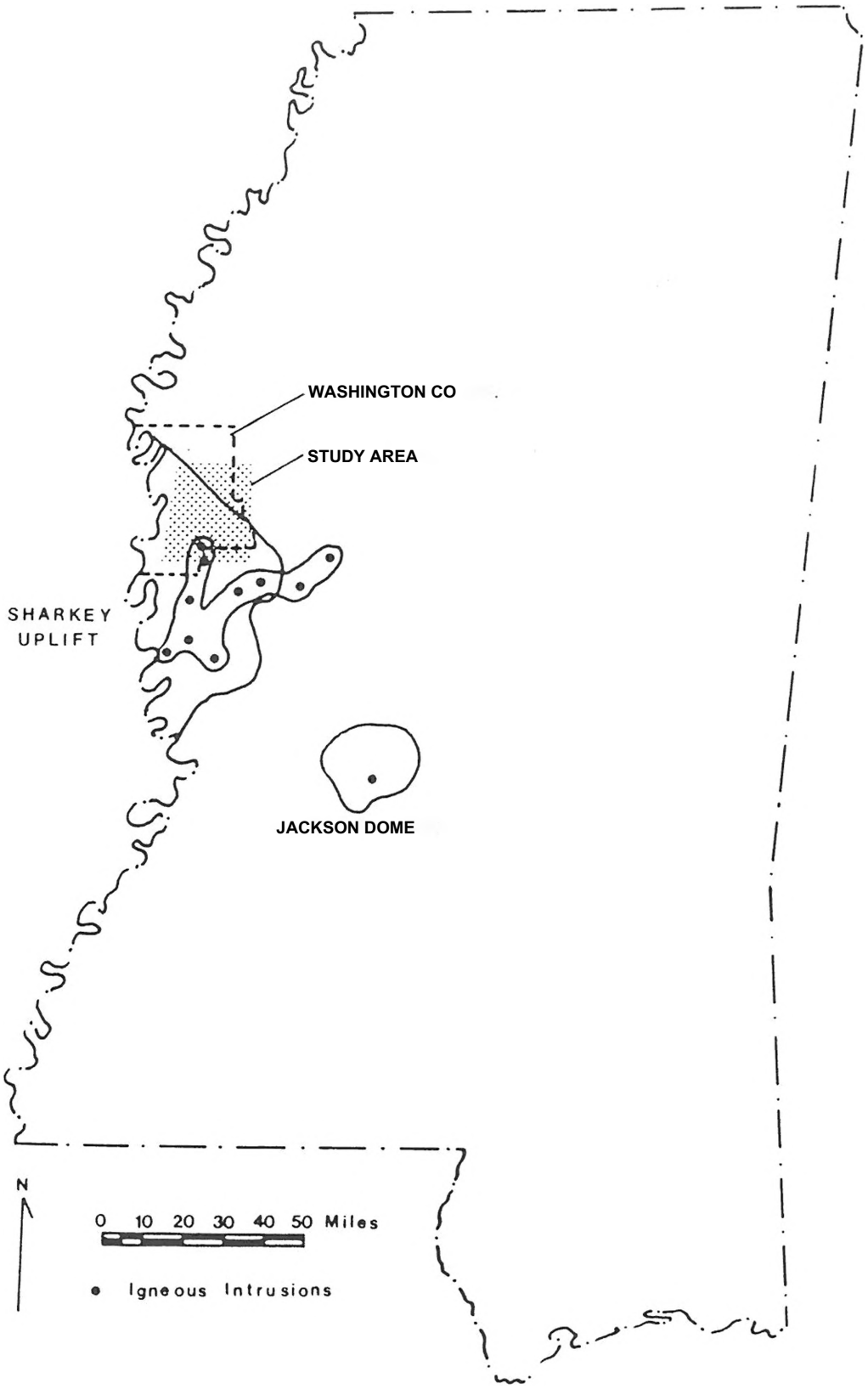

FIGURE 5. LOCATION OF IGNEOUS INTRUSIONS IN WEST CENTRAL MISSISSIPPI (After Harned, 1960).

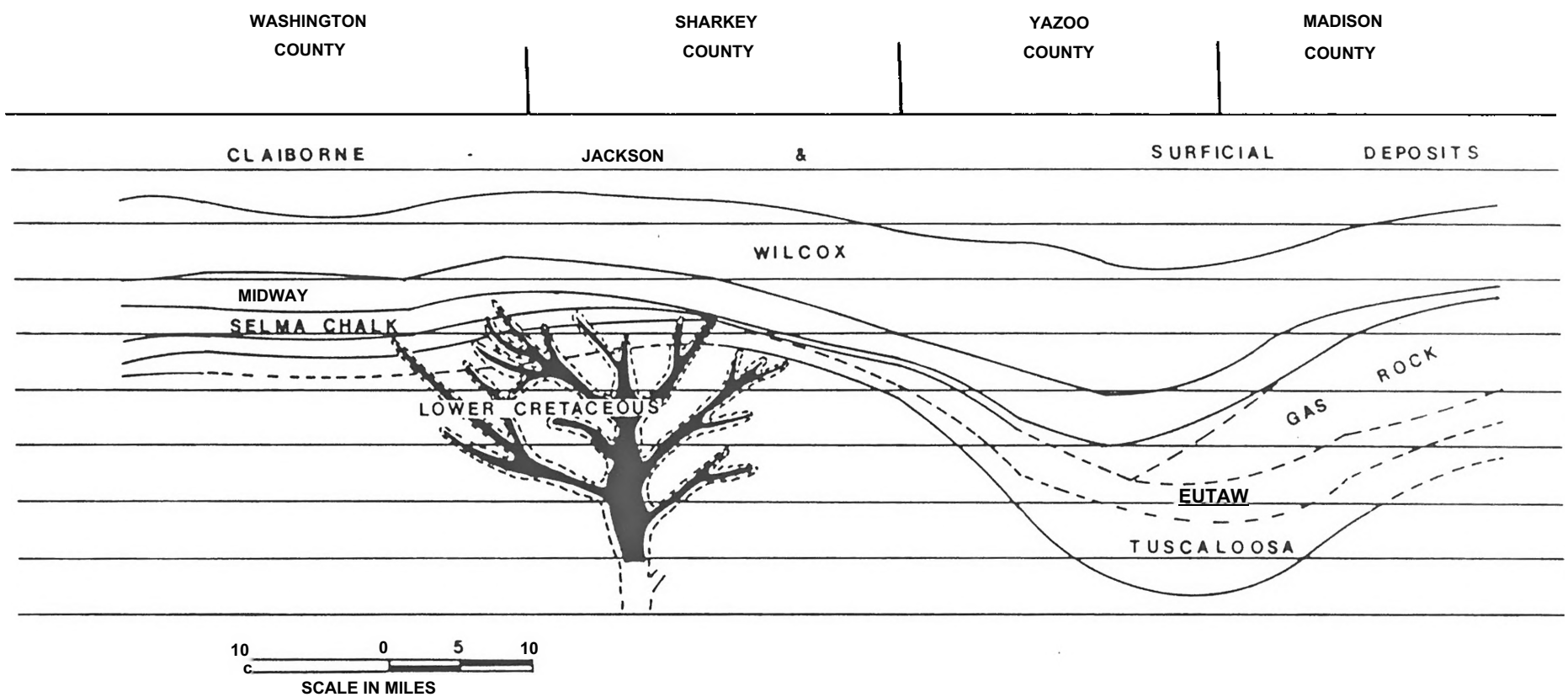

FIGURE 6. THE SHARKEY UPLIFT AND OVERLYING STRATA (from Harned, 1960)..

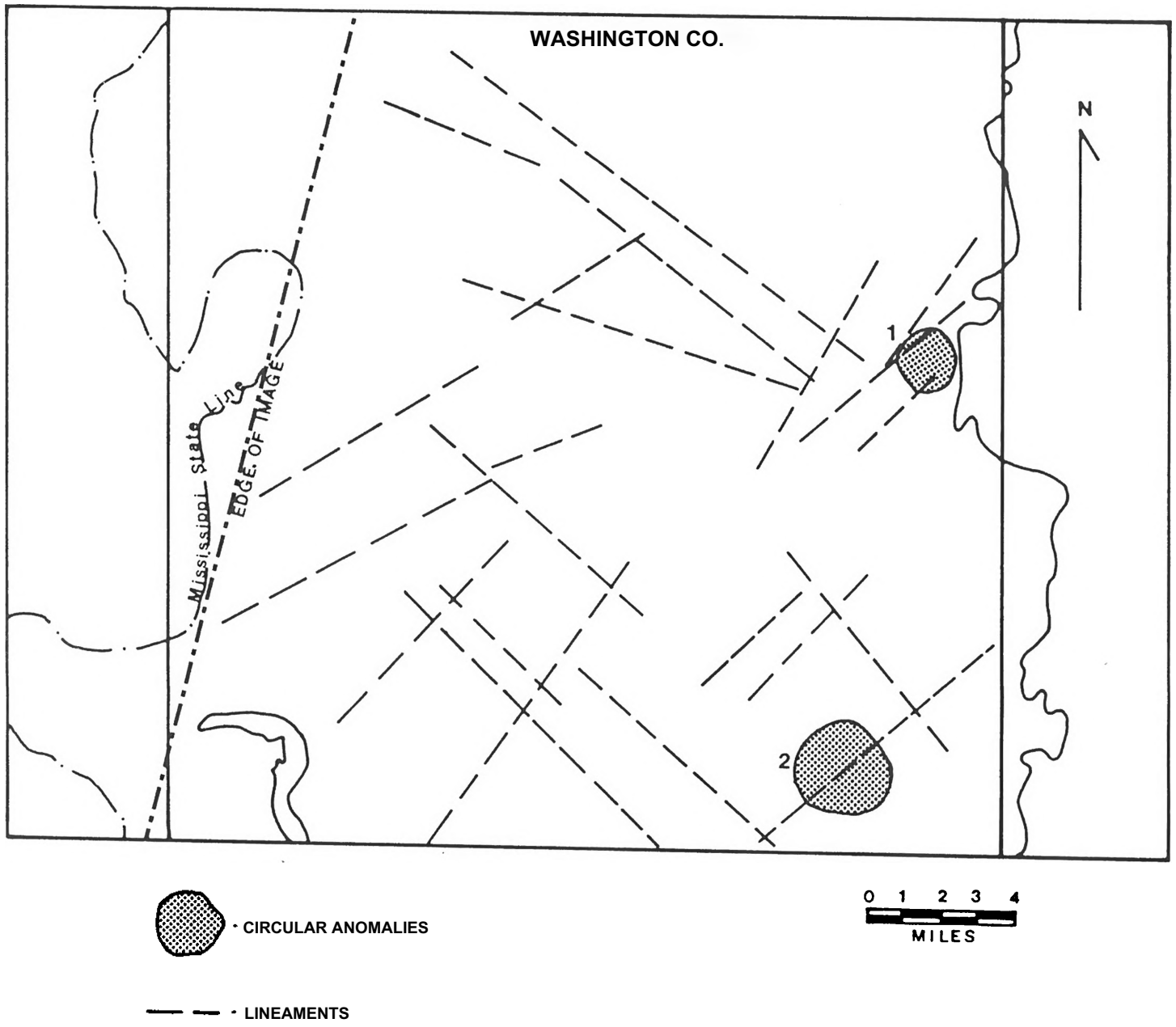

FIGURE 7. REMOTE SENSING ANALYSIS OF THE HOLLANDALE AREA.

Lineaments are generally assumed to represent fractures and faults. Circular tonal anomalies may represent such geologic features as salt domes, igneous intrusions and conceivably microseepage of hydrocarbons. Manmade features such as powerlines, roads, pipelines, and irrigation systems may also exhibit linear or circular patterns, so topographic maps and subsurface and geophysical data are used to lessen interpretational errors.

A prominent circular LANDSAT anomaly near Belzoni, Mississippi, six miles east of the Hollandale area, is thought to be the surface expression of an igneous intrusion (O'Niell, 1983). Well log data indicate that Upper Cretaceous strata thin toward this anomaly, thus suggesting erosion or nondeposition due to uplift. Additionally, igneous material was observed in cuttings from nearby wells. It is concluded that an igneous intrusion related to the Sharkey Uplift is present here.

Structure contour maps, produced from oil well completion card data, display several structural highs in the Hollandale area. Two, in northwestern and southwestern Washington County, are expressions of the Sharkey Platform. LANDSAT anomaly 1 is at the site of the third structural high of the contour map of the top of the Selma Group. Reported stratigraphic positions of gas rock and igneous material in wells at these locations suggest that igneous intrusion and uplift occurred here during the Cretaceous Period.

CONCLUSIONS

Analysis of the Hollandale area suggests that igneous intrusions caused local uplift during the Cretaceous Period. Sites of intrusion (the circular anomalies), as well as fractured and faulted areas (indicated by LANDSAT lineaments), should be favorable locations for potentially economic hydrocarbon accumulation. Gravity, magnetic, and seismic, and possibly radioactivity or geochemical data may be helpful in screening and evaluating circular LANDSAT anomalies prior to eventual testing by drilling.

APPENDIX A

WELL LOG DATA

No.	Loc.	Operator - Well	Elev.	TD	Tops	Inti. Prod. or DST
1	9-14N-7W	A.W. Williams & Roy Northern, #1 Dean	117'	3806	Wx 1573′ Mwy 2801′ G. Rock 3433′ B/G Rock 3547′	TD in Igneous D 6 A
2	3-14N-8w	Shell Oil Co., #1 M.S. Skinner	122′	3410′	NA	D & A
3	1-14N-8W	Perkins & White, #1 Mary B. Lee	118′	3455′	Wx 1580' Mwy 2558′	D & A
4	4-14N-8w	Shell Oil Co., //1 R.D. Fisher	NA	3453′	NA	D & A
5	9-14N-8W	Charlie Perkins et al, //1 General American Farms	NA	500′ SH	NA	D & A
6	7-14N-9W	Placid Oil, //1 W.H. Cooper	112′	6677′	Wx 1675' Mwy 2652' G.Rock 3160' Pal 3252' CV 3620' Smk 6420'	D & A
7	15-14N-8W	Noble & Perkins, #1 Middleton - Worthington	122′	6598′	Wx 1614' Cly 3220' G.Rock 3248' Hoss 3350' CV 3710′ Smk 6300'	D & A
8	30-14N-9W	Solitaire, #1 Williams	110′	3054′	NA	D & A
9	30-14N-9W	Alhombra oil, //1 Williams	110′	2630′	NA (no log)	D & A
10	30-14N-9W	Alhombra oil, #2 Williams	NA	1950′	NA (no log)	J & A

No.	Loc.	Operator - Well	Elev.	TD	Tops	Inti. Prod, or DST
11	30-14N-9W	Alhombra oil, #3 Williams	110′	3433′	Cly 315′ Spar 695′ Cret 1295′ Wx 1560′	D & A
12	24-15N-5W	Murphy & Sun, //1 W.B. Swain	109′	4312′	Log not Released	D & A
13	14-15N-6W	David K. Brooks, #1 Luis Keith	105′	9263′	Mwy 2802′ G. Rock 3630′ CV 6790 Hay 8452' Smk 8907'	D & A
14	20-15N-6W	Murphy & Co., #1 Treadway	118′	7815′	Wx 1495' Mwy 2817' Chalk 3517' L/Cret 3817′ CV 4330′ Smk 6930'	D & A
15	28-15N-6W	Moses & New, #1 Treadway	112′	3908′	Tall 1250' Wx 1503′ Pc 2801' Cly 3500' B/Ch & T/Tus (?) 3701' L/Cret 3803′	D & A
16	30-15N-6W	Murphy & Sun, #1 Ganier	120′	4466′	Log not Released	D & A
17	8-15N-7W	Leroy Percy St. Park, #1 Water Well	105'	1716′	NA	D & A

No.	Loc.	Operator - Well	Liev.	TD	Tops		í ntl. ? rod . or DS ï¨
18	8-15N-7W	Warrer & Tide Water, //1 Leroy Percy St. Park	112'	5501'	Chalk Tuse L/Creţ	3506' 3756' 3836'	D δ A
19	8-15N-7W	Murphy, //1 Wilton	NA	3879'	Log not Released		D 6 /X
20	14-15N-7W	Murphy, //1 Mattie Lee	113'	7593'	Wx Mwy Ch G. Rock L/Cret Smk Ign	1508' 2740' 3448' 3690' 3970′ 6520′ 7440′	D & A
21	2-15N-8W	Murphy & Sun, //1 Currey	120′	3790'	NA		D 6 A
22	18-15N-8W	Feagel & Monia, //1 Quinn	110′	3605'	Wx Pc Cly G. Rock Reworked	1585' 2619' 3209' 3290- 3400' igneous 3535'	D 6 A
23	18-15N-8W	Delta, //1 Rich	NA	3708′	NA		D δ A
24	29-15N-8W	Robertshaw & Crow, //1 Shutt	118′	4077 ′	Wx Pc Cly G. Rock T/Igneous Sill	1624' 2597′ 3176' 3254- 3296' 3296'	D δ A

No.	Loc.	Operator - Well	Elev.	TD	Tops	Inti. Prod, or DST
25	35-15N-8W	Kingwood oil, #1 Rucker	116′	4520′	Tall 1335′ Wx 1565′ Mwy 2590′ Sei 3300′ G. Rock 3385′ Igneous 4415′	
26	28-16N-6W	Cities Service, #1 Ingram	NA	4661′	NA	D & A
27	29-16N-6W	Cities Service, #1 Vieh	114′	4338′	Tall 1471′ Wx 1763′ Pc 3086′ Ch 3767′ Eu Sd & Sdy Sh 4091′	D & A
28	19-16N-7W	Murphy & Sun, #1 Brown	112′	5150′	NA	D & A
29	21-16N-7W	Murphy & Sun, #1 Mayhall	112′	4628′	NA	D & A
30	34-16N-7W	Lee Raines, #1 Aldridge	121′	4020′	Cook Mtn 571′ Spar 730′ Win 1500′ Wx 1812′ Mwy 3211′	D & A
31	25-16N-7W	Murphy & Sun, #1 Jones	117′	4895′	NA	D & A
32	31-16N-7W	Murphy & Co., #1 James	NA	4158'	NA	NA
33	22-16N-8W	Murphy & Co., #1 Kimbrough	121′	4629′	NA	D & A
34	23-16N-8W	Murphy & Co., //1 Branton	123′	4253′	Wx 1754′ Mwy 2626′ Ch 3594' B/Ch 3731′	D & A

No.	Loc.	Operator - Well	Elev.	TD	Tops	Inti. Prod, or DST
35	35-16N-8W	Marine Prod. Co., #1 Trotter	NA	3739′	NA	D & A
36	35-16N-8W	Jack Anderson, //1 Trotter	115′	3917′	Win 1394' Wx 1656′ Mwy 2692′ U/Cret 3326′ G.Rock 3430′ L/Cret 3554′	D & A
37	19-16N-8w	Murphy & Sun, #1 Lans	119′	5021'	Zil 318′ Win 1382′ Wx 1803′ Mwy 3040′ Ch 3700′ Vol. Ash 4054-4866′ L/Cret 4920′	D & A
38	24-17N-6W	Amoco Prod., #1 John Dean	108'	10,800'	NA	D & A
39	7-17N-8W	Killman, //1 Fisher	126′	7062′	Win 1550' Wx 1780′ Mwy 3286′ Cly 4000′ Sei 4010′ Eu 4526′ Tuse 5180' Com 5410′	D & A
40	12-17N-8w	Murphy & Co., #1 Wynn	117′	4873'	Tall 1538′ Wx 1770 Mid 3056′ Ch 3708′ Taylor 3926′ Tuse 4486′ L/Cret 4716′	D & A

No.	Loc.	Operator - Well	Elev.	TD	Tops	Inti. Prod. or DST
41	2-17N-8W	Mallard Expl., #1 Castelli	115′	8518′	Mwy 2797′ Sei 3457′ L/Cret 3916′ CV 5639′ Smk 7248′ Wer 7837′ T/Eagle Mills (?) 7957'	D & A
42	2-17N-9W	Mississippi Valley Gas, #1 Bell	133′	5190'	Wx 1790′ Cly 3510′ B/Ch 3912′ Smk 4008′ E/M 5097′	D & A
43	12-17N-8w	Oromnd Drlg., #1 Douglass Wynn	NA	6014′	Wx 1760′ Mwy 3075′ Cly 3745′ Sei 3755′ Eu 4220′ Tuse 4500′ Cret 4752′ Tra. Pk 4856′ CV 5470′	D & A
44	18-17N-9W	Mississippi Valley Gas, #1 W. Character	133′	5321'	Wx 1857′ Mwy 2915 ′ Ch3585-3997′ Smk (?) 4110'	D & A
45	18-17N-9W	Mississippi Valley Gas, #1 Terry-Bell	135′	5159′	Tall 1511′ Wx 1835′ Mwy 2837′ Ch 3503-3900′ Ign & T/Smk 3967′	D & A

No.	Loc.	Operator - Well	Elev.	TD	Tops	Inti. Prod. or DST
46	19-17N-9w	Union Oil of Calif., #1 T.Johnson	127'	4579'	Wx 1875′ Mio 2923′ Sel(Cret) 3568′ B/Sel & T/Smk 4023' EM 4390′ 1st Sd 4490′ Ign 4575′	D & A
47	19-17N-9w	Mississippi Valley Gas, #1 T. Johnson	127'	4579′	Wx 1875′ Mwy 2923' Sei3868-4023' Smk 4023' EM 4390' Sd 4490' Ign 4575' Nor (?) 4747′ EM (?) 5174′	D & A
48	26-18N-6W	Gruss & Hawkins, #1 Neil	122′	6420′	Wx 1833′ Mwy 3407' Cly 4240' Sei 4261' Eu 4910′ Tuse 5758′ Pal 6347′	D & A
49	22-17N-5W	Lisbon Gasoline, #1 Wynn et al	135'	5060′	Cr 1386′ Wx 1810′ Mwy 2826′ Cly 3450′ Sel 3480-3870′	D & A
50	31-14N-5W	Clyde Creighton, #1 Kastel	111'	3884′	Cr 1055′ Win 1230′ Wx 1432′	D & A

No.	Loc.	Operator - Well	Elev.	TD	Tops	Inti. Prod. or DST
50		(continued)			Mid 2980′ Ch 3607′ Tuse 3734′ L/Cret 3803′	
51	5-14N-6W	Shell oil, #1 Crawford	NA	3700′	NA	D & A
52	9-14N-6W	Tide Water, #2 Panther Burn	109′	3765′	Wx 1500' Mwy 2747′ U/Cret 3460' Ign 3584'	D & A
53	14-14N-6W	United Gas Pub. Ser, #1 Lenhart	108′	3807′ in igneous	Wx 1424' Mwy 2846' Cret 3586'	D & A
54	15-14N-6W	Eureka Pet., #1 Cooper	109′	3729′	CR 998' Tall 1237′ Wx 1455′ Mwy 2780′ Ch 3514' Sd 3640—3668′ Ign 3694- -3729′	D & A
55	17-14N-6W	Tide Water, #1 Panther Burn	NA	3538′	NA	D & A
56	19-14N-6W	Shell, #2 D.D. Low	NA	3735′	NA	D & A
57	20-14N-6W	Shell, #1 D.D. Low	NA	3700′	NA	D & A
58	34-14N-6W	Wadley, #1 Durst	106′	4008′	Wx 1510′ Sd 1522′ Mid 2841′ Cla 3580′ Sel 3610′ Marl 3690′ Aus 3773′ L/Cret 3810′	NS

No.	Loc.	Operator - Well	Elev.	TD	Tops	Inti. Prod. or DST
59	12-14N-7W	Amerada, #1 Panther Burn	120′	4418′	Wx 1555′ Ch 3500′ Sd 3643′ B/of sd igneous 3770′	D & A
60	14-14N-7W	Amerada, #2 Panther Burn	118′	3970′	Zil 1184′ Win-Tall 1335′ Wx 1567′ Mid 2807' Ch 3494' Tay sd. 3629′ L/Cret. 3763'	D & A
61	24-14N-7W	Walker-Bracken et al, #1 McGee	116′	3746′	Wx 1567' Mwy 2818' G.Rock 3497--3618′ Tay 3618- -3724′ 1st ign 3730′	D 6 A
62	16-14N-6W	Holman, #1 Unit 16-16	108′	3650′	Ch 3560′ Wood 3630'	D & A
63	4-14N-4W	Giant Pet., #1-4 Bass	115′	6500′	Mwy 2775' Sei 3495′ L/Tusc 4330′ L/Cret 4740′	D & A
64	16-14N-4W	Giant Pet., #1-16 School Brd.	122'	8440′	Mwy 2660′ Sei 3376′ Undiff. 3618′ Smk 7925′	D & A

No.	Loc.	Operator - Well	Elev.	TD	Tops	Inti. Prod. or DST
65	29-14N-4W	Dancinger oil, #1 Bellegrade Lbr.	96′	3014′	Wx 1250′ Mwy 2682′	D & A
66	15-14N-4W	Union Prod. Co., //1 Box	115'	5652′	Wx 1230′ Mwy 2659′ Sei 3479' Ign 3632-5652′	D & A
67	23-14N-4W	Fred Wall, #1 C.B. Box est	109′	4516′	Zil 850′ Win 1045′ Wx 1273′ B/Wx 2580′ Mid 2818′ Cly 3405′ Sei 3410′ Wood 3550′ Wtr. lain 3695′ Vol Ign to TD 4516′	D & A
68	36-18N-5W	Ohio oil, #1 Percy Ray	123′	5707′	Cly 4075′ Sei 4150′ Eu 4732′ Tuse 5689′	D & A
69	8-17N-5W	Petro & Hamill, #1 Gardner	130′	9800′	Wx 1712′ Ch 4286′ Coff 4920′ Eu 4996′ L/Tusc 5753′ L/Cret 6018′ Hoss 6190′ CV 7248′ Hay 8750' Buck 9334′ Smk 9467′ Ign 9777′	D & A

to
to