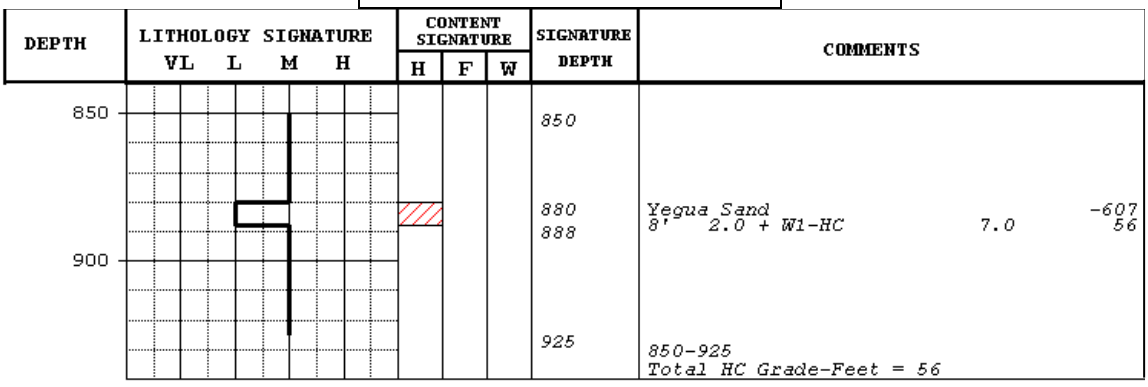
Determination of Relative Grade and Grade-Feet Values On Electrotelluric Logs

"Grade" and "Grade-Feet" values given on an Electrotelluric (ET) Log are measurements of "relative porosity" and are derived from two parameters: the Lithology Signature response and the Content Signature response. Although the ET-Log will not yield absolute porosity values (e.g. 10%, 15%...etc.) the relative porosity of an individual zone can be identified by using a mathematical "point system" derived from a combination of the Lithology Signature and the Content Signature.

Lithology Signature

The Lithology Signature response gives an indication of relative porosity as a function of leftward deflection from the shale-base-line (M line). For a known control well a shale zone is specifically calibrated to track the M line. A dense limestone will register a higher response (near the H line) and a porous sandstone or porous limestone will register a lower response (near the L line). The example ET-Log in Figure 1 shows shale from 850 to 880 (M line), porous sandstone from 880 to 888 (L line), and more shale from 888 to 925. In this case the sandstone registers a 2.0 unit leftward deflection from the M line (shale-base-line). Although it cannot be determined if the absolute porosity is 10% or 15% there is a direct relationship between increasing relative porosity and leftward deflection of the Lithology Signature from the M line.

Figure 1. Example ET-Log



Content Signature

The Content Signature column indicates the type of potential fluid encountered. A hatch mark under the "H" column indicates a hydrocarbon: either oil or gas. The "W" column indicates water (both fresh and saline), and the "F" column will indicate an undetermined fluid in the case of HC. In water work the "F" column is marked to indicate salt water.

In the comments section of the Figure 1 ET-Log a porosity zone is described as follows:

Zone Thickness Lithology Value + Fluid descriptor Grade Grade-Feet

In the Figure 1 ET-Log this is shown as:

8’	2.0	+	HC	7.0	56

Fluid Descriptor: This indicates the type of fluid. HC = a hydrocarbon, W = water. In most cases this will be weighted with a numerical value of 3.0. In some cases, a particularly strong fluid signal will be encountered. These will be indicated as M-HC or S-HC (moderate or strong). Those values will be 4.0 and 5.0 respectively.

Grade is determined by a formula using the previous numbers from the line:

Grade = (*Lithology Value* x 2) + 3.0
Grade = (2.0 units x 2) + 3.0
Grade = 4.0 + 3.0
Grade = 7.0

Grade-Feet is determined by:

Grade-Feet = *Grade Value* x *Zone Thickness*
Grade-Feet = 7.0 x 8’
Grade-Feet = 56

Therefore, the ***HC Grade-Feet*** value for the 880-888 porosity zone is 56. This value is useful to compare one zone to another zone among local sites.

The ***Total HC Grade-Feet*** value for a given ET-Log interval (e.g. 850-925) is the sum of all the zones’ individual Grade-Feet values. This is a useful value for comparing the total potential productive capacity of multiple ET survey locations.