Evaluation of Geophysical Techniques in the Determination of a Salt Contaminated Environment

W. Reed[1], H. Lehto[1], W. Bond[1], D. Bagnall[1], and J. W. Ward[1]

[1]Angelo State University, Department of Physics and Geosciences

Abstract

Salt contaminated soils propose environmental risks for land that once flourished for agriculture use. To successfully remove or remediate a salt contaminated environment it is important to know the boundaries of the contamination, identify any sources of contaminates, and monitor the movements of contaminates. Electromagnetic geophysical techniques provide a feasible noninvasive approach to studying the subsurface and identifying the location and perimeter of a salt contaminated environment. This study compares three separate electromagnetic methods including galvanic DC resistivity, capacitively coupled resistivity, and frequency domain conductivity. Galvanic resistivity surveys have been around for quite some time and have shown to be successful for effectively and accurately modeling salt contaminated environments. However, when modeling large areas, DC resistivity lines can be very burdensome and time consuming to carry out. In order to measure the movement of a salt contaminated environment, it is more efficient to use a method that is less burdensome and time consuming to take fast and accurate data for geophysical modeling. Both the Gem-2 which uses a frequency domain method and the Ohm Mapper which uses a capacitively coupled method are quick methods that can perform complete surveys in only a few hours covering areas up to 100,000 square meters. In order to evaluate these methods, a galvanic DC survey was performed using a Syscal Pro-Switch 72 along with surveys from the Gem-2 and OhmMapper. This data was then compared with well logs taken at the survey site to verify the accuracy of the data. The three methods were then compared based on their physical limitations to collect data at the site as well as their ability to collect the most accurate data. It was found that the Gem-2 has the best capability for efficiently and effectively carrying out a geophysical survey of a salt contaminated environment.