

Seramur & Associates, PC
165 Knoll Drive
Boone, NC 28607

March 15, 2023

Mr. Bill Backus
Preservationist
Office of Historic Preservation
Dept. of Parks, Recreation and Tourism
Prince William County
17674 Main Street
Dumfries, VA 22026

Re: Report of Ground Penetrating Radar Survey of the Allen homeplace cemetery or “Potter’s Field” in Prince William County, Virginia.

Dear Mr. Backus:

Seramur and Associates, PC has completed a Ground Penetrating Radar (GPR) survey to delineate cemetery boundaries at the Allen homeplace/Potter’s Field cemetery in Prince William County, Virginia (Figure 1).

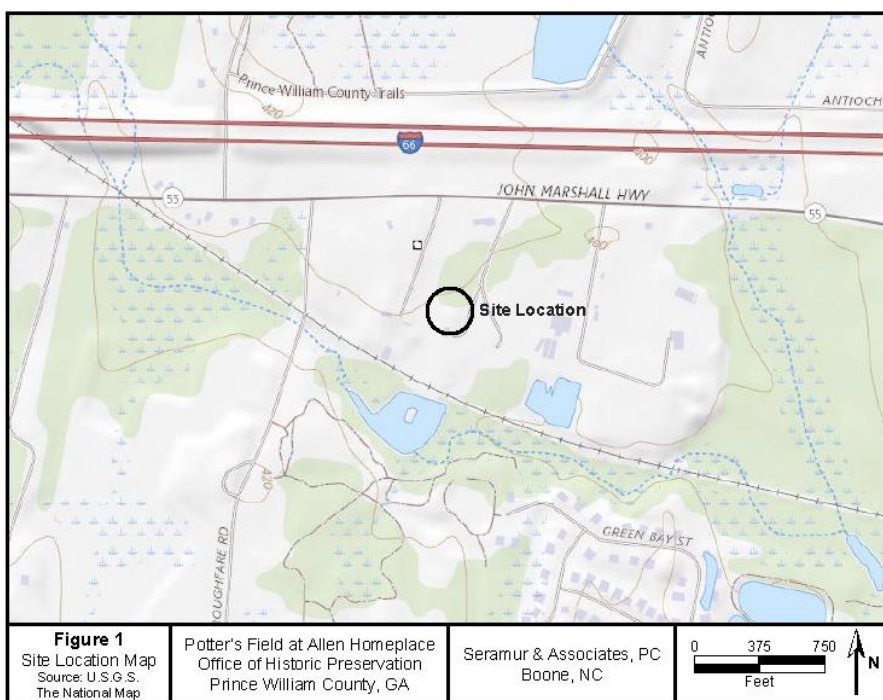


Figure 1. Topographic map showing the project location.

The GPR survey was completed using a GPR GSSI UtilityScan with a 350 mHz hyperstacking antenna. The GPR systems send pulses of electromagnetic energy or radar into the earth through a transmitter. The radar waves propagate through the subsurface and are partially reflected back to the receiver when materials with different electromagnetic characteristics (dielectric properties) are encountered below the surface. Soil that is excavated and used to backfill a grave shaft can have different dielectric properties (conductivity) than the surrounding undisturbed soil. Changes in subsurface materials such as disturbed soil in a grave shaft and vaults or intact coffins in a grave can be detected by the GPR system. The GPR system detects these changes and shows them as reflections or anomalies on the radar profiles.

The GPR system operates on a three wheeled cart with a calibrated survey wheel. GPR Grids 1 and 2 were collected inside the cemetery fence (Figure 2). Grids 3 and 5 were collected along the west and north sides of the cemetery. Grid 4 was collected across a lone grave marker located outside of the cemetery fence and in the southwest corner of the parcel. GPR grid data was collected along unidirectional transects with a one foot spacing. Fiberglass tape measures and the Pythagorean theorem were used to establish the rectangular grid corners which were marked with flags. Christian burials are typically oriented east-west. GPR transects are collected in a north-south direction so that the antenna crosses each potential burial on multiple transects.

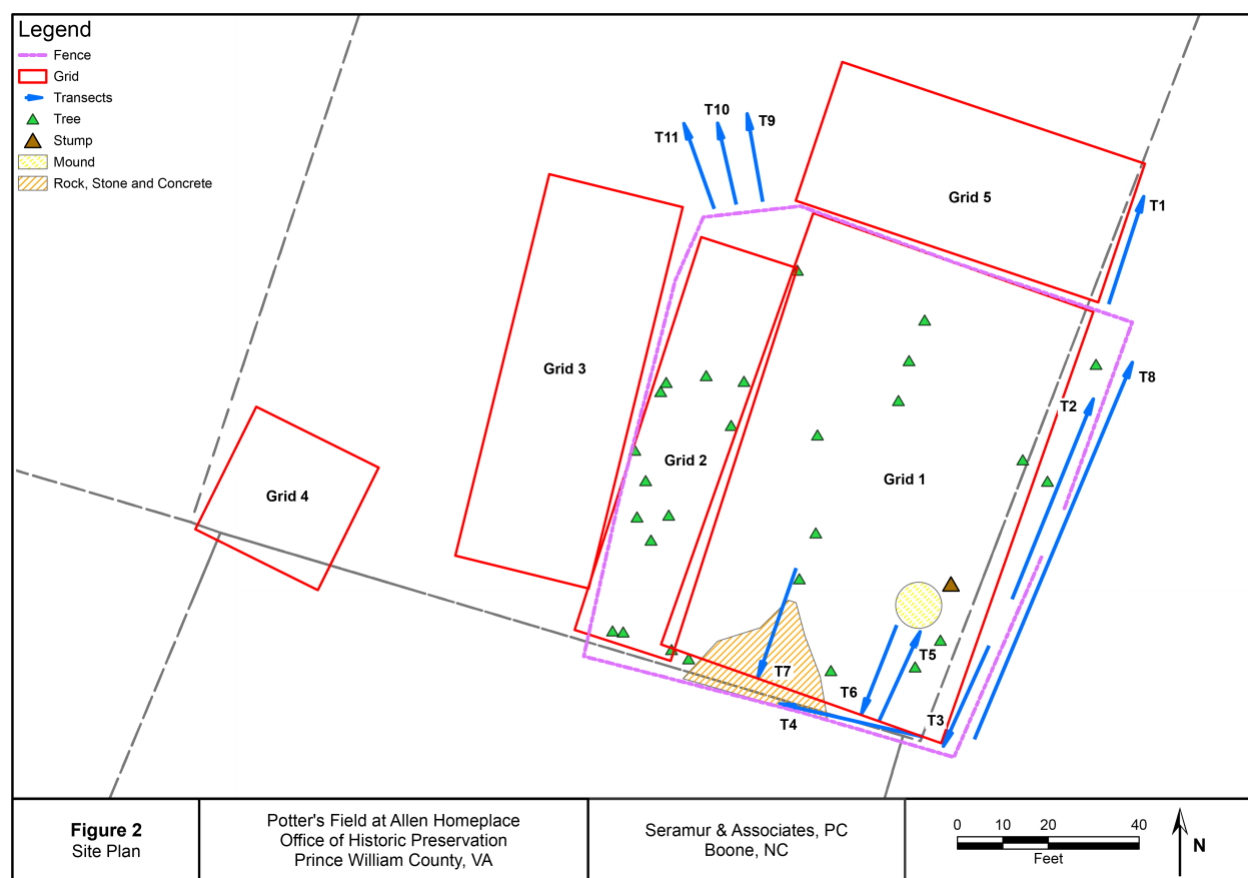


Figure 2. Cemetery map showing location of Grids 1 through 5 and the GPR transects collected in and around the fenced cemetery.

The GPR grid data was processed using GPR-Slice software for 3-D imaging and horizontal depth slices. The data processing steps included correcting for time zero, applying an automatic gain control and a background removal to eliminate horizontal banding or ringing in the GPR data. A GPR slice is a plan view map of all reflections between a particular depth interval or time window. GPR slices were constructed for multiple depth thicknesses below the ground surface to observe features at different depths. These were reviewed to determine if anomalies characteristic of unmarked burials were present. Variations in dielectric properties of the soil will affect the calculated depth and thus the depth of the 3-D slices is approximate. GPR profiles (cross-sections) of each transect were also reviewed for evidence of unmarked burials. This evidence would include shallow truncated reflections along the edge of a grave shaft and deep, higher amplitude reflections off a coffin, vault or the base of the grave shaft.

Findings

The fenced area of the cemetery is wooded and our GPR transects were collected around the trees. A few of Grid 1's transects stopped short at a mound of dirt in the southeast corner of the cemetery (Figure 2).

Stones and pieces of concrete covered the ground surface in one portion of the southern edge of the cemetery. Mapped cemetery features included trees, headstones, cut stones, field stones and depressions (Figure 3).

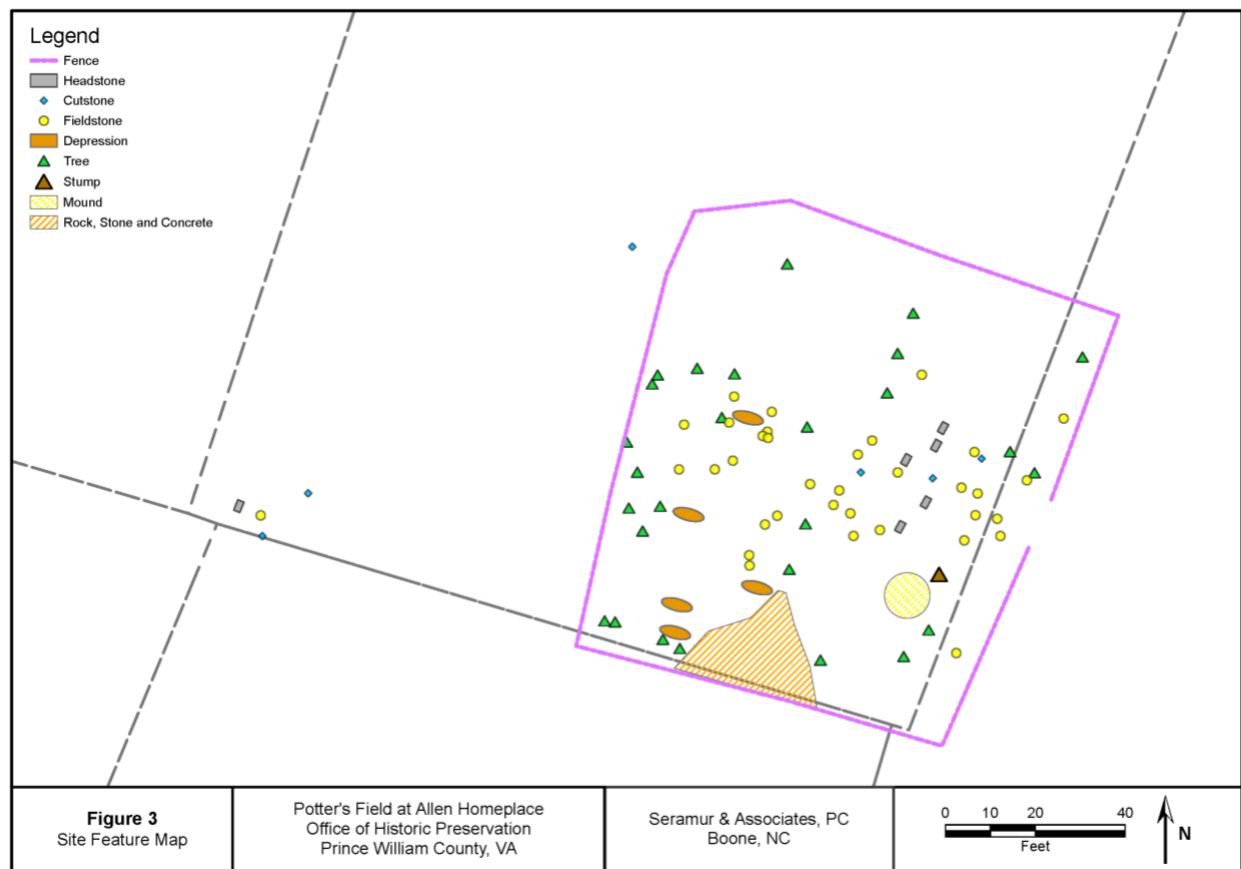


Figure 3. Map of observed cemetery features.

A review of the GPR data identified 31 potential burials (Figure 4). These were identified as subsurface reflections on multiple GPR profiles (Figure 5). Anomalies the size and shape of a grave were also identified on the GPR depth slices. Some of these reflections and anomalies were quite subtle and identified by truncated reflections in the vicinity of field stone. GPR reflections or anomalies were identified at the location of three of the five depressions mapped within the fence. It is likely that there are additional unmarked burials within the fenced area that did not produce a distinct reflection in the GPR data.

The GPR data collected at the lone grave marker in the southwest corner of the parcel shows a rectangular, reflection-free anomaly on the 0.0-0.3-foot GPR depth slice (Figure 6a). Homogenous backfill in a grave shaft can produce these rectangular, reflection-free anomalies. The GPR transects mainly show subtle indications of a burial at this location. The 9-foot transect line shows a high-amplitude reflection at a depth of 1.5 feet (Figure 6c). This reflection propagates into the lower profile which is a characteristic of a buried metallic object. If this was an urn burial, the buried metallic reflection in the 9-foot profile could be an urn. It could also be a buried metal plaque which are often used as grave markers. The 10-foot transect line only shows a slight change in reflection characteristics across the reported burial location (Figure 6c). There is a change in the reflection characteristics where the GPR crosses the reported location of the grave shaft on the 11-foot transect line (Figure 6c). There are truncated reflections on the north side (right side on profile) of the reported burial that could represent the edge of the grave shaft. The subsurface reflections across this burial show evidence of subsurface disturbance and a possible grave shaft but there are no deep reflections indicating a burial.

Evidence of unmarked burials was not observed in the GPR data collected in Grids 3 and 5 to the west and north of the fenced cemetery. Evidence of unmarked burials was also not observed in the GPR transect data that was collected outside the perimeter of the fenced cemetery. At this time, it appears that the cemetery fence encloses the burials in the Allen homeplace cemetery/Potter's Field.

A rectangular set of high amplitude reflections was apparent in one area of Grid 3 (Figure 7a). This set of reflections measures approximately 12' x 15'. The GPR profiles show that the high amplitude reflections extend to a depth of about 5 feet (Figure 7c & d). This set of high amplitude reflections has characteristics of a rubble-filled cellar. A linear set of blue reflection free areas can also be observed on the 0.7-1.0 foot depth slice (Figure 7b). These linear reflection-free areas form a distinct 90-degree angle on the southern corner. These could indicate the footprint of a structure that enclosed the set of high amplitude reflections, but the northern boundary of the footprint is not observed.

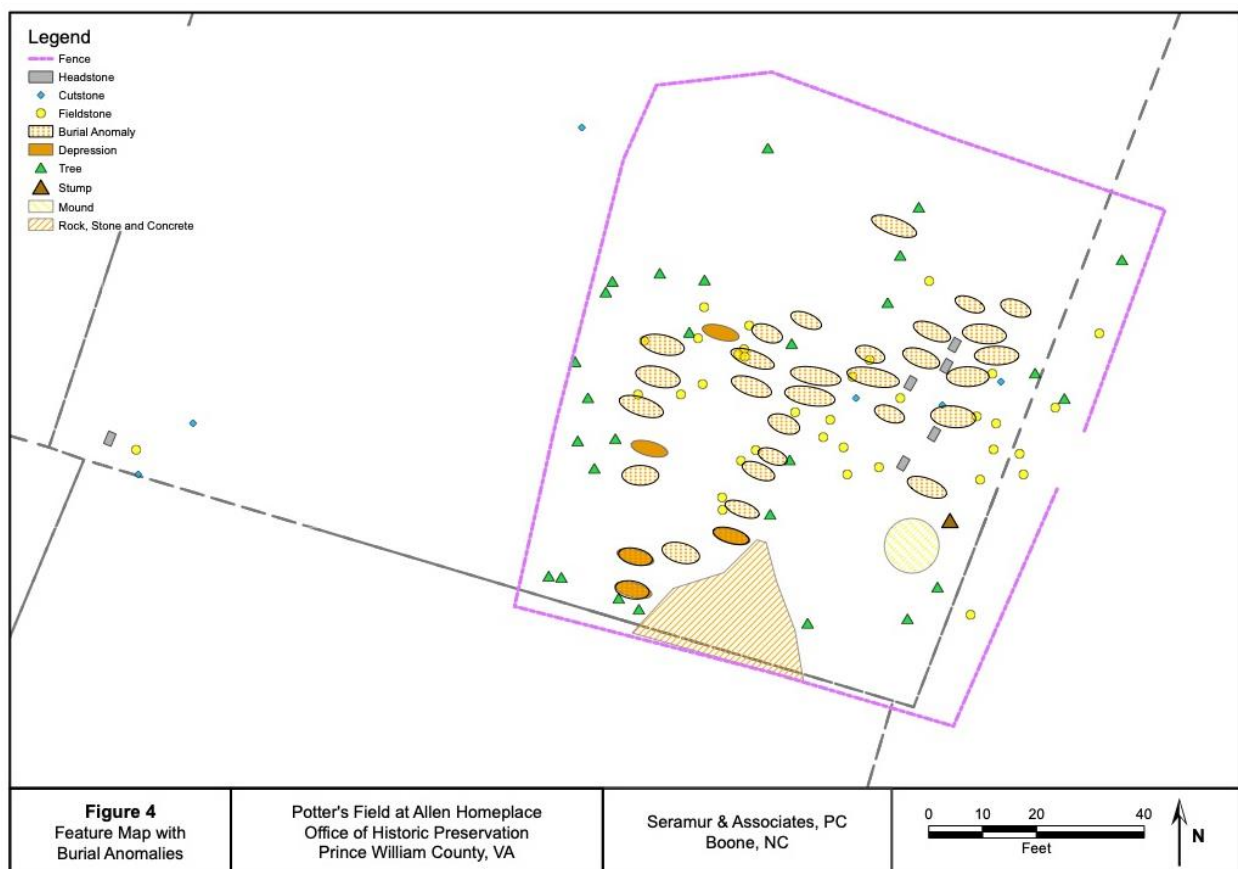


Figure 4. Cemetery map showing location of unmarked graves imaged in the GPR data.

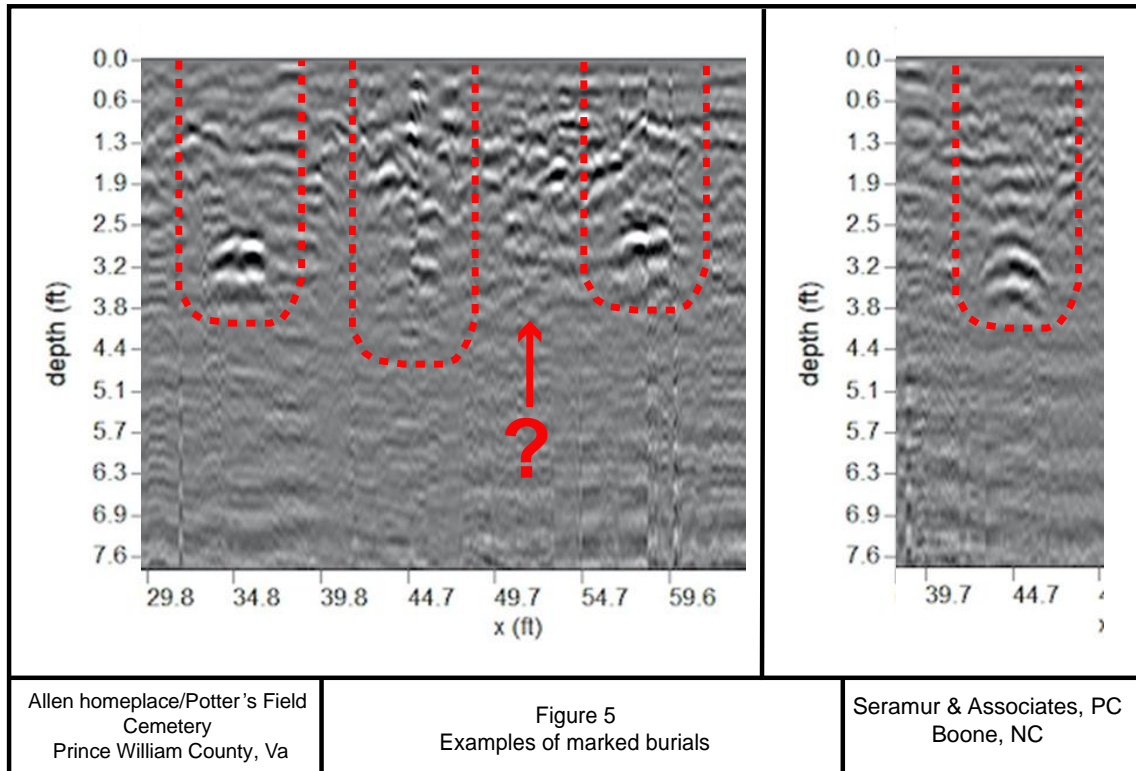


Figure 5. Examples of reflections produced by burials in the fenced cemetery.

Discussion

The GPR survey imaged many of the burials within the fenced area of the cemetery. Some of the anomalies associated with these burials are quite subtle. The cemetery fence appears to encircle the burials at the Allen homeplace cemetery/Potter's Field. There may be additional burials within the cemetery fence that did not produce a coherent set of reflections that could be delineated in the GPR data.

The GPR data collected at the lone burial in the southwest corner of the parcel indicates a former excavation and the presence of a grave shaft. The profiles across this burial do not show reflections off the base of the grave shaft. The rectangular set of high-amplitude reflections imaged in Grid 3 have the characteristics of a rubble filled cellar.

Thank you for the opportunity to provide geophysical surveys at this site. Please contact me if you have any questions about our findings or this report.

Sincerely,

Keith C. Seramur, P.G.
Consulting Geologist

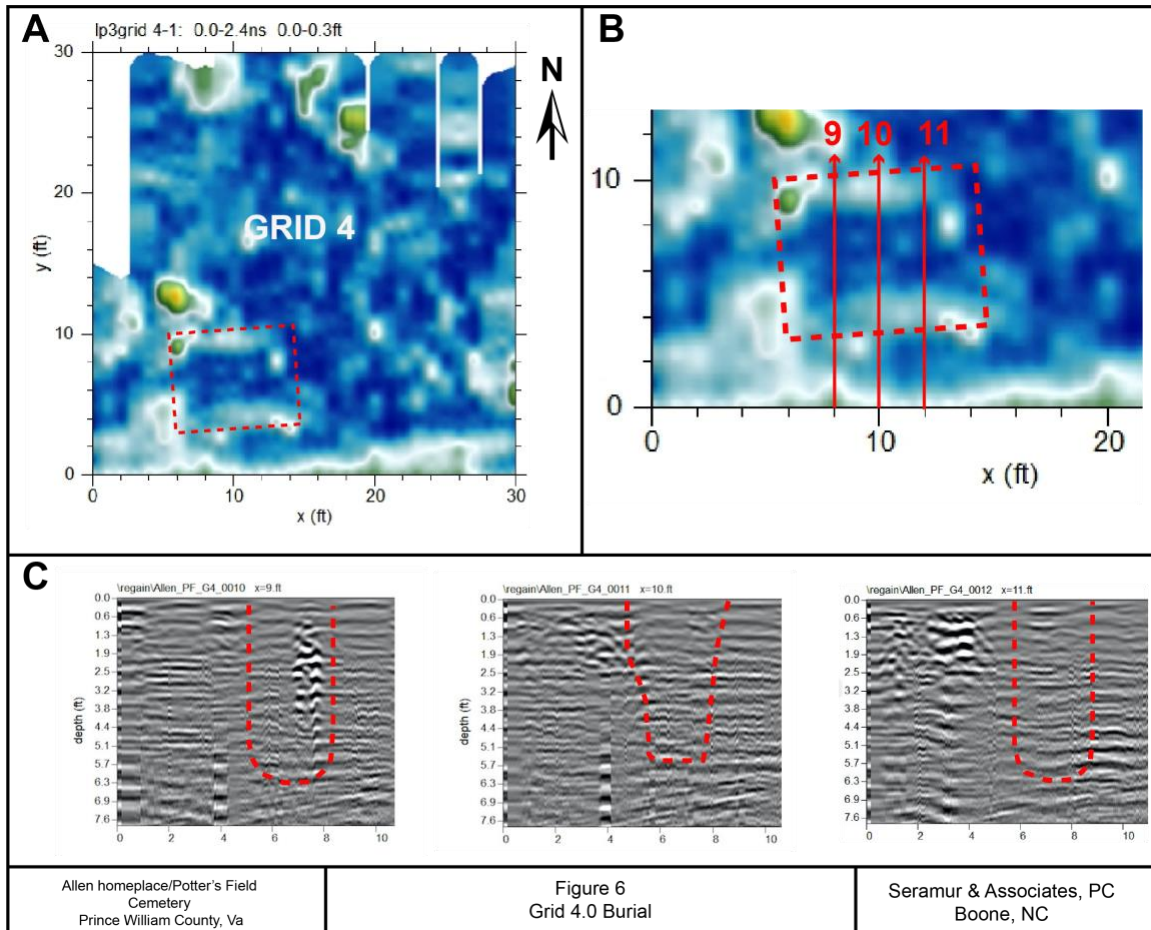


Figure 6. GPR data from the Grid 4 that extended over the lone burial in the southwest corner of the parcel. The 0.0-0.3 foot depth slice shows a rectangular reflection-free area east of the headstone (a). The location of GPR profiles across the marked burial are shown on b.

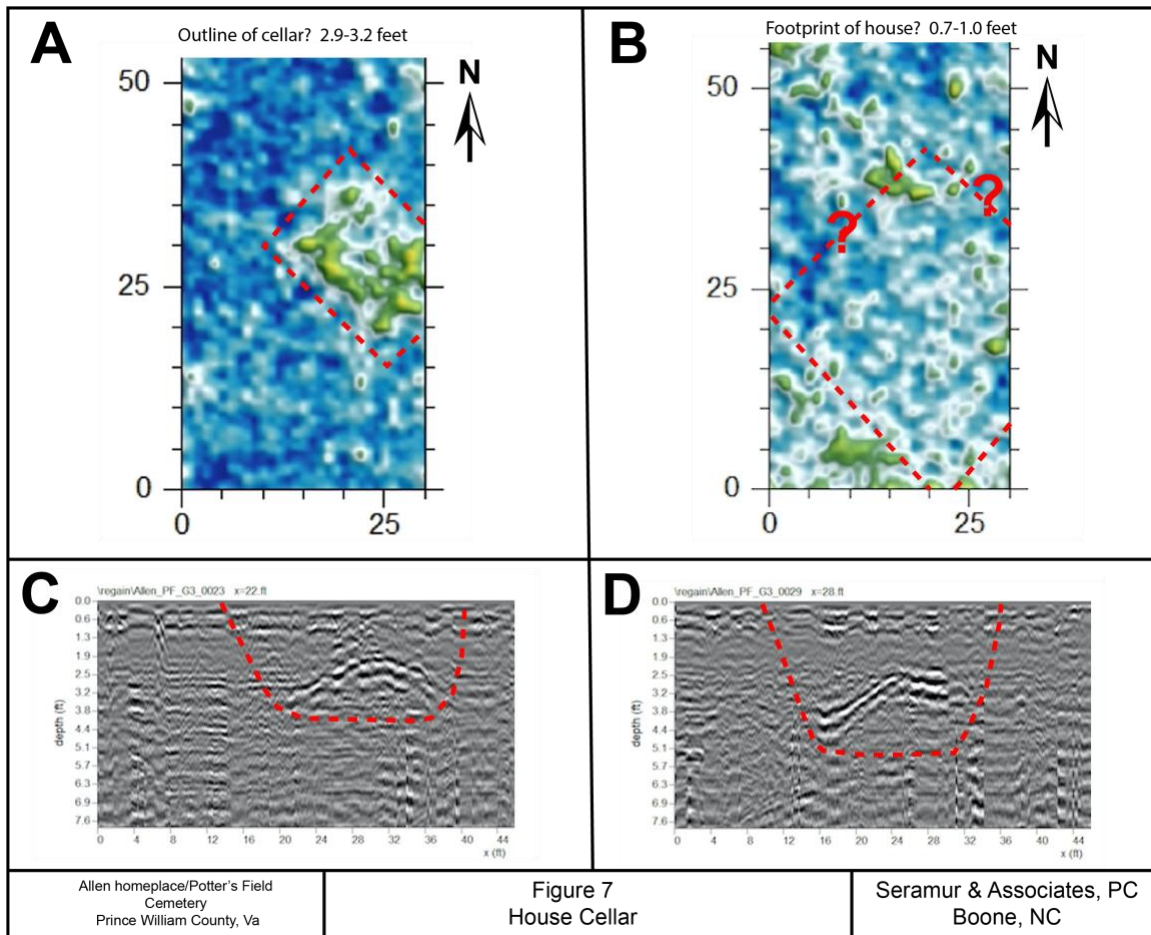


Figure 7. GPR data from Grid 3 showing a rectangular set of high amplitude reflections that has the characteristics of a rubble filled cellar.