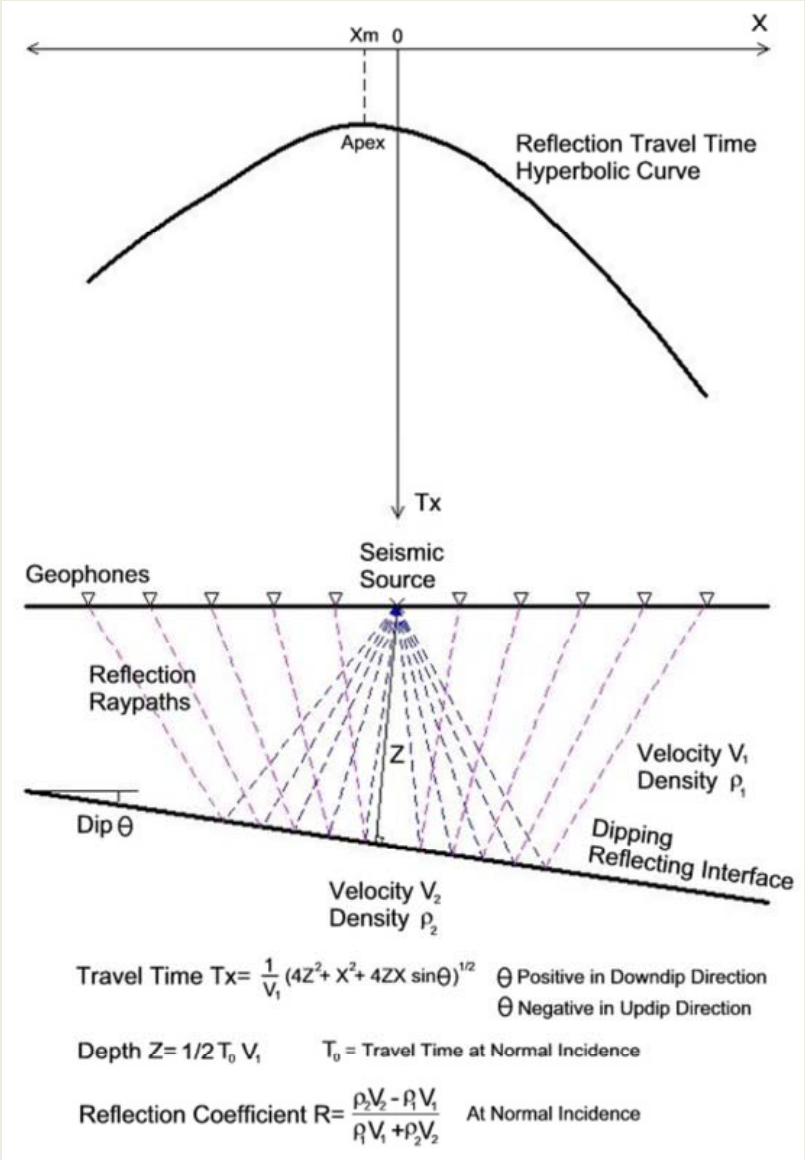
Seismic Reflection

Seismic reflection methods use seismic energy sources generated from the ground surface to reflect seismic waves off subsurface layers with differing seismic velocity and density. The vibration patterns from these reflected waves are recorded on the ground surface by numerous geophones. A 2D reflection survey with the energy source moved along a single line of geophones is used to generate a set of "field records" showing vibration-amplitude versus time recorded at each geophone position. The reflection patterns from multiple layers line up along hyperbolic "travel time curves" (such as that shown on the left) and undergo computer processing to display a two-dimensional profile of subsurface reflection pattern amplitudes (seismic reflection profile). A 3D reflection survey with the energy source moved across several paralleling geophone lines undergoes similar computer processing to prepare three-dimensional map-view and profile displays of reflection pattern amplitudes.

The specialized computer processing is first used to enhance the amplitude and coherency of the reflection patterns and generate a 2D reflection time profile (or 3D reflection time volume). Subsurface velocity-versus-time functions generated from this processing and other data sources such as seismic refraction and down-hole velocity surveys are then used to convert this time profile to a reflection depth profile.

The amplitude of the reflection patterns shown on these profiles is a function of acoustic impedance ($=\rho_i V_i$). Reflections from interfaces separating earth layers with large differences in acoustic impedance (such as sands overlying shales) exhibit higher amplitude reflections.



Example 2D Seismic Reflection Profiles Showing Subsurface Sedimentary Structure and Evidence of Faulting
Data Recording and Processing by Advanced Geoscience, Inc.