

WATER SURVEYS

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Groundwater Soundings Report

November 2, 2017

On November 1, 2017 we conducted several seismoelectric soundings at three locations at

This sounding method has the potential to determine the approximate depth of water-bearing geologic formations (aquifers) and the sustainable yield (gpm) of a well completed in them. Seismoelectric effects are initiated by seismic waves which induce relative motion between the formation matrix and water in the pore space. The motion of water moves anions in the water cyclically toward and away from cations in the water that adhere to the surface of the formation matrix. This vertical cyclic motion creates changing electric dipoles (current) which generate electromagnetic signals that can be detected at the ground surface.

At a vertical sounding location, a seismic source is created using a hammer and plate or a blank shotgun cartridge that produces a seismic wave which propagates into the ground at a speed depending on the density of geologic formations through which it passes. Generally, this speed varies from about 1500 to 3000 meters/sec in sedimentary rocks, but can be greater in igneous or metamorphic rocks. The seismic wave spreads out to form a hemisphere. When the wave reaches a formation saturated with water, electrically charged ions move up and down as described above, and the electromagnetic signal generated is transmitted to the ground surface at approximately the speed of light. When the wave passes through a layer with little water, no electrical signal is generated. No electrical signal is generated if the water is saline, so the method can only detect abundant fresh water.

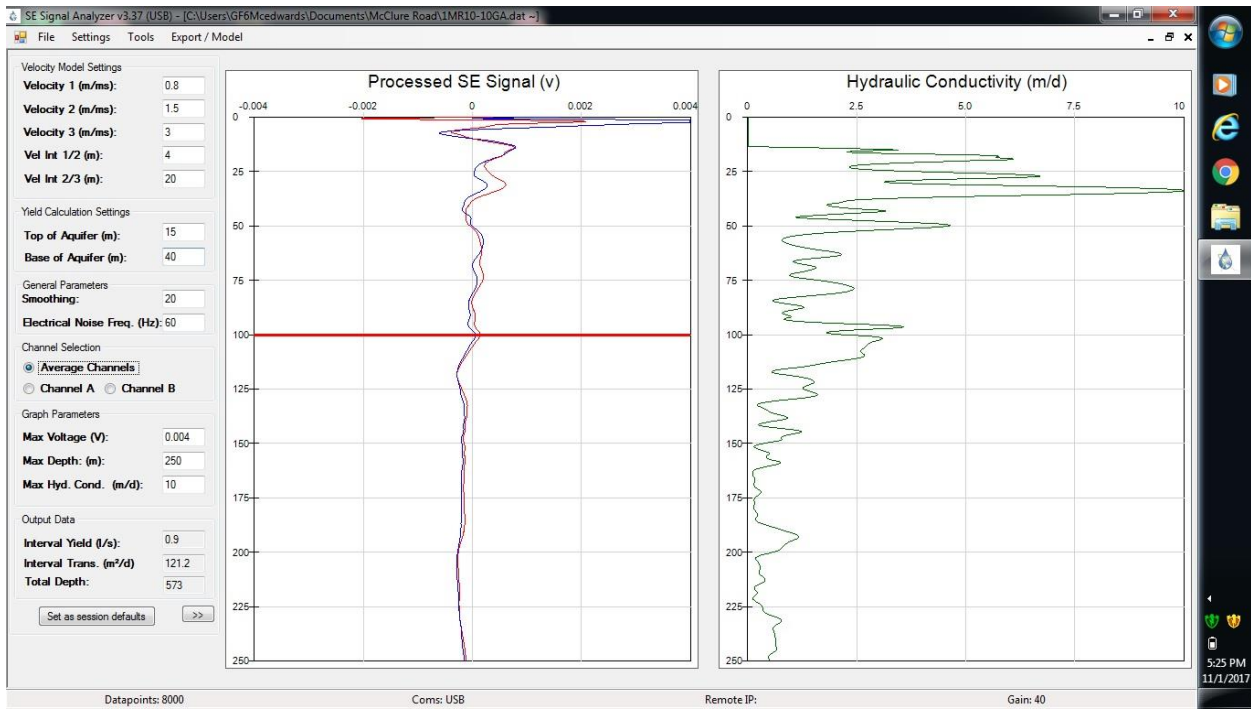
The electrical signal is measured at the surface using two sets of electrodes to get duplicate readings. The electrodes are one meter long, driven into the ground, and are spaced two meters apart. The electrical signals are processed using proprietary software embedded in the patented AquaLocate GF6 Seismoelectric Survey System. We operate the equipment and interpret the soundings results in accordance with training provided by Aqualocate and by our experience with

the equipment. However, because the method is inferential and the algorithms used are proprietary to a third party, Water Surveys cannot guarantee water will be found at the depths and yields indicated by the equipment.

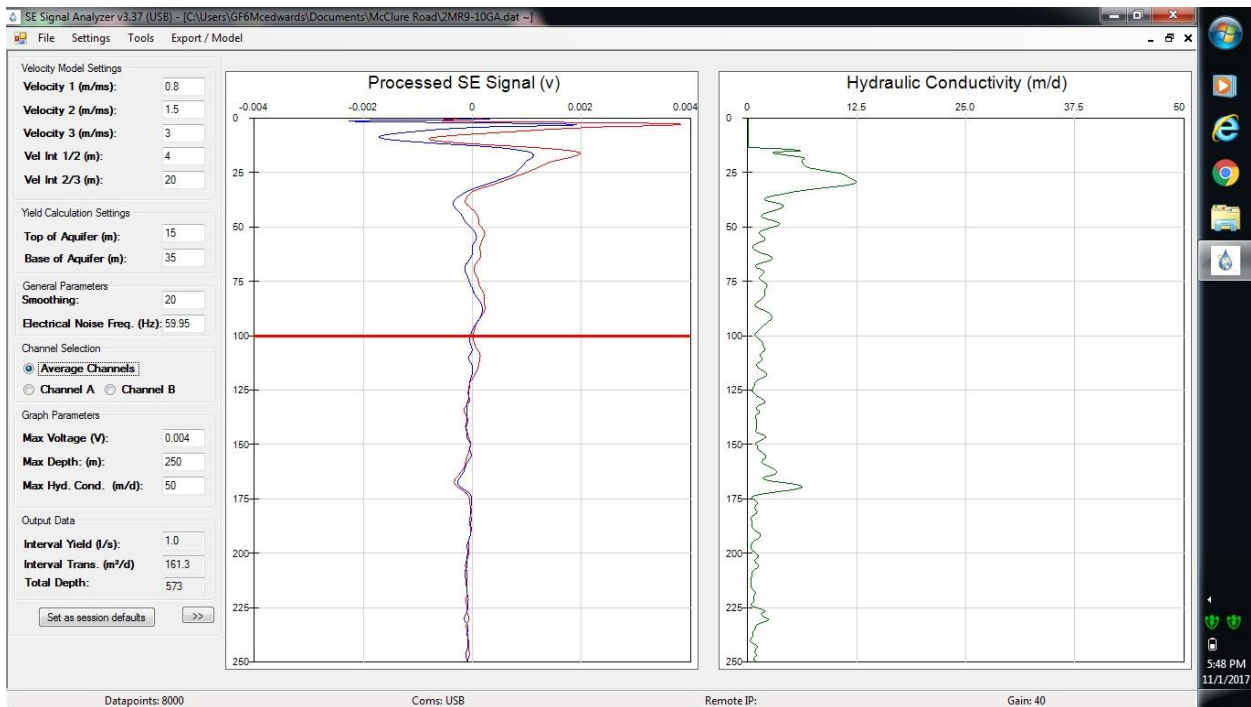
The sounding locations are shown in the Google Earth image below identified by their order of occupancy.



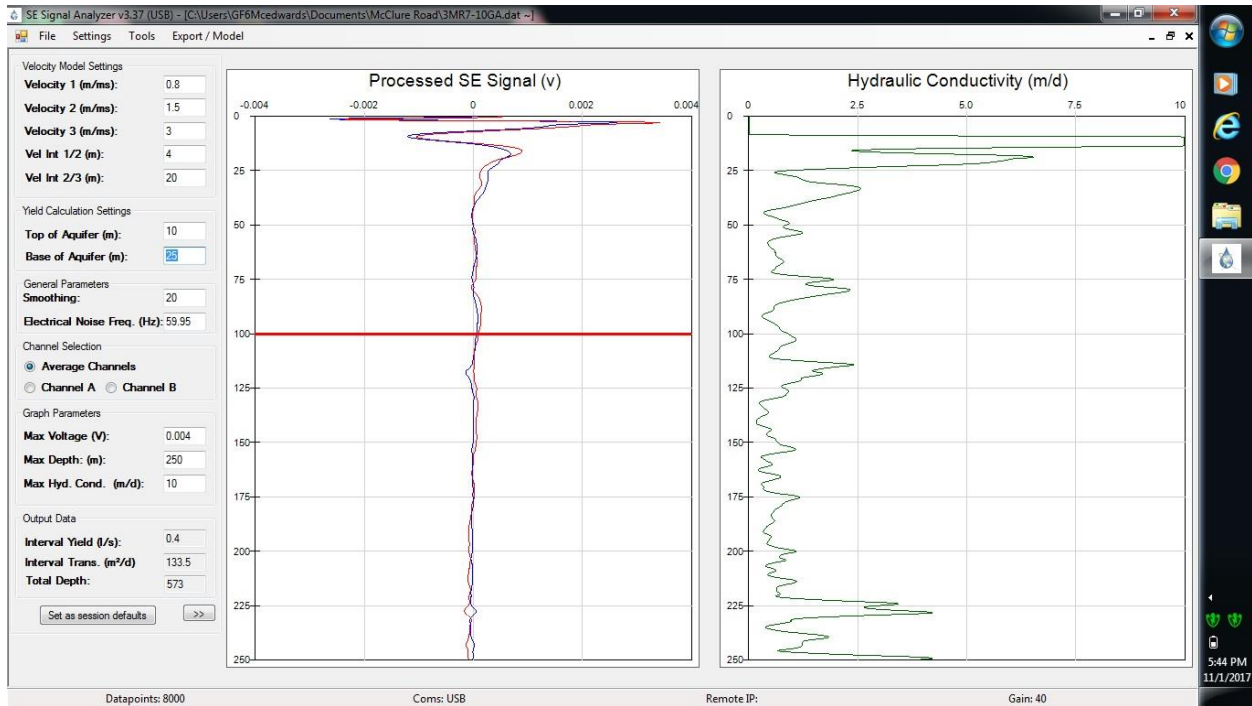
At location 1, which corresponds to Station 8 of our previous very low frequency survey (VLF) and which we understand is very near a dowsed location that indicated groundwater, four hammer-and-plate and six blank shotgun cartridge soundings were done. The shotgun cartridge soundings appear to indicate the presence of water-bearing zones from 15 to 40 meters (50 to 130 feet) with an apparent combined yield of about 5 gpm. A representative shotgun cartridge reading showing the induced voltage and the hydraulic conductivity computed from the voltage is given on the following page. Voltages from the two sets of electrodes are shown in red and blue.



At location 2, VLF target 5A, four hammer-and-plate and six blank shotgun cartridge soundings were done. The shotgun cartridge soundings appear to indicate the presence of water-bearing zones from 15 to 35 meters (50 to 115 feet) with an apparent combined yield of about 10 gpm. A representative shotgun cartridge reading is given below. Note the increased scale of the hydraulic conductivity.



At location 3, VLF target 7B, three hammer-and-plate and six blank shotgun cartridge soundings were done. The shotgun cartridge soundings appear to indicate the presence of water-bearing zones from 10 to 25 meters (35 to 80 feet) with an apparent combined yield of about 2 gpm. A typical shotgun cartridge reading is given below. Note the decreased scale of the hydraulic conductivity.



Depths are based on our assumptions regarding the speed of the seismic wave through the underlying rock and are believed to be accurate to within 20 percent. Yield estimates are conservatively low. The three sounded locations are marked in the field with construction flags.

We appreciate the opportunity to be of service. If you have any questions, please call.

Very Truly Yours,
WATER SURVEYS



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