

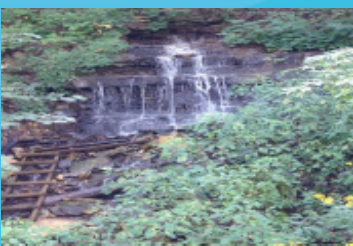
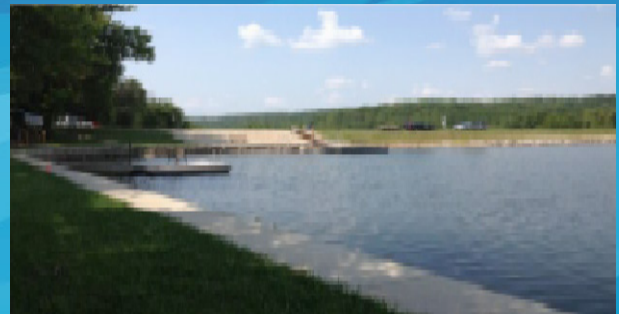
Case Study

Grout Wall Effectiveness Study

Willowstick tracked seepage around a grout wall and along an old diversion pipe

Background

A Homeowners' association observed two seeps downstream of their embankment and contracted engineers to install a grout wall to cut off seepage. Grouting appeared to be largely ineffective because the seepage flow rate was not reduced and the seep location moved closer to the dam. Therefore, the Homeowners Association decided to try to characterize seepage flow paths. An accurate understanding of seepage conditions would help guide and direct further grouting efforts.



The Problem

Seepage through or under a dam is concerning if not remediated. Cutting off seepage by grouting is expensive, and the homeowners' association wanted to make sure they targeted the right areas to cut off seepage flow paths.

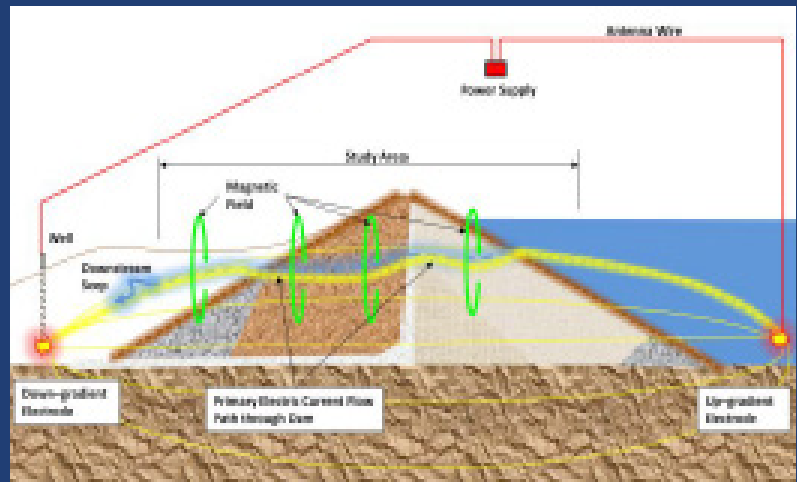
The Solution

Willowstick Technologies was contracted to help the client identify the seepage flow conditions at the site. The plan was to map and model any significant preferential seepage flow paths likely contributing water to the seeps downstream of the dam.

A secondary objective was to understand how effective previous grouting efforts were in targeting seepage flow.

How the Technique Works

The Willowstick technology energizes the groundwater of interest directly with an alternating electric current. Groundwater tends to be far more electrically conductive than the surrounding rock or earthen materials. This causes the electric current to gather in and flow through any subsurface water bearing features.



This flow of electric current through the water bearing features generates a magnetic field that is measured in a grid pattern at the earth's surface using a highly sensitive magnetometer. This magnetic field data is then used to generate maps and 3-D models of the subsurface groundwater conditions including any preferential flow paths.

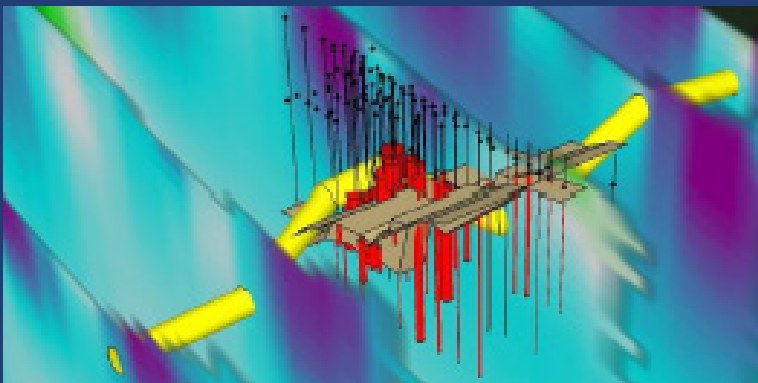
There is no rerequired well drilling, no large equipment, and no extra personnel to manage.

The Results

The Willowstick investigation identified two discrete seepage flow paths. One flow path travelled around the installed grout wall along the top of rock. The second flow path followed the alignment of an old diversion pipe. The surveys identified both the location and the depth of these seepage flow paths.

From start of fieldwork to delivery of the report was less than six weeks. This represents a substantial time and cost savings when compared to drilling and grouting blindly.

The groundwater investigation provided the client with new insights and intelligence about the subsurface conditions at the site. The dam owner will likely use this intelligence to design a new grout wall and investigate the area around the old pipeline.



3D model showing the results of Willowstick seepage flow survey. Seepage Flow path (yellow tube) flowing around the grout wall (red tubes) before passing under the dam near top of rock.