Seismic Refraction Velocities in Minnesota

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Velocities calculated by the seismic refraction method are very useful in interpreting geology from refraction data. The depth and seismic velocity are strongly correlative with geologic materials and can be used to help in mapping.

DNR Waters seismic refraction data typically records three velocities: unsaturated/unconsolidated material above the water table, saturated/unconsolidated material from the water table, and first bedrock. The following three charts show material velocity versus geologic formation for each of these three basic types.

Note that material velocities are generally lowest in unsaturated/unconsolidated material, slightly higher in saturated/unconsolidated material, and highest in bedrock units. Refraction velocities show a significant variation both within a given geologic formation and between formations.

Figure 1 is a plot of the velocity variability in unsaturated/unconsolidated material.

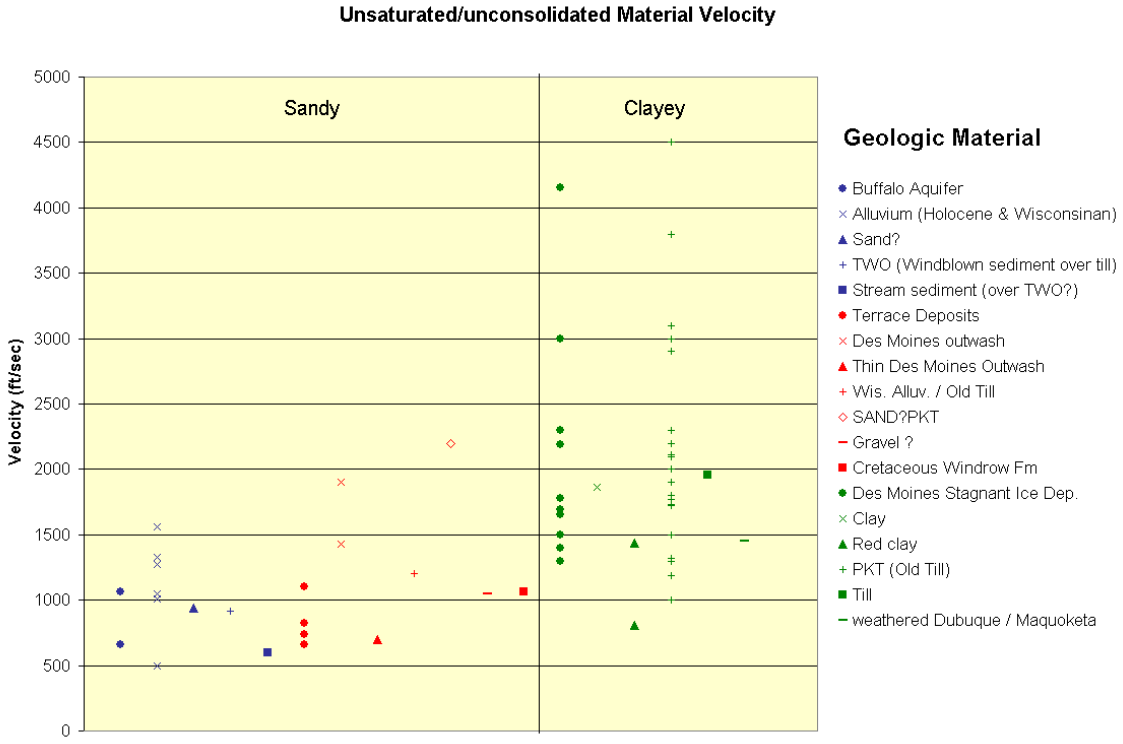

Figure 1: Unsaturated/unconsolidated Material Velocity

Figure 2 is a plot of the velocity variability in saturated/unconsolidated material.

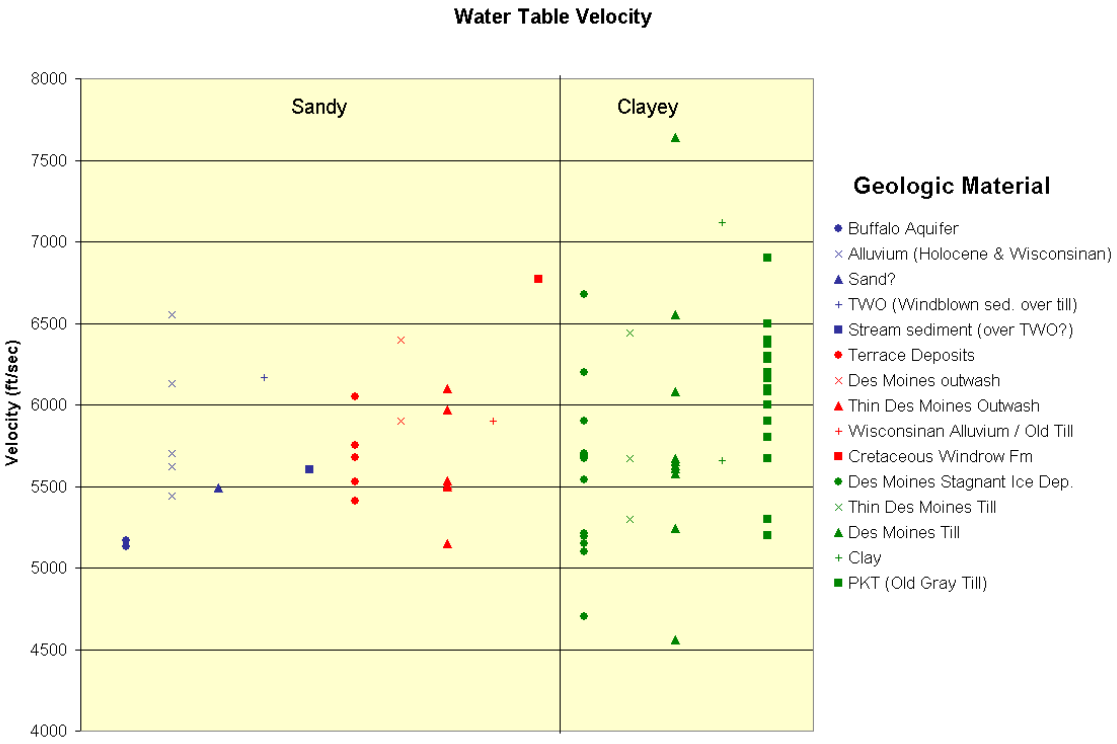

Figure 2: Saturated/unconsolidated Material Velocity

Figure 3 is a plot of the velocity variability in bedrock. The bedrock units are plotted from youngest to oldest (left to right). Note that the younger geologic units generally have a lower material velocity than older ones and that there is significant variation within each geologic unit.

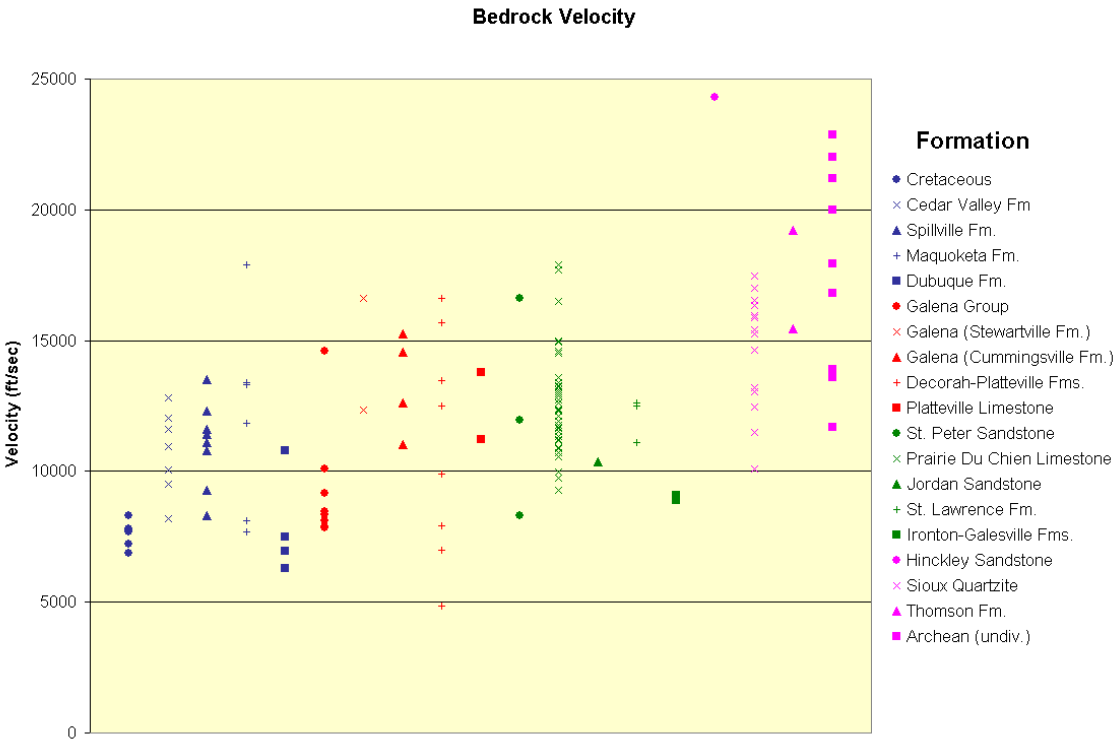

Figure 3: Bedrock Material Velocity