

CHAPTER 3 – GEOPHYSICAL METHODOLOGY AND INSTRUMENTATION

The Geonics EM31-3 is a frequency domain EMI instrument. This instrument is comprised of one transmitter (Tx) coil and three receiver (Rx) coils all operating at a frequency of 9.8 kHz. The three Rx-Tx coil spacings are 1 m, 2 m, and 3.66 m (3.3 ft, 6.6 ft, and 12 ft), as shown in figure 5. The maximum effective depth of investigation of this instrument is approximately 5 m (16.4 ft).

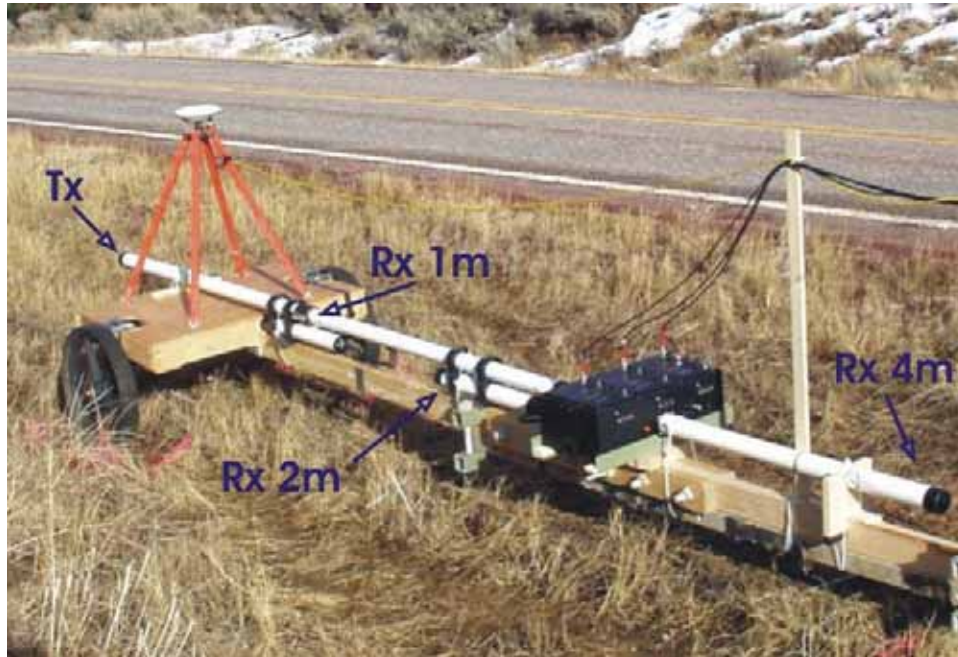


Figure 5. Photo. EM31-3 mounted on low metal content trailer.

Current is induced into the ground by the transmitter coil, while the receiver coils measure the secondary fields due to the decay of the induced (ground) current. The secondary electromagnetic field is not in phase with the primary electromagnetic field and therefore can be resolved into both a quadrature (out of phase) and an in-phase component. The amplitude of the quadrature component of the secondary electromagnetic field is proportional to the bulk conductivity (or apparent conductivity) of the ground down to the instrument depth of investigation. For this project the quadrature component is the only measurement used from the EM31-3 instrument. However, the in-phase data were recorded and used for identifying metallic structures under the roadway and to assist in determining the data lag correction parameters, which are related to the differential global positioning system (DGPS) positioning, used in data processing.

Positioning of the EMI data with the ATV-towed array was accomplished using a Trimble Real Time Kinematic (RTK) DGPS. The positional data were recorded in World Geodetic System 1984 (WGS 84) Longitude and Latitude and converted to FHWA local grid coordinates. The EMI and DGPS data were recorded simultaneously in the field.

