

SOIL AND PLANT SCIENCE DIVISION

Technical Soil Services

Connecticut NRCS and Special Projects Office



U.S. Department of Agriculture-Natural Resources Conservation Service (USDA-NRCS) Helps Crack a 48-year-old Cold Case

Purpose

In June 2022, at the request of the East Haven Police Department, a ground-penetrating radar (GPR) investigation was completed to identify the location of the unmarked grave of a victim named Jane Doe on the southeast side (near a metal fence) of State Street Cemetery located in the town of Hamden, Connecticut. After [digging up the wrong body](#), the East Haven police stated that they would not be giving up finding the correct casket. With the help of USDA-NRCS, on Monday, April 17, 2023, police were able [to identify the 18-year-old young lady as Patricia Newsom](#).

State Street Cemetery, 2125 State Street, Hamden, Connecticut

Previously known as East Farms Cemetery at Potter Town and the South Side Cemetery, the State Street Cemetery has fallen into neglect. Moved to its present location in 1855, the State Street Cemetery's oldest burial is Timothy Potter who died on October 24, 1799.¹

With the advancement of DNA evidence, law enforcement is looking to solve a 48-year-old case in East Haven, Connecticut. The murder victim, a young woman given the name Jane Doe, was discovered by a truck driver. After the Medical Examiner could not identify her, she was buried in Hamden a year later. Recently, the East Haven police received a tip that the 1975 homicide victim was buried in an unmarked grave at State Street Cemetery. With help from the Hamden town clerk and a cemetery maintenance person, the police determined that the victim's burial permit was at State Street Cemetery and that she was buried without a marker near a metal fence. Having this information and after an unsuccessful first attempt, the East Haven Police Department contacted USDA-NRCS to conduct a GPR investigation to identify the location of the unmarked grave.

Figure 1 is a Google Map image with a superimposed soil map from the Soil Survey of the State of Connecticut showing the location of the GPR investigation.² The GPR

¹ State Street Cemetery Website [Online]. Available <https://www.statestreetcemetery.com/> [verified June 2022]

² Soil Survey of the State of Connecticut [Online]. Available http://casoilresource.lawr.ucdavis.edu/soilweb_gmap/ [verified June 2022]



survey area is located within a soil delineation that is labeled 306 Udorthents-Urban land complex. To the north of the cemetery is soil map unit 237C Manchester-Urban land complex, 3 to 15 percent slopes.



Figure 1. A SoilWeb image with soil lines and symbols from the Soil Survey of the State of Connecticut. The red-colored circle indicates the approximate location of the GPR investigation.

Udorthents are soils that have been altered by cutting or filling. Urban land is land mostly covered by streets, parking lots, buildings, and other structures of urban areas. Due to the variability of the soil properties and characteristics of Udorthents, limitations (if any) for suitability of GPR can only be determined onsite. Manchester soils consist very deep, excessively drained soils formed in sandy and gravelly glacial outwash and stratified drift. Thickness of the solum ranges from 12 to 24 inches (30 to 60 centimeters (cm)). Rock fragments, mainly rounded pebbles, range from 15 to 50 percent in the solum and from 35 to 70 percent in the substratum. Because of their low clay, water, and soluble salt contents, soil scientists consider these soils well-suited for GPR investigations.

GPR Survey

A soil scientist constructed one GPR grid (23.5 by 6 meters (m)) across a relatively open grass lawn and recently cleared area within the cemetery (see figure 2). To facilitate the construction of the grid, two parallel survey lines were laid out on the north and south sides of the designated site. Along these lines, survey flags were inserted into the ground at a spacing of 50 cm. Then volunteers sequentially stretched a rope between matching survey flags located on the opposing lines that defined the grid area, while the soil scientist moved the GPR survey cart along this rope for guidance while collecting subsurface data. Following data collection along the line, the tape was sequentially moved 50 cm to the next pair of survey flags to repeat the process, with the GPR moving in the same direction (south to north). The grid's origin (0, 0 m) was in the southwest corner.



Figure 2. A photograph of survey flags on the north side of the State Street Cemetery GPR grid.

The anticipated confined dimensions of the potential unmarked graves and the position of interments required the relatively narrow grid line spacing and south to north direction. As in most cemeteries, burials were interred in a traditional Christian burial position that placed the bodies face up and facing east in the direction of the rising sun to see the “Second Coming of Jesus.”

GPR Results

Figure 3 shows six depth-slice images from the grid site. These images are taken from the 3D data cube of the grid that has been horizontally sliced at soil depths of 0, 40, 70, 90, 100, and 140 cm. In each depth-slice image, the reflected radar energy was averaged horizontally between adjacent, parallel radar traverses (each spaced 50 cm apart). For display purposes, each depth-slice image is viewed from overhead looking downwards into the grid.



On the 0 cm depth-slice image in Figure 4, across a large portion of the grid area, the soil appears as low amplitude (colored black) reflections that suggest relatively homogenous materials with a general absence of highly contrasting, anomalous features. With increasing soil depths, higher amplitude (colored light gray, yellow, and red) reflections become more numerous and apparent.

The 70 cm depth-slice image contains multiple moderate- to high-amplitude (colored light gray and red) reflections with a generally elongated, east to west appearance. An increasing number of high-amplitude (colored bright red) reflections appear in the 90, 100, and 140 cm depth-slice images. Many of these reflectors appear to form orderly arranged rows that extend in a north-south direction across the gridded. As these reflectors appear elongated in form, orderly arranged, and at a fairly uniform depth, they suggest the possibility of marked and unmarked graves. Yellow-colored dashed lines highlight these orderly rows of potential graves on the 140 cm depth-slice image. Colored rectangles highlight the potential marked and unmarked graves.

Figure 4 shows a photograph taken within the GPR survey area with flags identifying three unmarked burials next to the metal fence (highlighted by various colored dashed lines). Brush removal uncovered one stone marker from a 1975 burial (highlighted by a yellow-colored arrow). Figure 5 shows a photograph of a stone marker uncovered during the GPR investigation. The 1983 burial was in line and adjacent to an unmarked burial located next to the metal fence. The burials were confirmed to be set in sandy glacial outwash material that makes for easy digging.

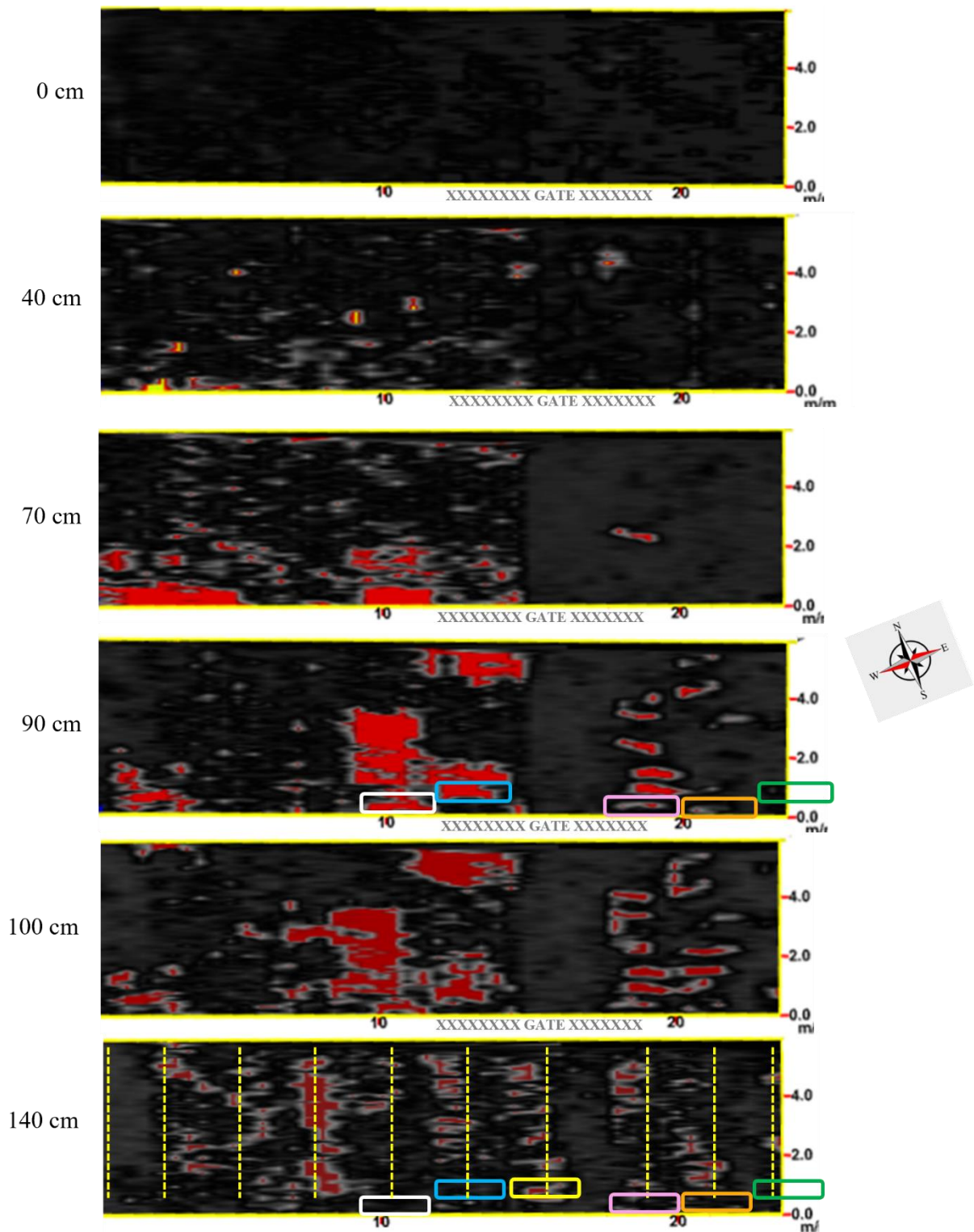


Figure 3. Six depth-slice images of the grid site taken at soil depths of 0, 40, 70, 90, 100, and 140 cm.



Figure 4. A photograph taken within the GPR survey area with flags identifying an unmarked burial next to the metal fence (highlighted by a white-colored dashed line). One stone marker from a 1975 burial (highlighted by a yellow-colored arrow) was uncovered during brush removal.



Figure 5. A stone marker of a 1983 burial that was just uncovered in line and adjacent to an unmarked burial that is located next to the metal fence. The burials were confirmed to be set in sandy glacial outwash material.