AWRA 2011 ANNUAL WATER RESOURCES CONFERENCE
Albuquerque, New Mexico
November 7-10, 2011

HIGH RESOLUTION GEOPHYSICAL SURVEYS TO EFFICIENTLY SITE RECHARGE BASINS

John Jansen*

ABSTRACT: Artificial recharge and water augmentation are important aspects of many groundwater management programs. The subsurface must be understood in reasonable detail to design an efficient and effective artificial recharge system. Often the cost to collect this data by drilling is prohibitively high. When properly applied, geophysical methods can provide subsurface information at a much lower cost. Geophysical data provides more complete coverage and can be used to target drilling efforts toward the most important areas. This presentation uses several recent projects to demonstrate the use of geophysical methods to select favorable sites and direct a testing program to develop artificial recharge projects.Two electrical geophysical methods to site recharge basins that are particularly well suited for this application. High resolution electrical resistivity surveys use a string of electrodes planted on the surface and a low power current source to measure the electrical conductivity of the subsurface. The method is capable of mapping the lateral and vertical grain size distribution of the upper 300 to 400 feet along profile lines several hundred feet to up to a few thousand feet long in a matter of hours. Time Domain Electromagnetic Induction (TEM) surveys use a loop of insulated wire on the surface to generate an electromagnetic pulse that penetrates into the subsurface. TEM surveys can measure the grain size distribution to below approximately 1,000 to 1,500 feet in about an hour. These methods can be used independently or jointly to screen large areas to find suitable recharge sites, identify buried perching layers, identify faults that could impact infiltration pathways, or map the progress of a wetting front during recharge. This presentation will present results from several geophysical surveys conducted to assist water districts find suitable recharge sites in southern California. The case histories will demonstrate how the high resolution electrical resistivity and TEM methods have been used to find areas with permeable sediments in the vadose and shallow saturated zones, identify perching layers, map faults, measure offsets of the water table across faults, and direct drilling programs to improve site characterization and obtain subsurface information in the most important areas.

* Senior Managing Hydrogeologist, Cardno ENTRIX, 1388 Colonial Blvd, Fort Myers, FL 33907 USA, Phone: 239-896-0576, Email: John.Jansen@cardno.com