

CULTURAL RESOURCES REPORT COVER SHEET

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TCP(s) found? Yes No

Replace a draft? Yes No

Satisfy a DAHP Archaeological Excavation Permit requirement? Yes # _____ No

Were Human Remains Found? Yes DAHP Case # _____ No

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Ground Penetrating Radar (GPR) Survey of Walla Walla County Poor Farm Cemetery site, City of College Place, WA

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Summary

A Ground Penetrating Radar (GPR) survey of the site of the Walla Walla County Poor Farm Cemetery was conducted, to determine possible locations of gravesite on the property. The Cemetery was in use from the 1870s until the late 1940s. The grave markers and other elements of the cemetery site were removed and the ground used as pasture and parkland, so little in-situ evidence for the locations of gravesites currently exists. For the survey, the site was divided into three areas, and GPR lines were spaced every 2 feet to completely cover the area. Line locations were established with both measuring tapes and GPS. A total of 124 GPR lines were collected. From these data, a large number (>3000) of subsurface targets, corresponding to discontinuous objects in the ground, were identified. Many of these targets are at depths, and have spatial characteristics, that are consistent with burials. Other targets, typically with higher contrast reflections, are attributed to possible pipes, and/or to small cylindrical grave plot markers known to be present. The large number of GPR targets confirms a large number of burials at the site. Identification of individual gravesites was difficult, due to the low reflectivity of the targets. This is consistent with most of the burials being smaller (infants), the possibility of many of the burials being cremated remains, and the age of the burials at the site. The GPR data were compiled into a 3D set of data, allowing the radar reflectivity to be examined in map view. This resulted in a number of rectilinear shapes to be resolved, which correspond to burial sites in the Poor Farm Cemetery. Using new survey data, air imagery, and the 3D-GPR data, a preliminary overlay of the original cemetery plat map is presented.

Walla Walla County Poor Farm Cemetery

The Walla Walla Country Poor Farm was established in 1891 and operated until a gradual phase-out in the late 1940s until it finally closed in 1954. County poor houses and poor farms were an important community institution in the United States, providing housing and sustenance for indigent residents of each county, many of which were elderly or infirm. These institutions served this purpose until the advent of the Social Security and other state and federal level support programs were firmly established. A component of the Walla

Walla County Poor Farm was the Poor Farm Cemetery, which operated from 1891 until 1954. The cemetery is located on the corner of Mockingbird and Sandpiper Lanes in College Place, WA. The adjoining land was developed as a mobile home park, following which the majority of the cemetery markers were removed, and the cemetery site was graded and used as a park. The City of College Place, and a local civic organization (Walla Walla 2020- see ww2020.net) worked to document the Walla Walla County Poor Farm and Cemetery as part of their historic sites and markers project (ww202.net/historic-sites/). This resulted in finding many of the burial records for the Poor Farm Cemetery, and provided information needed to erect an informational marker at the cemetery site. Copies of the Poor Farm and cemetery description are included as an appendix to this report, and copies of the photos of the Poor Farm Cemetery burial records will also be included with the data appendix. This information documented the presence of ~600 burials at the site. The locations of the cemetery plots and the spatial organization of the cemetery site are incomplete. Thus the goals of this project are to use geophysical methods (Ground Penetrating Radar (GPR) and GPS-enhanced drone-based photometric surveys to locate burials at the site.

Introduction and Methods

For the GPR survey, a GSSI SIR-4000 GPR unit, with a 350 MHz antenna mounted to a wheeled cart, with a GPS unit, were used. A map of the site, with the outline of the property survey conducted for the City of College Place (2021), as well as an estimated location of the cemetery site provided by previous plats, maps, and surveys. To provide a robust link between the GPR survey and the 2021 Property Survey, the SE corner marker of the 2021 survey was used as the reference datum (see survey location map). The largest portion of the site, the elevated, open field, was designated as Area A. Two other locations were also surveyed. Area B is the portion of Sandpiper Lane immediately to the West of Area A (see survey location map). Area C is located immediately to the South of Area A, and corresponds to all or part of a former railway right-of-way (see Figure 1, survey location map).



Figure 1: Cemetery Site, with 2021 Survey boundary, and interpreted historic site boundary

For each area, a grid of GPR lines was established using measuring tapes, with the origin (0 N and 0 W) defined by the SE corner marker of the survey (see GPR area map).



Figure 2: GPR survey Areas

In areas A and B, the GPR lines were run ~ N-S. In Area C, the GPR lines were run ~E-W. The spacing between lines was 2 feet. The direction of travel for each GPR line was noted and a line number assigned.

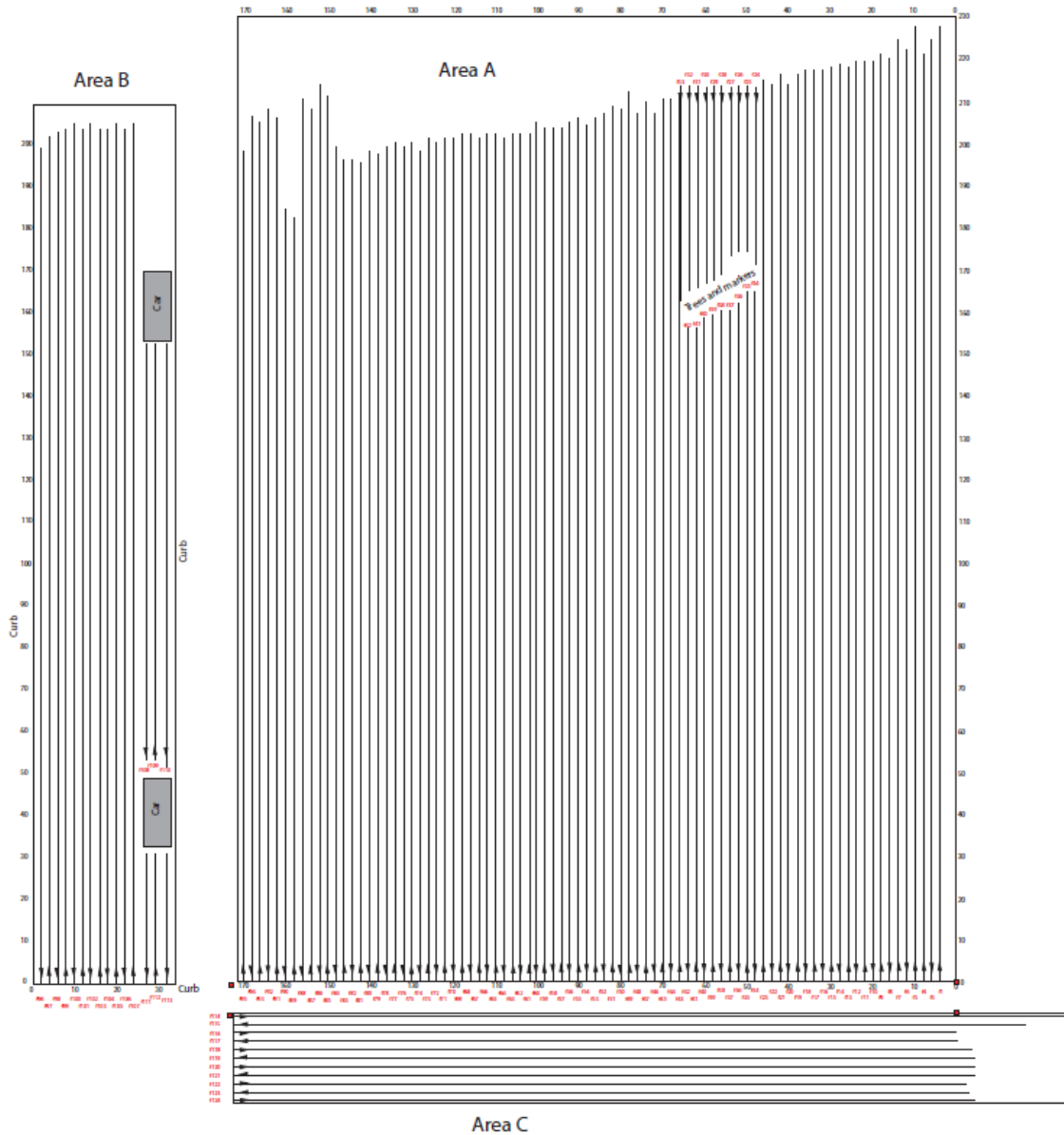


Figure 3. Map depicting GPR survey lines for Areas A-C. A larger version of this figure will be available in the appendix

An appendix listing each line number, its length, and location on an index map will be provided. For the first 12 GPR lines, the GPS data logger did not sync with the GPR unit, so those locations have been manually determined using the measured coordinates. For all of the other GPR data (Lines 13-124), GPS data was also recorded, providing this additional spatial information. The data collection was routine, and the data collected was of good quality.

The GPR data were processed and analyzed using standard methods with the GSSI RADAN-7 software package. Data filtering to remove background and high-frequency noise was applied. For each GPR line, a set of radar scatterers, hyperbola-shaped reflections, was noted. The location (depth and spatial position) of each target was picked, and these coordinates are saved and tabulated (see data appendix). Each GPR line was also used to produce a Google Earth KMZ file, and an image of the radargram for each GPR line was saved (as a .jpg file). The locations of the GPR targets were then plotted on site maps, and in GIS maps with an air photo overlay.

Results

A representative GPR radargram (line 21, Area A) is provided as an example. The uninterpreted data (Figure 4a) and the interpreted data (Figure 4b) are shown.

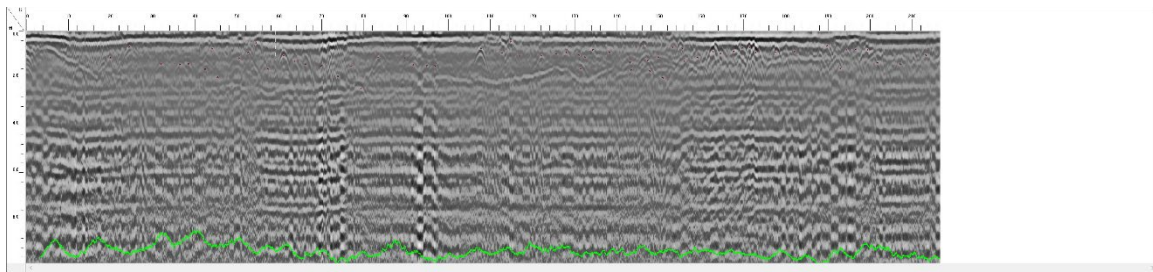


Figure 4a. Radargram for GPR line 24. Distance (ft) is provided at the top of the figure (S on left, N on right), with approximate depth below surface (ft) also provided. This depth is provisional. The greyscale provides a measure of the radar reflection amplitude (darker black/white are higher-amplitude reflections). Green line indicates estimated depth at which signal is too attenuated to provide useful information.

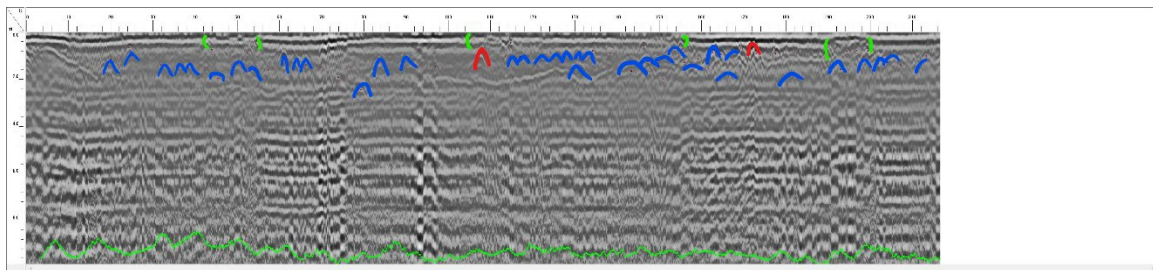


Figure 4b. Interpreted Radargram for GPR line 24. Blue lines note hyperbola-shaped reflections that are picked as GPR targets that are likely associated with burials. Red lines mark high-amplitude GPR reflectors- these can be either subsurface utilities (water pipes), or else cylindrical grave plot markers. The green lines at surface note areas of ground subsidence or disturbance.

The majority of the radar targets were found between 1 and 4 ft depth, with some targets being near the surface. In addition, areas of ground disturbance or subsidence were also noted. This analysis was applied to all 124 GPR lines, with over 3000 GPR targets identified. The locations of these GPR targets are tabulated (see data appendix).

Using the spatial coordinates of the GPR targets, their locations on the GPR lines were mapped (Figure 5). Few targets were found in either Area B or Area C.



Figure 5. GPR lines and GPR targets for Area A. Higher-amplitude targets are plotted in red. Targets that may be associated with burials are marked in blue.

From examination of the GPR target map, it is clear that there is abundant evidence of the past burials at this site. It is somewhat less clear whether sets of targets can be used to identify unique burials or burial plots. The same GPR targets were plotted on the GIS-based photo map of the site (Figure 6).



Figure 6. GPR targets plotted on air photo map in GIS database. Darker blue targets on East side were interpolated without GPS data. All other targets located using GPS coordinates from the collected GPR data.

The next stage of analysis was to create a 3D image of the GPR data. The transect line coordinates were used in Radan7 to construct the 3D radar data. These are then used to portray radar reflectivity in map view. Differing depth intervals were examined, with the best being a 0.8 ft thick average centered on 2.0 ft depth in the areas.

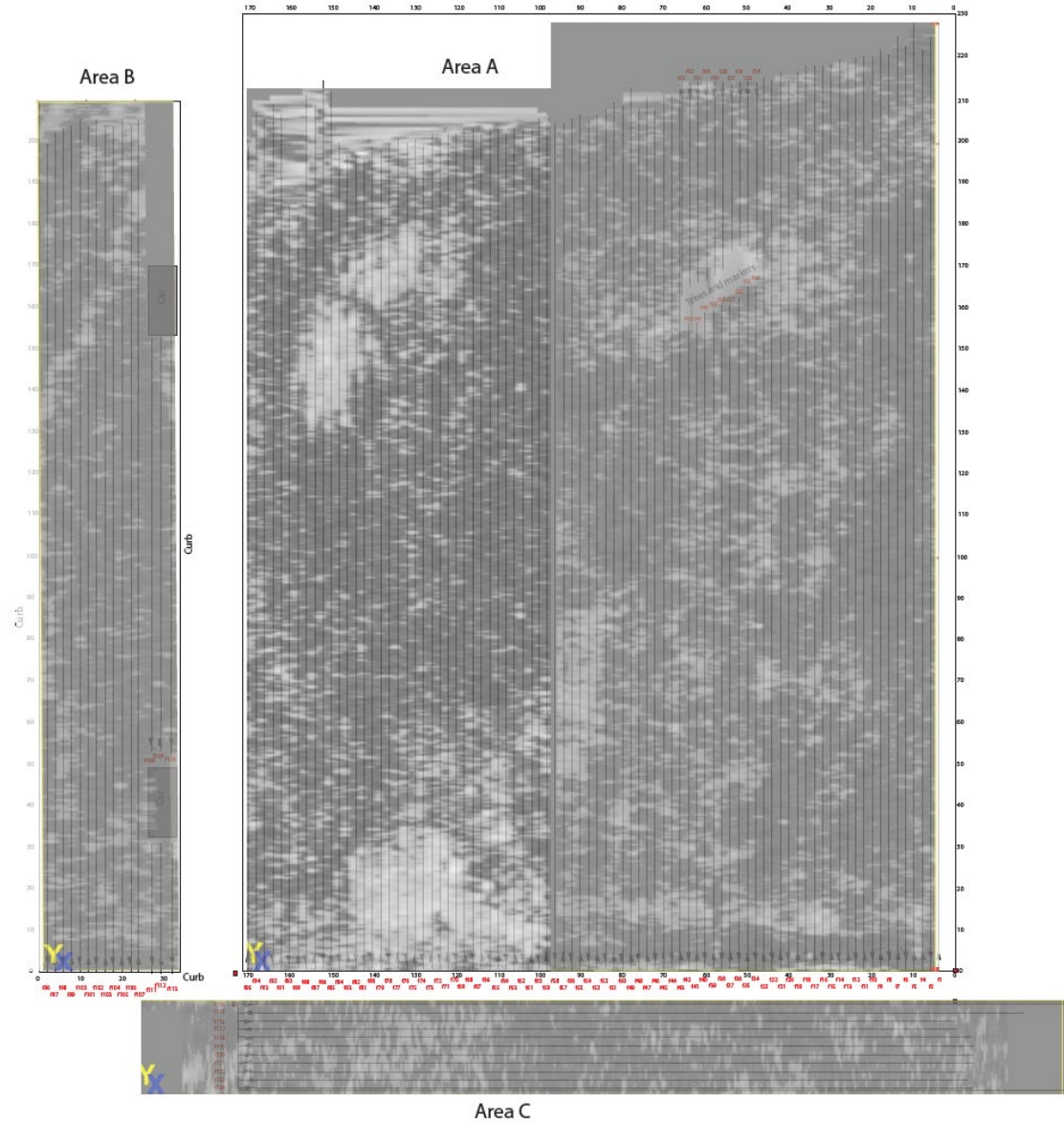


Figure 7. Map view of 3D GPR data set, centered at 2.0 ft nominal depth, for GPR Areas A, B, and C.

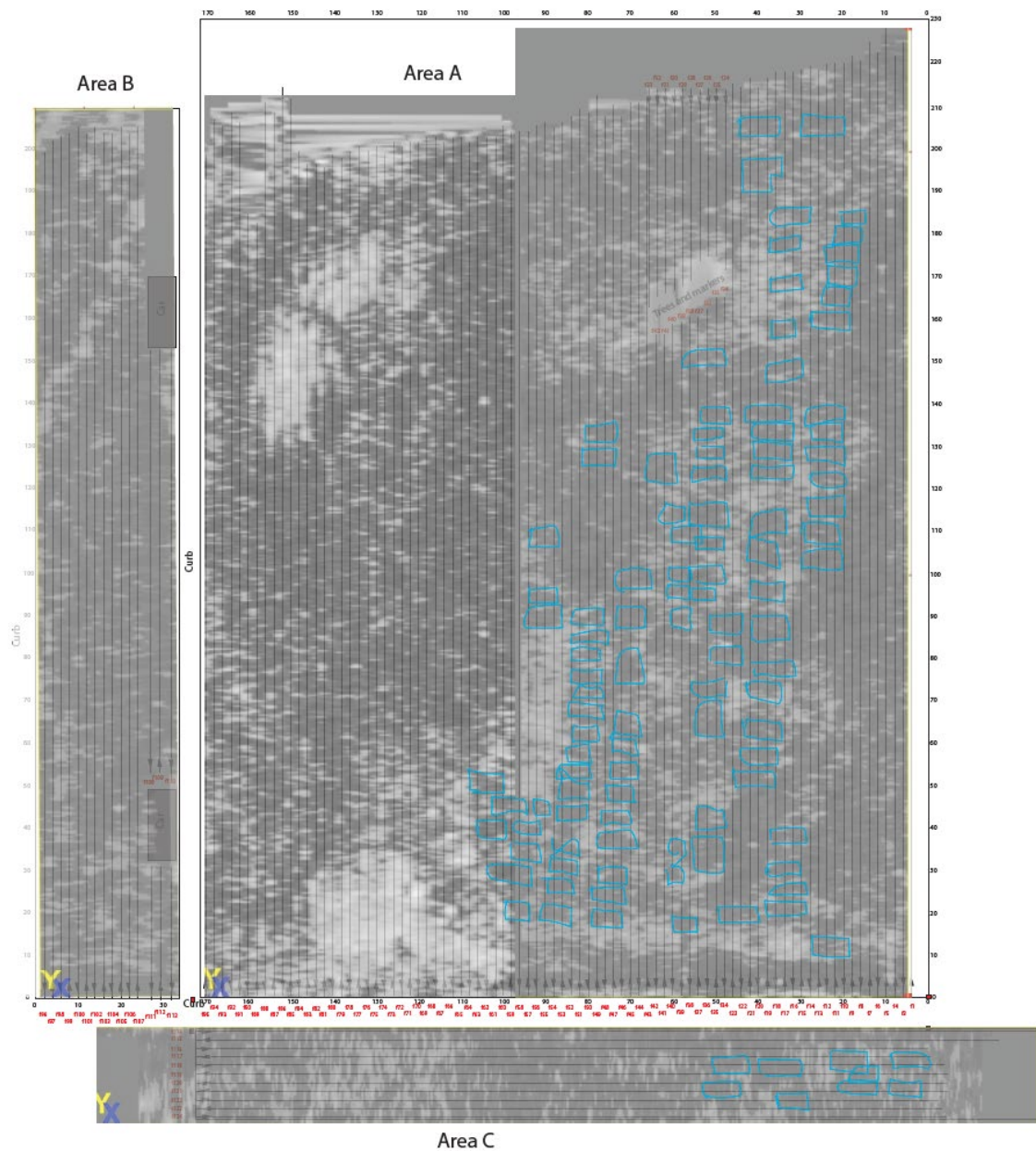


Figure 8. Annotated version of GPR map from Figure 7, probable burial locations are outlined in blue. The lengths and widths of the rectangular patterns of the radar reflections is consistent with dimensions of typical burial plots. From this image, ~118 burial plots are interpreted.

From the map view of the 3D GPR data, a number (~118) of rectangular shaped radar reflectors is apparent (Figures 7 and 8). The sizes (2-3 feet x 4-8 feet) are typical of burial plots. These rectangular GPR reflectors are arrayed in ~north-south rows, mainly visible in the eastern portion of the site. Larger, more continuous GPR reflectors are present, some of which are ~ in line with the better-defined sets of rectangular reflectors- these may be larger, group burials, or locations where cremated remains were buried.

On the cemetery site, it is also apparent that numerous rectilinear impressions in the ground surface are present. These are clearly visible in air photos (Figure 9), and somewhat apparent in LIDAR images (from the WA DNR LIDAR portal- Figure 10).



Figure 9. Air photo (Google Earth Pro) of the Walla Walla County Poor Farm Cemetery site. Sets of E-W oriented, rectilinear ground depressions are visible, primarily in the eastern half of the site.



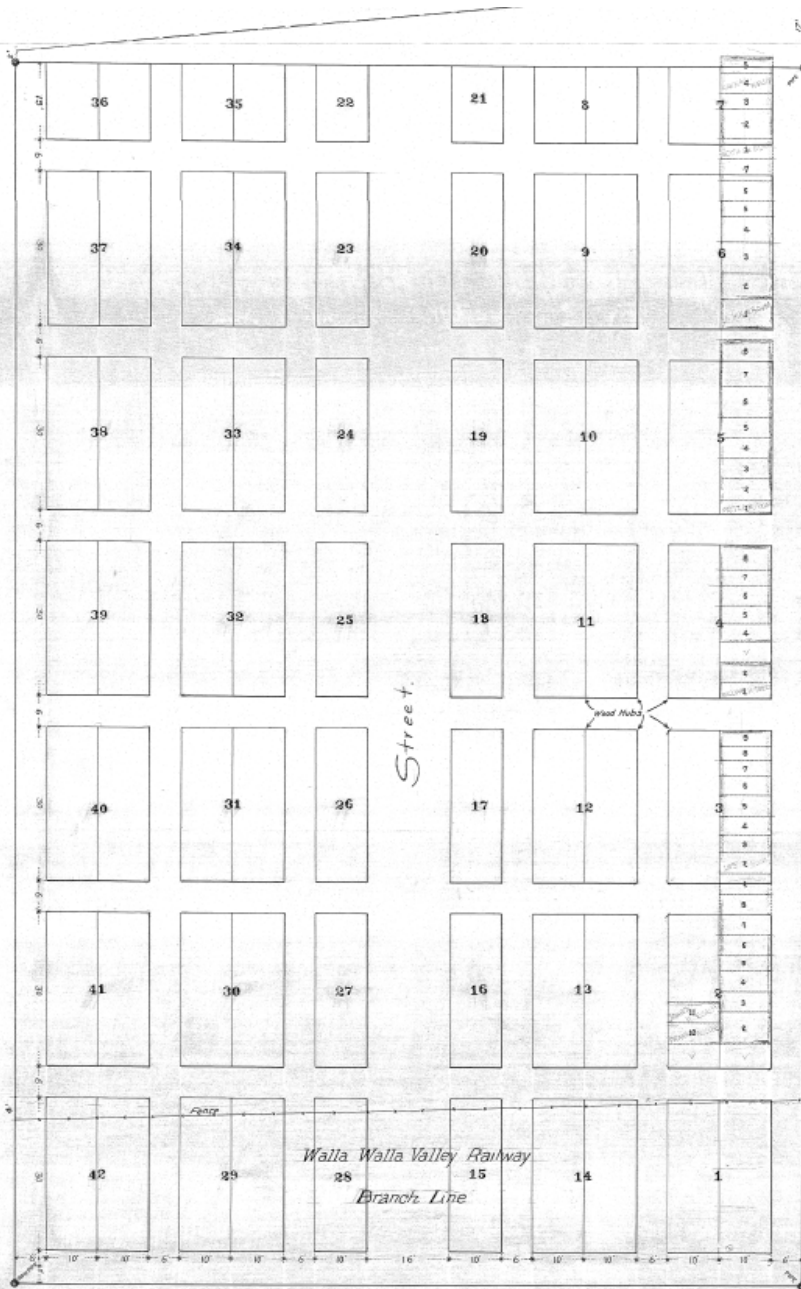
Figure 10. Shaded relief image of WA-DNR Lidar data for the Walla Walla County Poor Farm Cemetery site. The resolution of the LIDAR data is too poor to resolve the depressions evident in Figure 9, however surface features are present, noting that a more detailed LIDAR survey of the site may provide additional information.

A comparison between the GPR map and the ground surface photos was also made (Figure 11). Examination of the GPR data that was overlain on the air photo demonstrates a very close correspondence between the location of ground surface depressions and the subsurface GPR features.

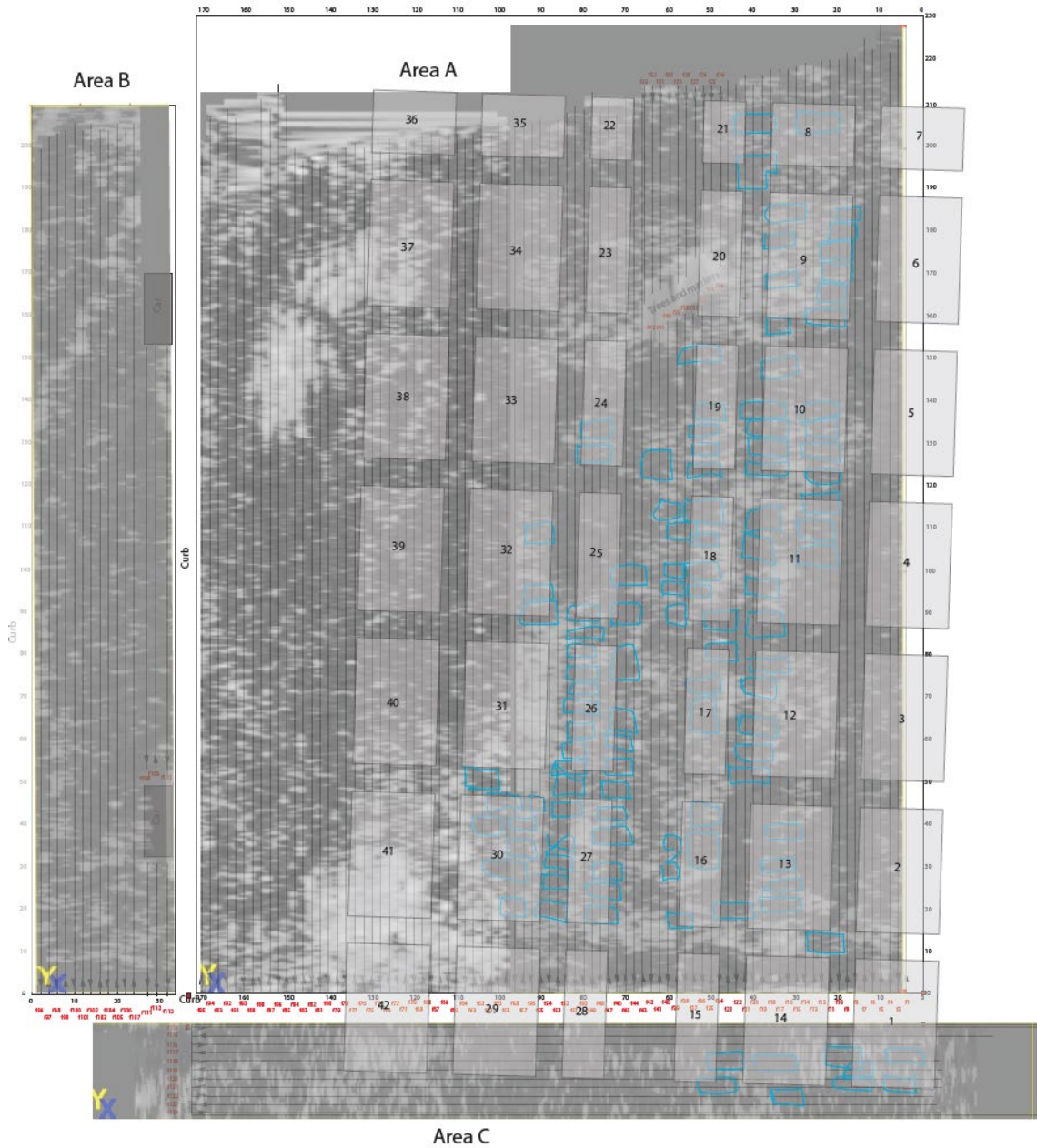


Figure 11. Comparison between surface depressions visible on air photos (A) and rectangular subsurface GPR reflections (B) for the Walla Walla County Poor Farm Cemetery Site, There is good agreement between the locations, sizes, and shapes of these features.

GPR targets was used to attempt to constrain the location of the original 1920s plat map of the Cemetery Site (Figure 12). The dimensions of the cemetery lots, spaces between the lots, their lot numbers were drafted to scale. Using the GPR map image with interpreted burial plot locations, an attempt was made to overlay the Plat map information on the present site. Attempts to use the GPR targets to help constrain the overall location of the Poor Farm Cemetery plots from the Plat map are non-unique. The largest uncertainty is in the location of the railway right-of-way indicated on the Plat map (Figure 12), and the relationship between the more modern locations of the SE corner of the cemetery plat and this Plat map. The chosen location is favored as the density of GPR targets is somewhat less in the areas between cemetery plots, as well as the general footprint of the older Plat map, the current site, and the locations of probable burial-related GPR targets. The preferred interpretation (Figure 13) provides a good correlation between GPR-defined burial plots and the dimensions of the set of cemetery lots on the plat map. The correlation is imperfect- with many burial locations apparent in areas that are not defined as lots on the original plat map. This is likely the product of burials being made in locations that did not strictly adhere to the site plan as shown on the plat map, which is a common practice in older cemeteries in the region.



PLAT *Map 1, 1929*
 OF
 CEMETERY AT COUNTY FARM
 WALLA WALLA COUNTY, WASHINGTON.
 SITUATED IN THE SW¹/₄ OF THE SE¹/₄
 OF SEC. 36, TR. 7 N. R. 35 E. W. M.
 SURVEY COMPLETED DECEMBER 1921.
 SCALE: 1" = 10'
 APPROVED BY COUNTY COMMISSIONERS *H. E. ...*
Ed. ...



Other Locations:

This report has focused on the main area of the cemetery site (Area A in Figure 2). The results from Area B and C are described here. For area B, located on SE Sandpiper Ln, did not show any GPR evidence for burials located there. A representative radargram (Figure 14) is

provided. These do show clear evidence of the substrate for the street, and subsurface utilities can be inferred from the map-view GPR data (Figure 15).

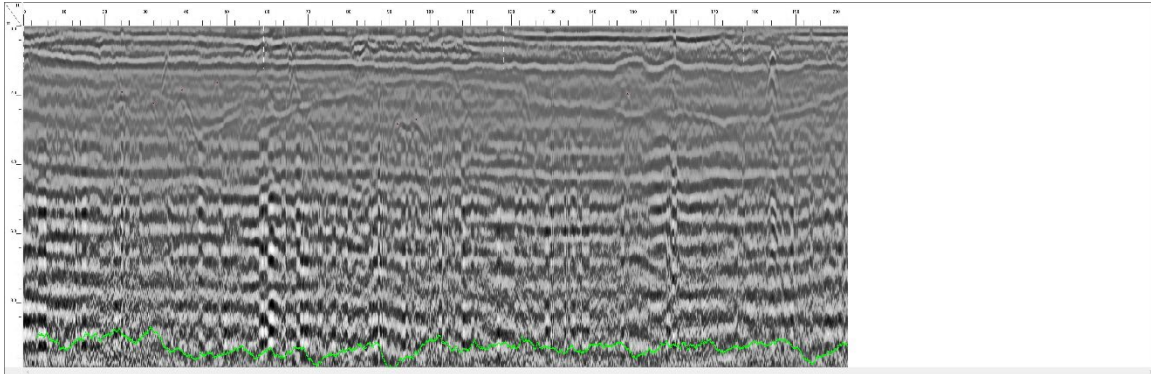


Figure 14. GPR radargram for Area B, under SE Sandpiper Ln.

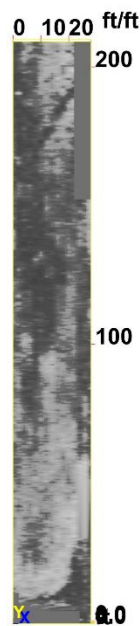


Figure 15. GPR map of Area B. Linear feature traversing north end of area is a subsurface utility.

For Area C, located along the railroad right of way on the southern portion of the study area, the GPR data revealed several interesting features. As noted above, some evidence for several burial sites may be present on the eastern portion of area C (see Figure 13). Other features include possible remnants of the railway (Figure 16). In this image, narrow GPR reflections

can be found that are oriented in an E-W direction. These two linear features are spaced 3.75 feet apart. This is narrower than standard-gauge for railroads (4.67 feet), however.

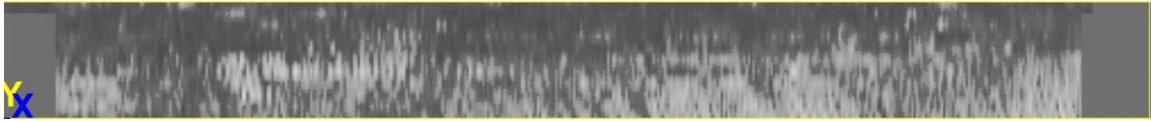


Figure 16. GPR map of Area C. Linear features running E-W are spaced 3.7 feet apart and could be associated with the former railroad trackway.

Conclusions and Recommendations

The GPR survey of the Walla Walla County Poor Farm Cemetery site provided high-quality GPR data, which indicates a great number of subsurface radar reflections that are consistent with burials known to have been associated with this site. GPR targets confirm multiple depths of burial, likely from multiple interments within single cemetery burial locations. Many of the GPR targets were small, or difficult to discern. This is also consistent with the large number of infant burials at the location, and of the age and condition of the remains. Maps of the GPR data did indicate a large number (~118) of individual burial sites were imaged and can be located on the site. While this is far fewer than the number of known burials, these most likely represent burials associated with bodies in coffins or caskets, and are better preserved due to a combination of burial practice and possibly age of the burials. Several larger GPR anomalies are also present- these have similar characteristics to the anomalies associated with smaller burials- so these may represent mass burials, or the interment of many smaller cremated remains that may not be resolvable as well-defined individual burial sites.

Additional research, which may allow for individual burials to be identified, would be to tabulate and map burial locations for specific cemetery plots that can be obtained from burial records. A set of these records (appearing to date from the 1920s-1930s) was reviewed- knowing the number of infant versus adult burials may help refine GPR target interpretation. Finally, older air photos of the site that include the cemetery and the railroad (or the cemetery and adjacent highways or roads) may also aid a more precise location of the cemetery plots.

A data appendix, with copies of all GPR data, GPR images, original versions of figures in this report, and GIS data, will be provided electronically. All data will be preserved at Western Washington University's Geology Department.

List of Appendices:

Appendix 1: Description of Walla Walla County Poor Farm and Cemetery from Walla Walla 2020 project web materials (<http://ww2020.net/>)

Appendix 2: Copy of signage placed at the Poor Farm Cemetery site.

Electronic Appendices:

Appendix 3: GPR data

Appendix 4: AGISOFT digital photogrammetry data analysis report

Appendix 5: GIS maps and data

Appendix 6: Maps produced

Appendix 7: Images of Burial Record Books

Appendix 8: older survey maps of Poor Farm site