PART 3: CONSTRUCTING AND USING MAPS OF SUBSURFACE GEOLOGY

Geologists and geological engineers often must determine the attitude of a surface (e.g., the top or base of a rock unit) or the thickness variation of a rock body in the subsurface. This information is very useful when exploring for hydrocarbons, water, or any type of construction that involves excavation. Therefore, geologists and geological engineers commonly use two types of maps:

- **Structure contour maps,** which use contour lines to show the configuration of the top of a rock unit (or sometimes the base of a rock unit, whichever is more useful). In other words, they illustrate the configuration of a surface relative to sea level or to some other horizontal datum.
- **Isopach maps,** which show the variation in thickness of a rock unit.

In this part, you will finish constructing a structure contour map. You will use it, in combination with an isopach map, to predict the location of a new hydrocarbon well. Start by completing the structure contour map in Figure 16.6. Use a pencil to draw in elevation contours using a contour interval of 100 feet and elevations provided for the *top* of the reservoir sandstone unit. Be sure to label the elevations of the contour lines that you construct.

Historically, some wells in Figure 16.6 have produced oil and gas (black dots), whereas others produced only salt water (dry-hole symbols—circles with ticks). Using a green pencil, color areas underlain by salt water.

Questions

8. What type of hydrocarbon trap is present in this map area?
9. Imagine that this is an old hydrocarbon field in which all wells have been abandoned (filled with concrete). Use the structure contour map in Figure 16.6 and the isopach map of sandstone thickness in Figure 16.7 to determine and mark the exact location on Figure 16.6 that is the best place to drill a new hydrocarbon well.
10. Using the Public Land Survey System discussed in Laboratory 8, page 141, specify the precise location of your proposed well by determining its section number and the quarter of a quarter within it.
11. Why is this location the best place to drill?
12. How deep must you drill to get to the bottom of the reservoir sandstone at this location?

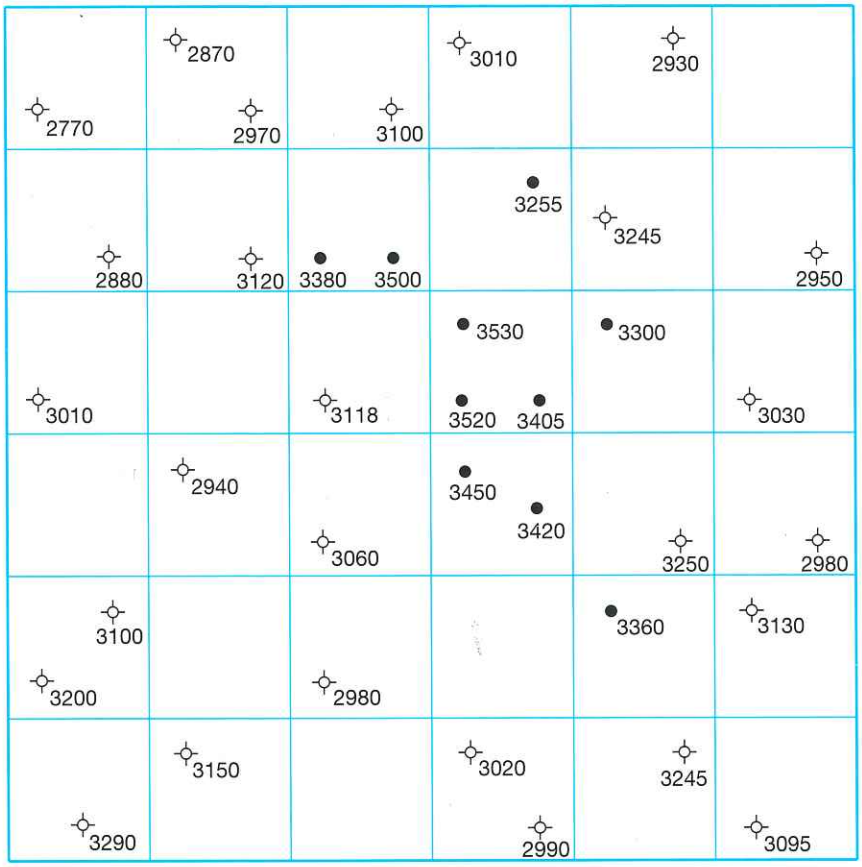

FIGURE 16.6 Map of a township in the Public Land Survey System showing elevations of points in wells where they contacted the top of a reservoir sandstone. Elevations are in feet above mean sea level. Solid black dots represent "producers," wells that produced oil and/or gas. Open circles with ticks represent "dry holes," wells that produced only salt water or nothing at all.

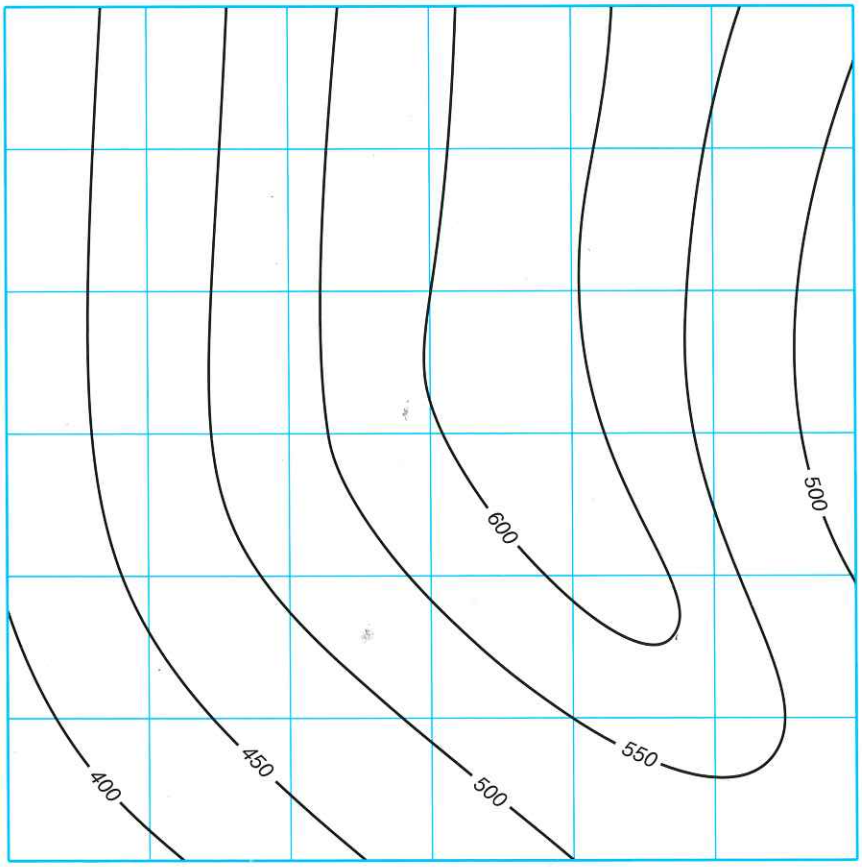

FIGURE 16.7 Isopach map showing thickness of the sandstone formation in Figure 16.6.