

## PETROLEUM GEOLOGY

A small area, located in a southern state, is part of a larger region which has been mapped by the U. S. Geological Survey. This mapping has established the following stratigraphic sequence for the region. The units are in stratigraphic order, i.e., from top to bottom.

Unit	Thickness (feet)
Thick gray shale and sandstone	
Upper limestone	12
Green and red shale	63
Gray sandy shale	125
Coal	2
Gray sandy shale	47
Red sandstone	51
Fossiliferous limestone	4
Green and red shale	360

All of these formations were found within the map area, but only three of them, the Upper and Fossiliferous limestones and the coal, could be recognized consistently. Using the tops of these three beds, enough points were mapped along their outcrops to (1) make a topographic map of the region and (2) to make a structure contour map on the top of the coal bed.

Points on the map are distinguished as follows:

- Triangles - instrument stations
- Circles - points on top of the Upper limestone
- Crosses - points on top of coal
- Squares - points on top of the Fossiliferous limestone

After the geology of this region had been published by the U.S.G.S., a smart petroleum geologist noted that there was evidence of a domal structure within the map area. On the basis of this observation a test well was drilled on the structure. In this well, number 1, a strong flow of gas was encountered at a depth of 1522'. Further drilling was encouraged by this result, and a regular drilling program for production and exploration was undertaken. The list on the next page gives the results of the first 20 drill holes.

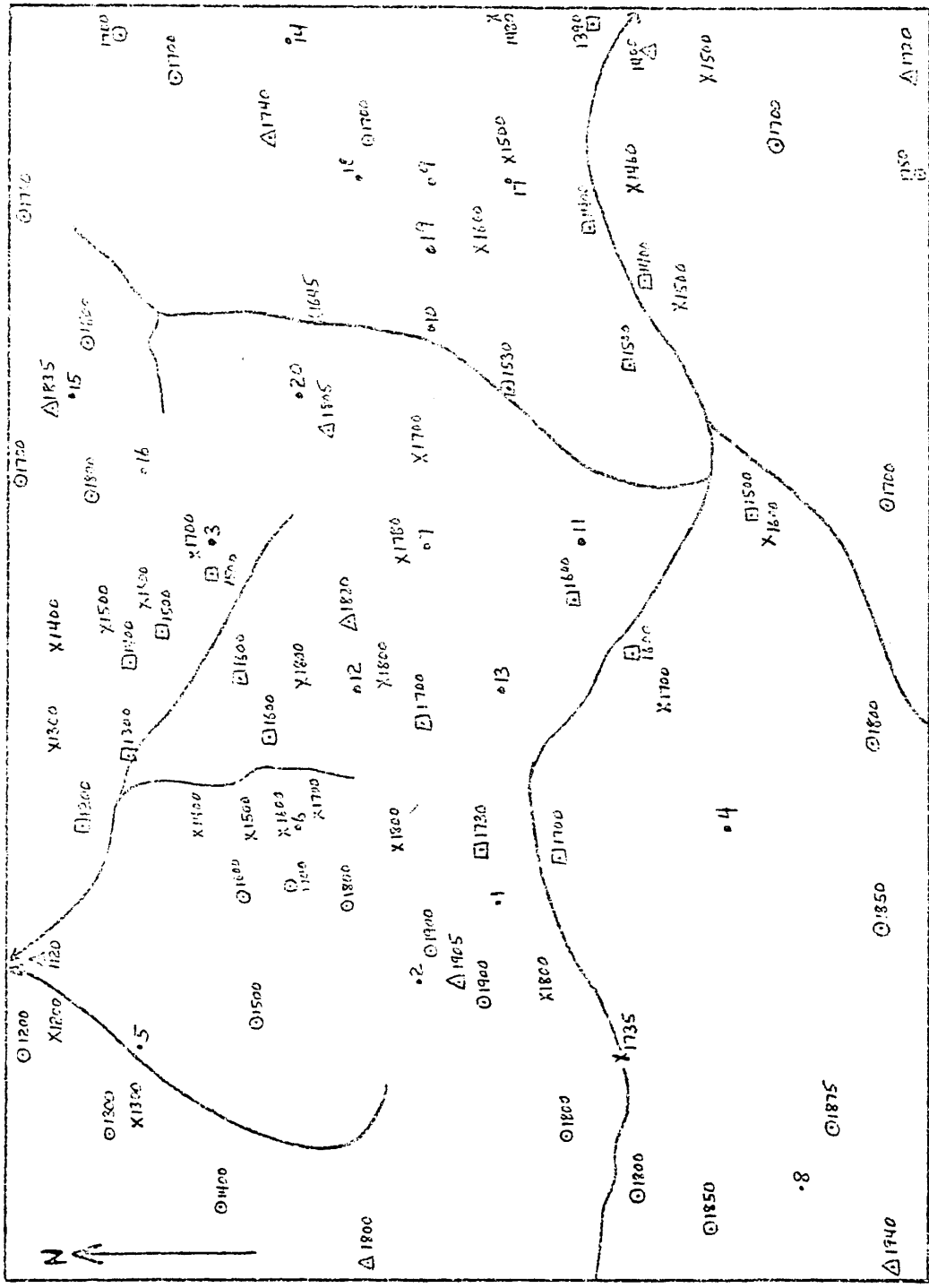
**TABLE 1. Data from Wells 1 - 20**

Well	Fluid	Elev.	Depth Below Surface (feet)					Interval coal to prod. horiz.
			Top	Top	Top	Elev.	Interval	
			1st ls.	Top coal	2nd ls.	Prod. horiz.		
1	gas	1715	-	-	0	1522		
2	oil	1895	5	205	305	1800		
3	gas	1670	-	-	40	1563		
4	oil	1770	-	45	145	1663		
5	water	1240	-	-	-	1543		
6	oil	1650	-	20	120	1626		
7	oil	1690	-	-	55	1542		
8	water	1883	48	248	348	1858		
9	oil & water	1615	-	65	165	1624		
10	oil	1595	-	-	55	1530		
11	oil	1560	-	-	-	1477		
12	gas	1803	-	0	100	1588		
13	oil	1635	-	-	-	1474		
14	water	1690	0	200	300	1808		
15	water	1815	5	205	305	1845		
16	oil	1810	-	130	203	1759		
17	water	1500	-	-	80	1555		
18	water	1703	-	178	278	1758		
19	water	1645	-	45	145	1596		
20	water	1800	-	115	215	1725		

Using the information shown on the map of the area, and the drill hole data on the preceding page, prepare the following:

1. A topographic map of the area using a 100' contour interval.

2. Superimpose on the topographic map prepared in (1) the outcrop of the Upper limestone in blue pencil, the coal in green, and the Fossiliferous limestone in red. Shade with light diagonal lines that part of the region in which the coal bed has been removed by erosion.
3. On a second copy of the map, make a structure contour map on the top of the coal bed. Use a contour interval = 100'. Where the coal has been removed by erosion, restore the structure using dashed structure contour lines.
4. Prepare a structure contour map on the top of the producing sand. Contour interval = 50'. Use dashed lines where much extrapolation or personal interpretation is necessary.
5. Prepare an isopach map showing the variation in thickness of the beds between the top of the coal and the top of the producing sand. Isopach interval = 10' (or 20' where necessary). Use dashed lines where much extrapolation or personal interpretation is necessary.
6. Prepare a structure cross section from well 5 southeast to well 7, and thence east to the east edge of the map area. Use the horizontal scale of the map and a vertical scale of 1" = 500'.
7. On the basis of 100% hindsight, explain the distribution of gas, oil, and water in the wells.



6" = 1 mile

○ Top of lower ls. exposed

□ well location

○ Top of upper ls. exposed