

GPR
MAGNETICS
ELECTROMAGNETICS
UXO DETECTION
BOREHOLE CAMERA
STAFF SUPPORT

Geophysical Data Analysis Report

**Daughters of Zion Cemetery
Charlottesville, Virginia**

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Prepared for
The City of
Charlottesville, Virginia

INTRODUCTION

1.1 Background and Objectives

NAEVA Geophysics Inc. (NAEVA) was contracted by the City of Charlottesville in 2016, 2017, and most recently in 2019 to conduct geophysical investigations at the Daughters of Zion Cemetery in Charlottesville, Virginia on behalf of the Preservers of the Daughters of Zion Cemetery nonprofit group. The purpose of the geophysical investigations was to attempt to map unmarked burials and to better define the outer limits of burials within the cemetery. Recently NAEVA was contracted to review the data collected through all three phases in greater detail in order to determine the locations of individual graves to estimate the number of graves within the cemetery.

2 RESULTS

2.1 Summary of Data Processing

GPR data were processed using Sensor and Software's EKKO Project program. Hyperbolic velocity calibration was used to determine the speed of the electromagnetic waves passing through the subsurface. For this site, a value of 0.29 ft/ns was used. The profile time axis was converted to depth using this speed constant for the site. Profiles were processed using low pass filters, DC removal and background subtraction which removed noise in the data. A SEC2 (Spreading and Exponential Compensation) gain was employed to compensate for signal attenuation. All profiles were examined individually, and markers denoting a potential grave were drawn on all profiles. **Figure 1** shows an example of a marked-up profile.

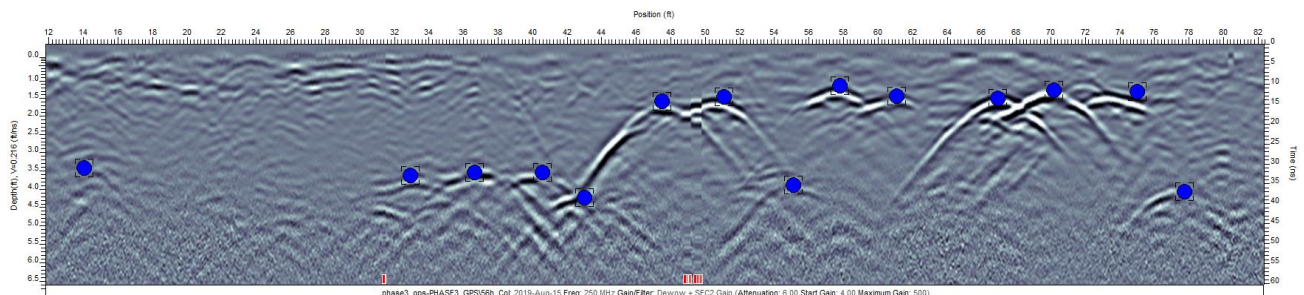


Figure 1 Blue dots over hyperbolas in the profile above represent potential grave locations.

Next, adjacent profiles were examined together with their locations matched up to see if potential graves align horizontally and vertically in the data. Any flagged location that didn't have a matching hyperbole on adjacent profiles was removed. EKKO Project gave each flagged point a unique local and geodetic location, so all points could be plotted on a master map along with the locations of all profiles. **Figure 2** shows the positions of all profiles along with all potential grave location points.

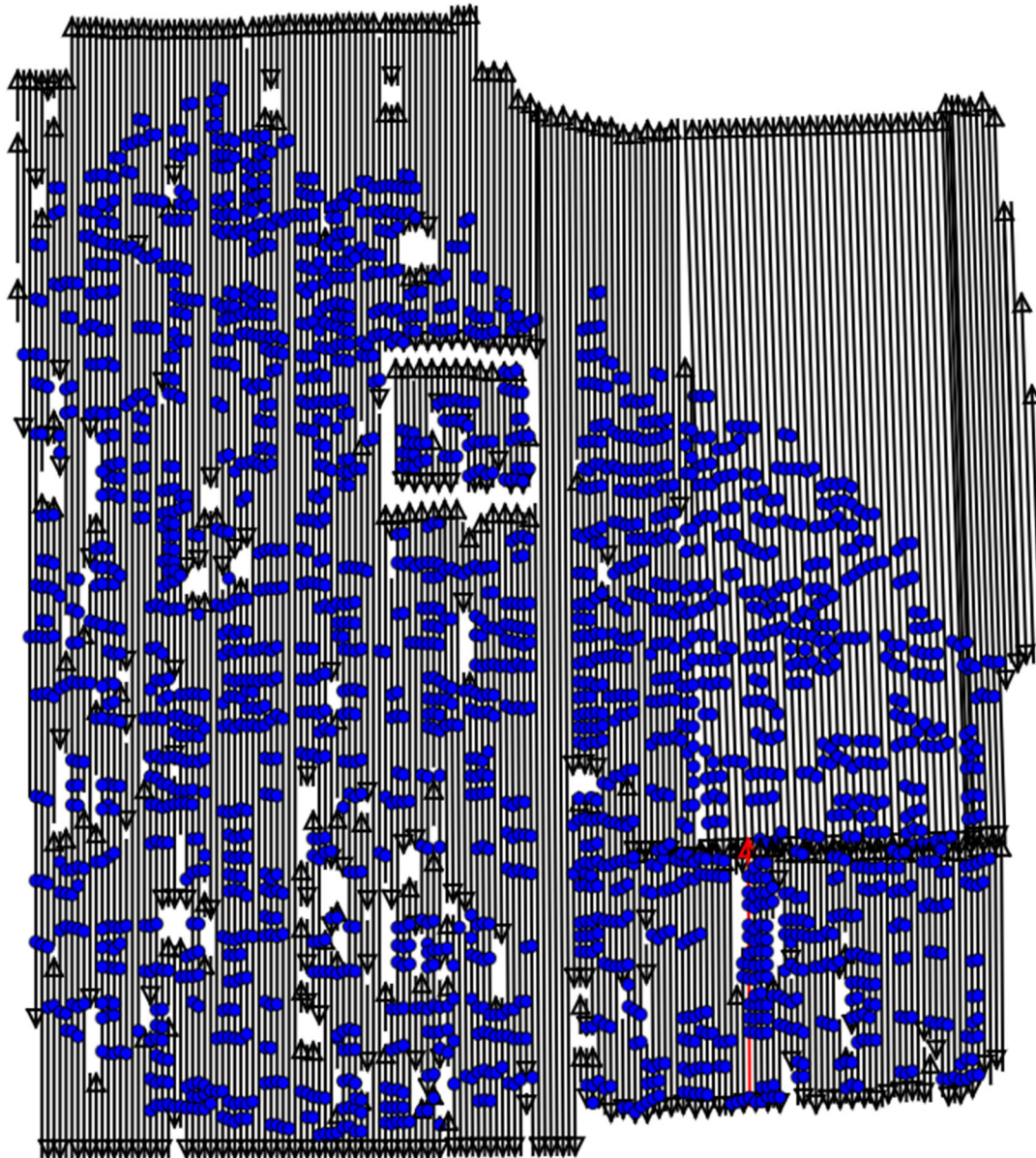
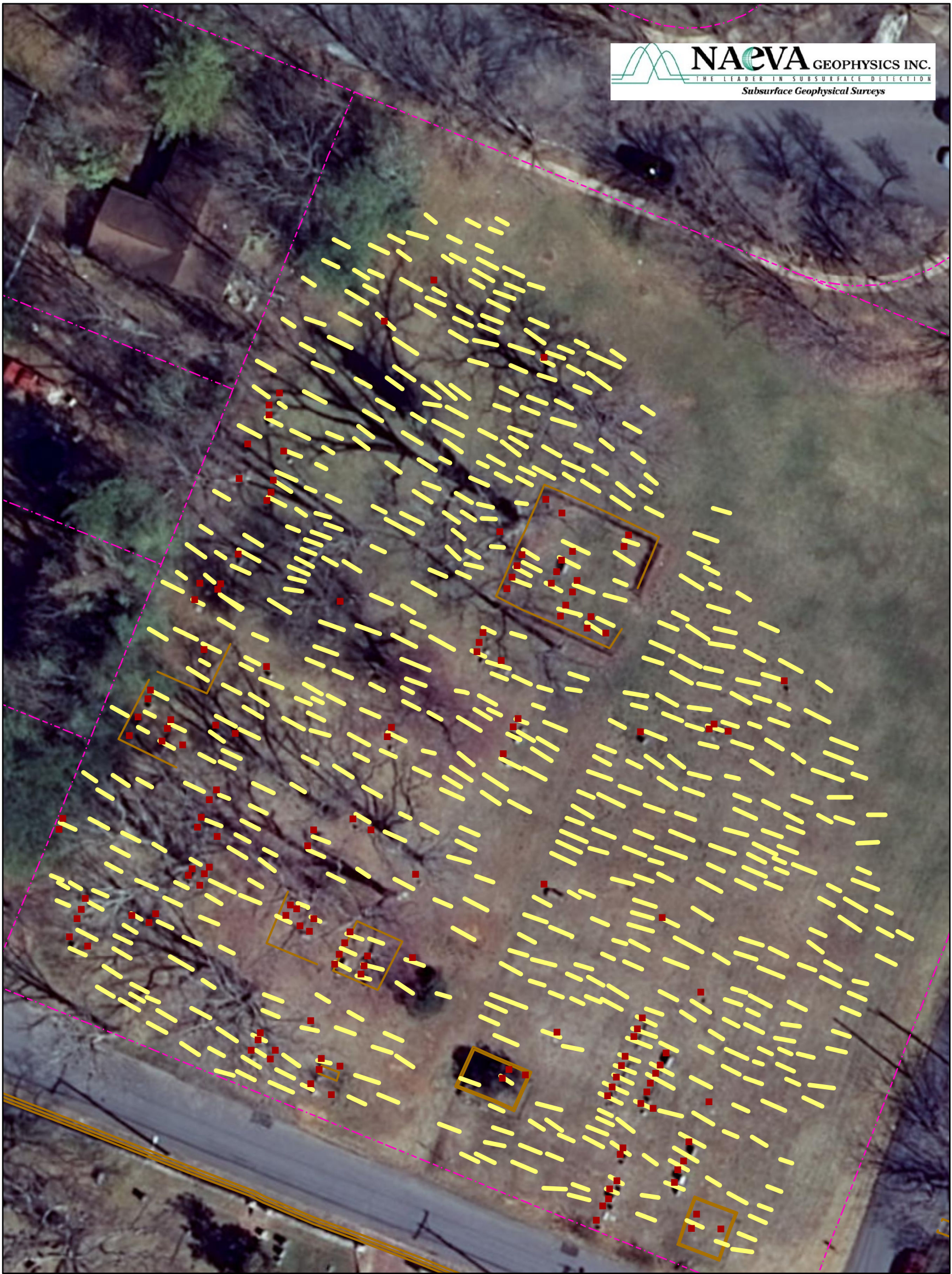


Figure 2 The locations of potential graves that were marked on the GPR profiles are automatically transferred to a map that covers the extent of GPR coverage within EKKO Project

All noted grave locations points were exported into ArcMap where lines were drawn through sets of points that resemble linear East-West features that are most likely graves. Tallying the individual burials visible in the GPR profiles collected at Daughters of Zion results in a sum total of 641 graves. A final map of interpreted grave locations can be found in **Appendix A**.

Appendix A

Map Showing Interpreted Grave Locations



Legend

- Headstones
- interpreted graves
- - - Parcel Boundary
- Plot Boundaries



0 25 50 100
Feet

Daughters of Zion

Interpretation

Daughters of Zion Cemetery
Charlottesville, Virginia