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Well Log Correlation Lab

Sedimentary Geology

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## Well Log Correlation: Lab Report 11

### **Introduction:**

Well logs provide detail of the variation of physical properties of the various rock layers below the ground. This method allows for geologists and other professionals concerned with this geologic information to determine the specific properties of the layered rock and sediment superimposed upon each other in a specific geographical location or land site. Personal ground water use, large and small scale construction, oil and gas drilling companies, and city planning rely on these data. In this Lab, we analyzed well logs in order to correlate the deposits with geophysical data. Different types of well logs are used to measure subsurface electrical resistivity, porosity, as well as density (Ellis & Singer, Web). One example would be determining whether or not water within the underlying ground was saline or not by use of measuring the electrical resistance of solutions which may or may not contain large concentrations of dissolved electrolytes such as sodium chloride. The particular logs being examined in this lab are from wells that were drilled in Humboldt County, California for the exploration of hydrocarbon near Tompkins Hill.

### **Methods:**

In order to glean as much information necessary to correlate the data of hydrocarbon concentrations within separate wells along Gas Well Road in Humboldt County, we took the varying locations of the wells into consideration, as trends in one log most closely related with the trends in the subsequent log from the well closest to the prior location. Each well, HE 5, HE 7, HE 8, and HE 10 are marked with a red circle in *figure 1*. Analyzing the plot diagrams of each log and matching up specific sequences of change in curve intensity was the main basis for correlating these four logs. Along with this graphical analysis of the consistency of the subsurface constituent rock, approximate depths measured from below the specific elevation of each well were used to further guide the correlation. Results from the correlation are shown in *figure 2* in the results section below. Each correlation is labeled in order to organize the data from top to bottom, letters A through E (in red).

### **Results:**

We were able to correlate several units from each of the well logs with each of the other logs from the various sites noted on our map section below (*figure 1*). The logs were lined up in order, from west to east, and labeled according to which well the data was retrieved from. Units of correlated data are outlined in red in *figure 2*. Using the patterns in the graphical analysis of the resistivity of the material, we were able to locate where the larger concentrations of hydrocarbon were. These are noted with letters A, B, C, D, and E. You can see the data trend tends to remain the same throughout each of the logs, where the spikes are located further below the surface in log HE 10, elevated slightly in HE 8, and nearly adjacent to these in HE 7.

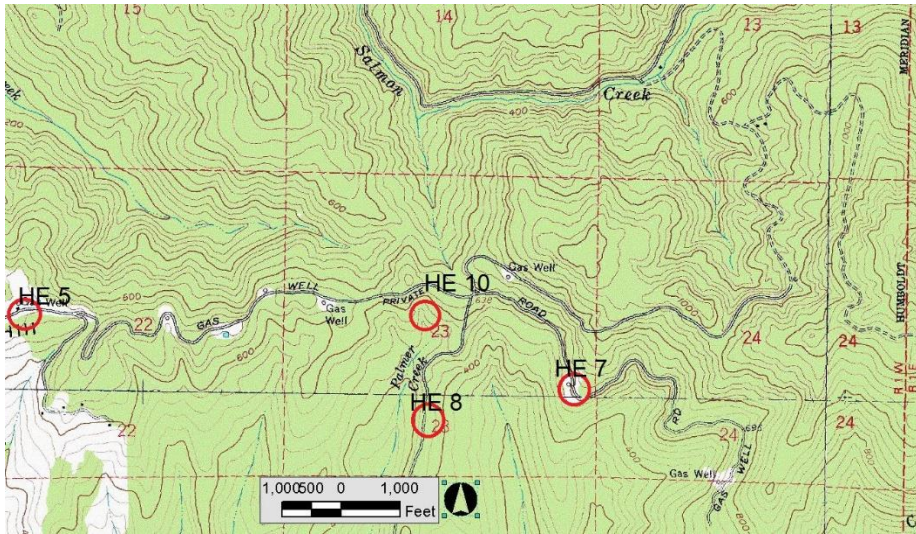


Figure 1: Tompkins Hill Map Section, featuring Wells HE 5, HE 7, HE 8, and HE 10.

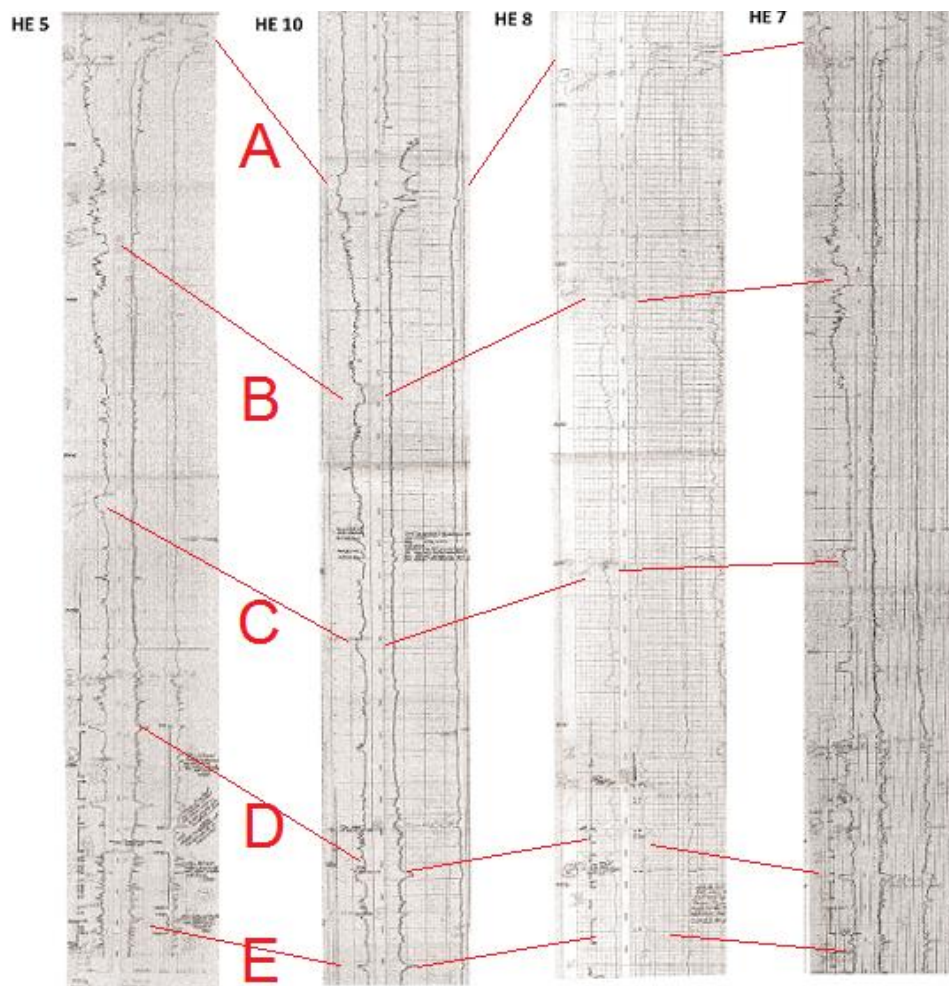


Figure 2: Well Logs HE 5, HE 10, HE 8, and HE 7 in order from east to west

### **Interpretation/ Discussion:**

The spikes in the data that were outlined in the results section are indicative to hydrocarbon deposits underneath the surface of the ground where the well log data was extracted. Intervals that have high resistivity are considered to be hydrocarbons while low resistivity zones are water bearing intervals (Adewove, 304). These spikes in hydrocarbon content of the underlying rock and soil were relatable among wells HE 5, HE 7, HE 8, and HE 10. These data indicate that the span of these deposits is large enough to fill the area from the westernmost point on the map (*figure 1*) at the location of HE 5 to the easternmost well HE 7. Since the data are consistent, the hydrocarbons could be used as a basis for determining the biogenic fossil fuel material in the sub surface near Tomkins Hill in Humboldt County, California.

### **Conclusion:**

An analysis of well logs was conducted in order to correlate the deposits of hydrocarbons in the soil with geophysical data. Analyzing the plot diagrams of each log and matching up specific sequences of change in curve intensity was the main basis for correlating these four logs. We were able to correlate several units from each of the well logs with each of the other logs from the various sites. The spikes in the data that were outlined in the results section are indicative to hydrocarbon deposits underneath the surface of the ground where the well log data was extracted. Intervals that have high resistivity are considered to be hydrocarbons and are indicated by the spikes, which were then interpreted as data which corresponded from log to log. Since the data are consistent, the hydrocarbons which span the vast area could be used as a basis for determining the biogenic fossil fuel material in the sub surface near Tomkins Hill in Humboldt County, California.

## Resources

Adewoye, O., et al. "Petrophysical And Structural Analysis Of Maiti Field, Niger Delta, Using Well Logs And 3-D Seismic Data." *Petroleum & Coal* 55.4 (2013): 302-310. *Academic Search Complete*. Web. 2 Dec. 2015.

Ellis, Darwin et. al. "Well Logging for Earth Scientists" (2<sup>nd</sup>. Edition) 2007, 2008  
*Schlumberger Doll Research: Ridgefield CT, USA*