

## EMRGe Researchers Help St. Louis Group in the Recovery of English Cave

In 2018, the English Cave Steering Committee, a subset of the Benton Park Neighborhood Association, contacted Dr. Norbert Maerz, at the time the Director of the Center, seeking technical advice on options to proceed with their project of recovering a long-lost cave of historical significance to the St. Louis area. From the 1830's until the 1920s, English Cave was used for beer storage and production, and was once a popular social gathering place due to the cool subterranean temperature. With the advent of mechanical refrigeration, it fell into disrepair, and was eventually covered up and forgotten. For the past 100 years, it has remained one of the last remaining lost urban caves in the St. Louis area.

Dr. Maerz gave the group technical advice on applicable site exploration techniques and examined both historical records and a previously conducted ERT (Electrical Resistivity Tomography) geophysics survey. Maerz concluded that there was enough evidence to justify drilling a borehole at this point, and convinced Geotechnology, Inc. to drill an exploratory borehole pro bono, and a second borehole at a reduced rate (Geotechnology is a St. Louis engineering firm that has hired many Rolla Geological and Civil Engineering students in the past). Dr. Maerz also suggested that if a 5" borehole reached the void, a LIDAR (Light Detection And Ranging) scan showing a 3-D map of the cave could be obtained using an experimental borehole LIDAR he and his team developed for a similar project a few years prior where a 3-D map of an underground cavity was produced for GeoEngineers in Springfield, Missouri.

Previously, Dr. Evgeniy Torgashov assisted by conducting a geophysical investigation using ERT. This test confirmed the depth to bedrock, but due to property access limitations the ERT traverse was too short, and was only able to image down to about 45' (The top of cave was eventually found to be at 47').

Based largely on old fire insurance maps, the Steering Committee proceeded to select a couple of candidate spots to drill - hoping they would hit the cave.

Around the same time, Dr. Catherine Johnson had been working with **Carlson**, a provider of high precision surveying equipment for the mining industry, to provide equipment to the University to support S&T's training and research objectives. One of the pieces of specialized equipment was a **Carlson** C-ALS (Cavity Auto-scanning Laser System) device, which had capabilities far beyond the experimental borehole LIDAR previously developed. Dr. Barbara Rutter assisted with the license management and acquiring the software documentation, and PhD candidate Martin Langenderfer helped conduct several tests of the C-ALS borehole LIDAR at the S&T Experimental Mine and at the EMRGe facility to determine the most efficient operational procedures. Dr. J. David Rogers contributed early St. Louis maps, provided background information on the local St. Louis geology, and supported the research in borehole LIDAR technology being conducted by Dr. Ken Boyko, EMRGe Post Doctoral Fellow. Dr. Boyko also directed the LIDAR scanning when Geotechnology happened to punch through to the cave on their very first drilling attempt.

After the cavity was scanned through the first borehole, it was discovered just how lucky the team was in selecting the drilling location; the borehole intersected the cavity just two feet from its western edge. Had the borehole been drilled three feet to the west, the cave would not have been found. After

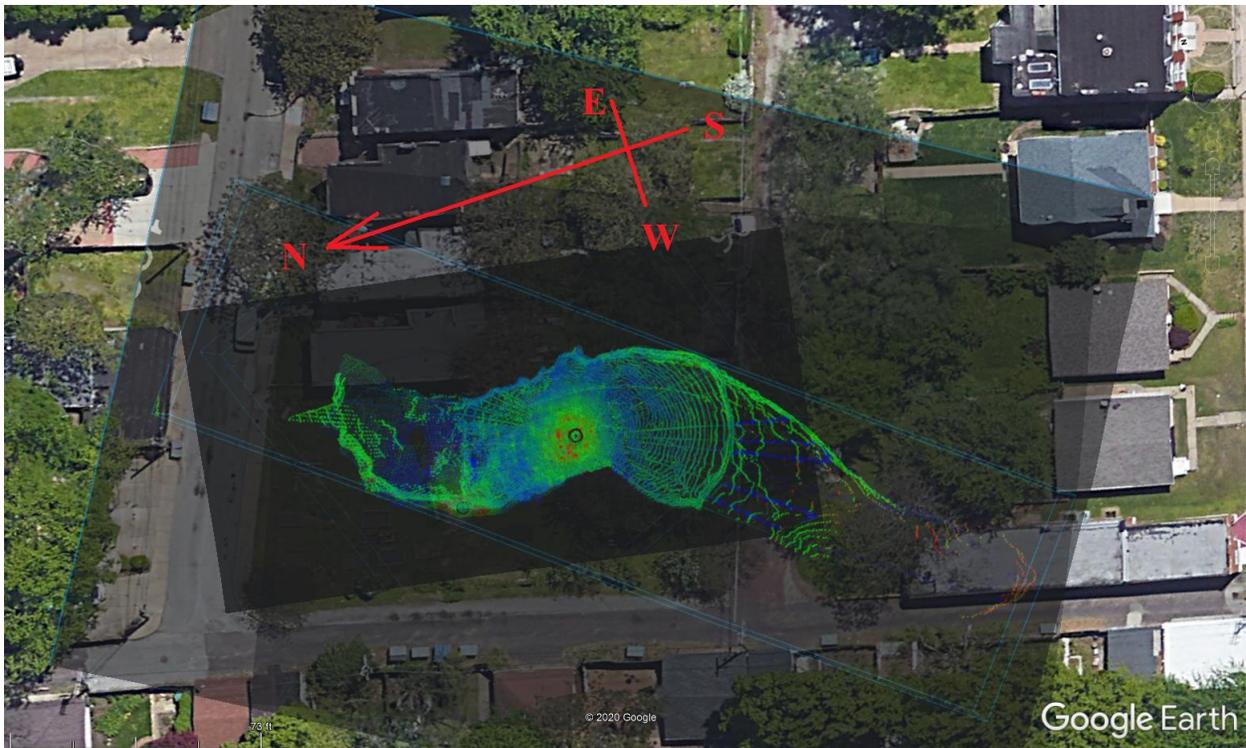
analyzing the LIDAR scan from the first hole, a second hole was drilled in the center of the cave. Subsequent LIDAR scans from the second borehole revealed many interior features which confirmed that the cavity was indeed the long-lost English Cave.

The English Cave Steering Committee consists of a few dozen St. Louis spelunkers, history buffs, and local citizens interested in finding and preserving the rich cultural heritage of St. Louis - including its many urban caves. The group has spent countless hours scouring old newspapers, land records, personal letters, and fire insurance maps searching for pieces of evidence relating to English Cave. One of their members, Chris Naffziger, a local historian and journalist working for the **St. Louis Magazine**, wrote an interesting article on the re-discovery (<https://www.stlmag.com/history/english-cave/>). Another member, Eric Wilkinson, works for the **Missouri Historical Society** and produced an excellent video (<https://www.youtube.com/watch?v=TYP504y65Ls&feature=youtu.be>) which tells the story of the research conducted, the drilling operation, and the enthusiasm which erupted when the English Cave was finally recovered.

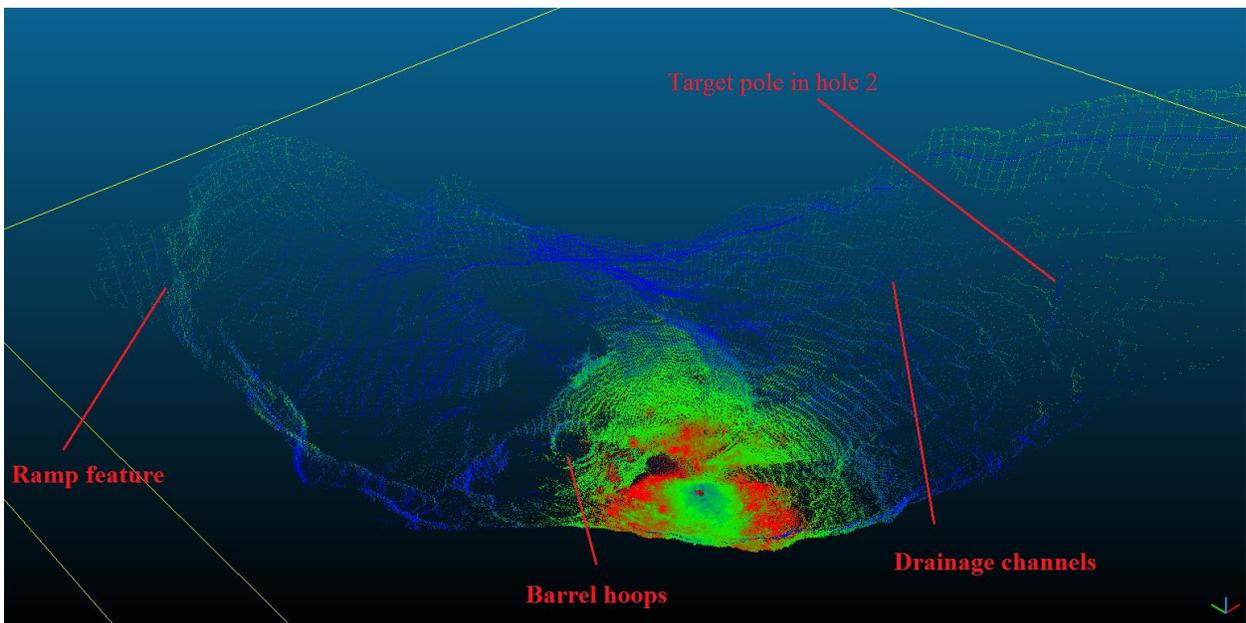
The English Cave Steering Committee expressed their sincere gratitude to all the folks at Missouri S&T's EMRGe Research Center who volunteered their time to this successful outcome by helping to apply the considerable expertise in Geological Engineering and EMRGe's technology to solve this unique problem.



Video by the Missouri Historical Society



Preliminary Overlay of English Cave positioned on Google Earth



English Cave features visible from hole 1 Lidar Scan