

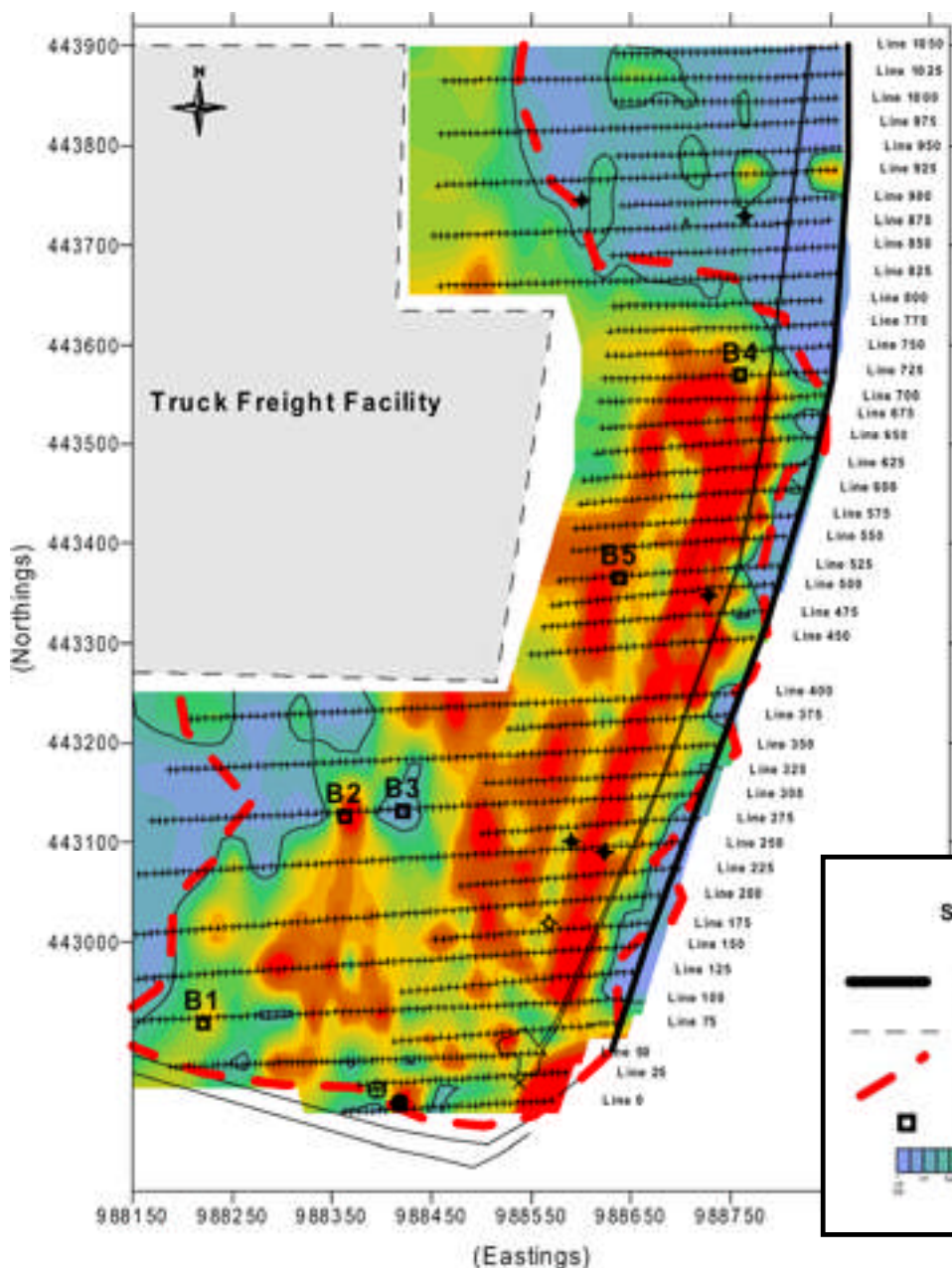


Buried Waste Characterization

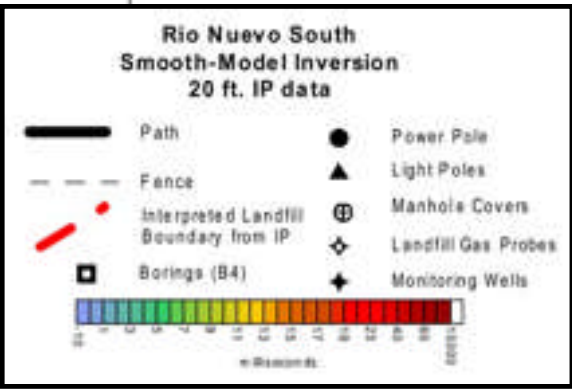


Soil Thickness, Vertical and Lateral Resolution

Induced Polarization (IP) and resistivity data acquisition is a cost-effective, non-intrusive, fast method for determining the soil cover thickness, footprint (lateral) and vertical extent of buried waste material. With stations every 7.5 feet and lines every 30 feet, a three person field crew can cover approximately 1.5 acres in a typical field day. Data coverage ranges from the surface to a depth of 30-40 feet. Greater depths can be easily achieved by changing the parameters of the survey.



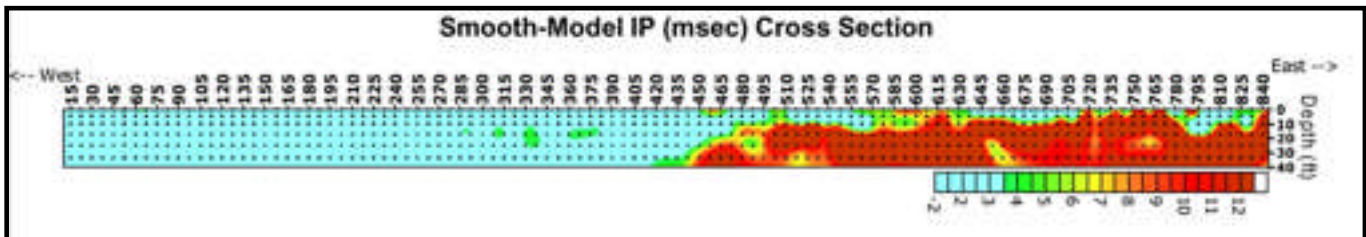
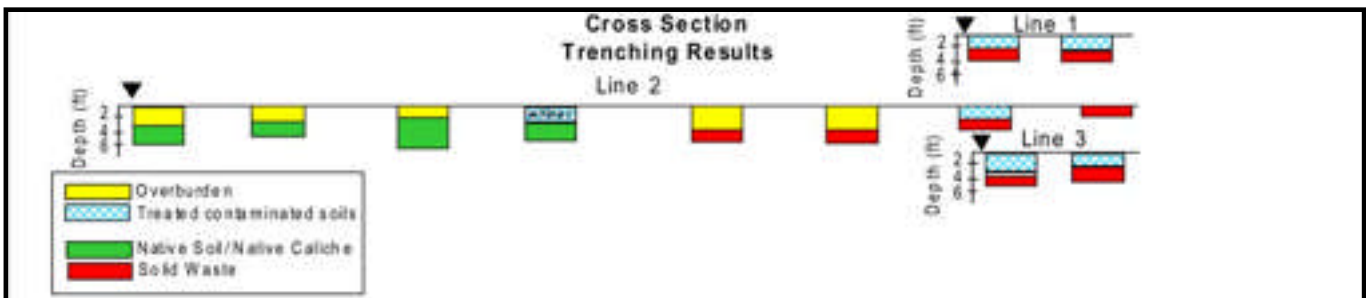
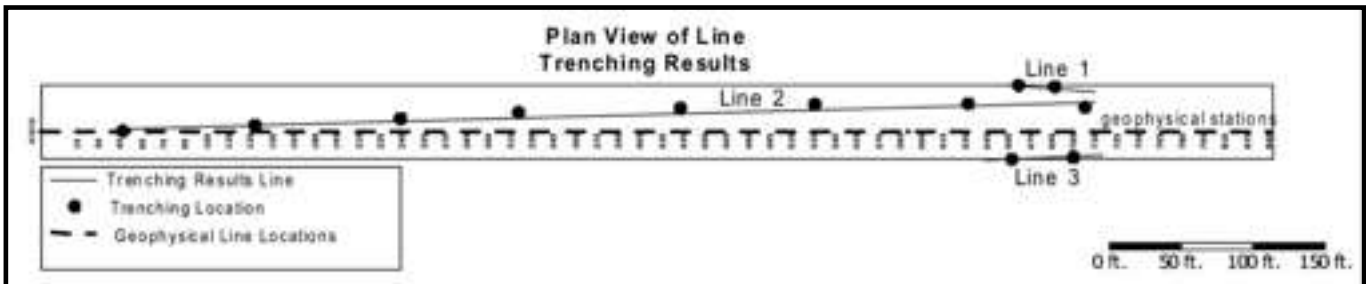
The plot to the left shows the IP results at a constant depth slice of 20 feet below the surface. Data from all depths were used to interpret the outline of the landfill (red dashed line). On Line 300, an isolated "hole" in the landfill was indicated by an absence of IP effects at all depths. Boring B3 was located to test this area, and no waste was encountered. Less than 100 feet away, Boring B2 encountered waste, verifying the excellent resolution of the IP results. Borings B1, B4, and B5 also encountered waste, as expected from the IP data.



Depth of soil cover and depth of waste material can both be determined using the IP method. The figures below display the trenching results in plan view and in cross section from a buried landfill in Tucson, Arizona. Shallow trenching on the western portion of the area did not encounter any buried waste material, whereas trenching on the eastern half showed waste from a few inches to several feet below the surface.

Also displayed below are the IP results along a line running through these trenches. Data depicted in green-yellow-red is interpreted as buried waste from the IP results. The western half of the line shows only background IP values. The eastern half shows elevated IP reading which correspond well to the trenching results which encountered waste material.

The vertical extent of the waste can also be determined from the IP data set. In this case the buried waste material extends below the 40 ft. depth shown on the plot. Deeper data can be achieved simply by altering the electrode spacing.



It is important to note that with the IP method, it is possible to detect buried waste that may not be detectable with magnetometry or resistivity (conductivity) methods. For example, waste that does not contain a significant amount of ferrous metal will not be detectable with magnetometers. Similarly, buried waste in a low resistivity background is often indistinguishable from the surrounding material with resistivity measurements. Since IP methods measure a completely different electrical property of the ground, IP surveys often detect waste that is unresponsive to other surveys.

Zonge International
 3322 East Fort Lowell Road
 Tucson, Arizona 85716
 Tel (520) 327-5501 Fax (520) 325-1588 Email zonge@zonge.com
 Sparks, Nevada Lakewood, Colorado Minneapolis, Minnesota