

Geophysical Surveys

Capabilities of the Site Investigation Field Unit (SIFU)

Overview

Geophysical surveys can be conducted in order to look for buried waste materials and contamination using a Geopex GEM-2 electromagnetic induction sensor. In addition, magnetic locators are available to survey for buried metal objects such as surveypins and drums.

The Geophysical Survey information can be combined with the information collected using the Geoprobe® soil conductivity probe (a “down hole” geophysical technique) to identify soil types based on the subsurface response to a direct current. Use of the GEM-2 in combination with the Geoprobe® soil conductivity meter at a site can provide valuable information about the extent of contamination and the site specific geology before collecting soil, ground water or soil gas samples. Using the Geoprobe® and geophysical surveying tools in a complimentary manner will help to reduce the number of soil borings and samples typically collected, and generally will lower the overall cost of subsurface investigation.

Finally, GPS surveying (Trimble®) services can be conducted in conjunction with the geophysical survey to accurately locate survey locations, anomalies (areas of interest) and site features.

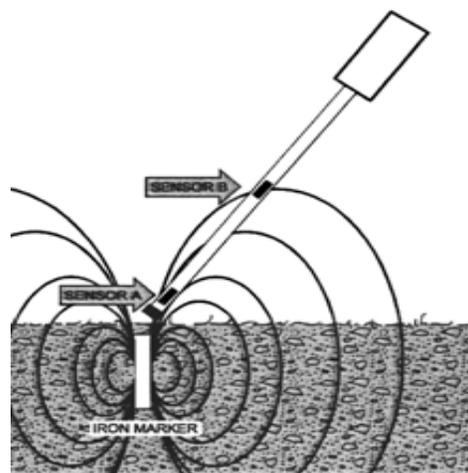


GEM-2 Electromagnetic Induction Survey in Progress

Geophysical Survey Methods

Schonstedt Magnetic Locator (GA-52B)

The Schonstedt magnetic locator is used to detect and locate buried ferromagnetic (iron-bearing) objects such as survey pins, pipes, and drums. The Schonstedt is used for “bump” surveys only, and (unlike the GEM-2), is not capable of recording and processing data for areas surveys. The maximum depth of investigation for the Schonstedt is less than 10 feet.

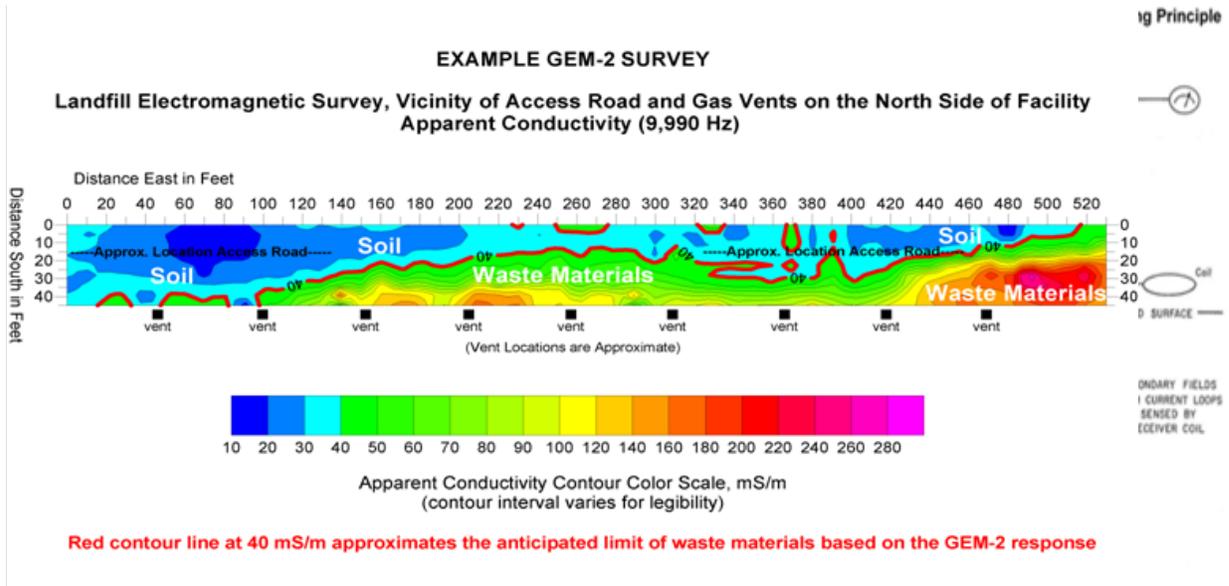


Geophysical Surveys

GEM-2 Electromagnetic Sensor

The GEM-2 electromagnetic sensor measures subsurface electrical and magnetic properties to help locate buried waste materials, subsurface structures and soil contamination. GEM-2 surveys help to better delineate areas of environmental concern before performing drilling, sampling and well installation activities. Advantages of GEM-2 surveys often include reducing the number of borings or wells needed, more effective sampling strategies, and reduced assessment costs.

Surveys are non-intrusive and are performed quickly in areas easily accessed on foot. In addition, SIFU can provide in-field data evaluation services using a laptop computer.



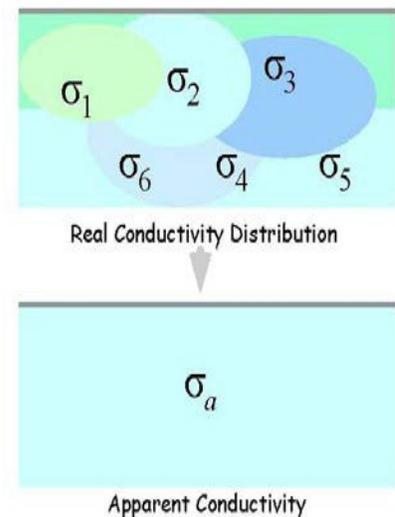
GEM-2 Operation

The GEM-2 detects variations in subsurface electrical and magnetic properties by transmitting a low frequency electromagnetic field (the primary field) into the ground. When contacted by the primary field, subsurface materials spontaneously generate secondary electromagnetic fields that are detected and measured by the GEM-2 receiver.

Based on the mathematical relationship between the primary field and secondary field, GEM-2 data can be used to estimate apparent conductivity and magnetic susceptibility of the ground. Apparent conductivity is an estimate of the bulk conductivity of the earth or fill materials.

Variations in apparent conductivity can be used to help locate waste, subsurface structures, or subsurface voids, and may also be used to help evaluate site geology.

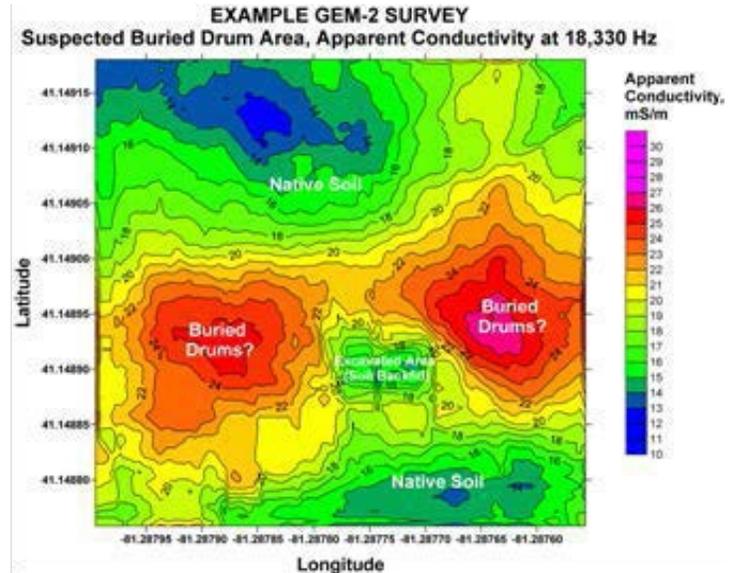
Magnetic susceptibility is a measure of the ability of earth or fill materials to become magnetized when exposed to the primary field. Magnetic susceptibility data are similar to magnetometer readings and can be used to locate waste materials or subsurface structures that contain high concentrations of ferrous (iron-bearing) metal.



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GEM-2 Survey Applications

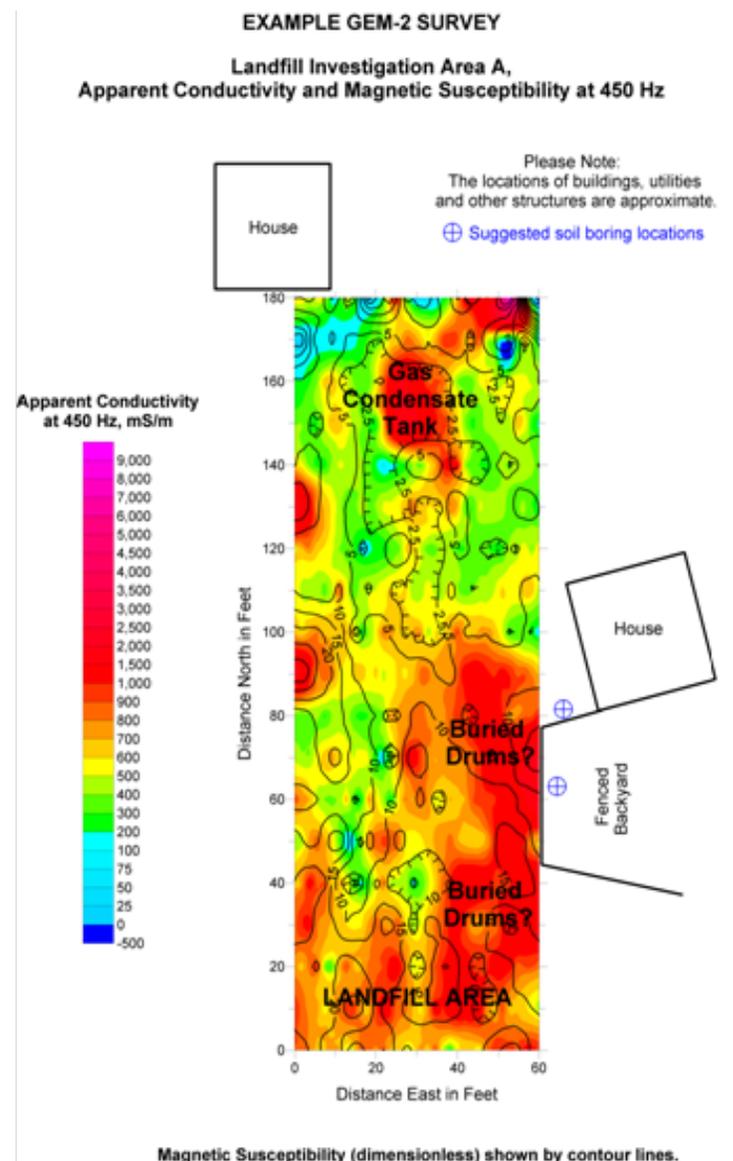
GEM-2 surveys performed by SIFU have successfully located wastes, subsurface structures and soil contamination in advance of intrusive investigation. Other applications include investigation of ground water contamination (e.g., leachate or salt plumes) and site hydrogeology. GEM-2 surveys often help achieve project objectives more efficiently by reducing overall time and cost.



GEM-2 Survey Options

To provide flexibility with respect to project budgets, schedules and objectives, three options are available for GEM-2 Surveys:

- 1) "Bump" survey only (*without in-field computer data evaluation or report*)
- 2) Survey with in-field computer data evaluation (*no report*)
- 3) Survey with in-field computer data evaluation and report.

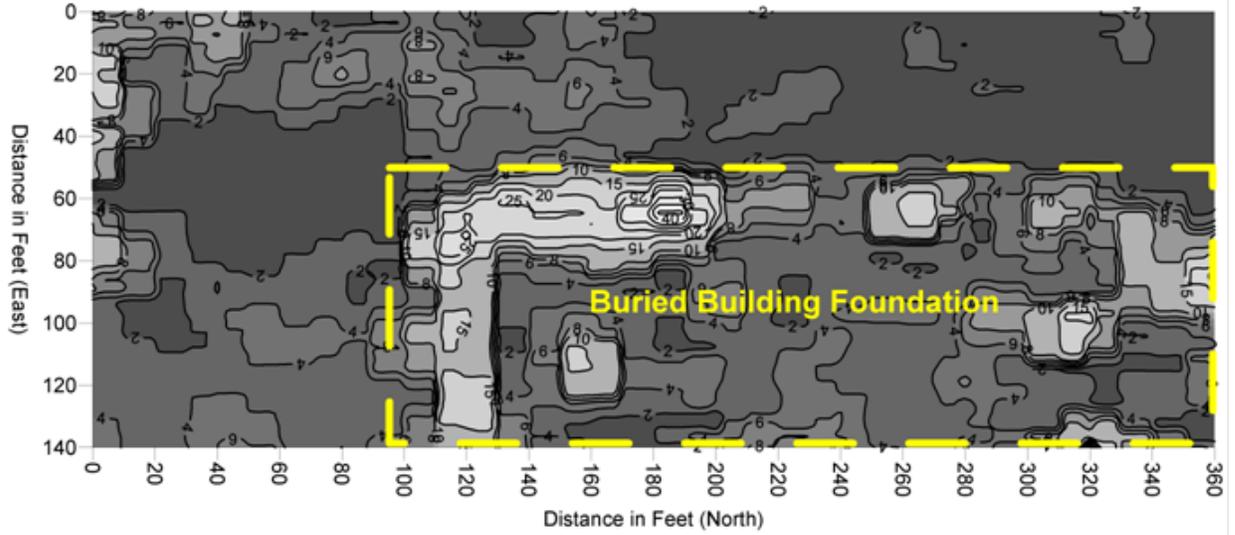


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EXAMPLE GEM-2 SURVEY

Magnetic Susceptibility at 510 Hz, Former Manufacturing Facility

0,0 Northing = 812239
0,0 Easting = 1548823



Magnetic Susceptibility (dimensionless) shown by gray scale and contours