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In the year 1861, in Salisbury, North Carolina, an empty cotton factory stood on the 300 block of East Bank Street, within sight of the railroad tracks. Later that year the factory was converted into barracks for a Confederate military prison. This prison, only built to contain 2,500 men, at its peak held 10,000 prisoners of war. The captured Union soldiers outnumbered the actual 1860s population of Salisbury. In 1865, the last of the healthy 3,729 prisoners, were shipped off to Greensboro, North Carolina while the prison was burned and disassembled. At the request of the Historic Salisbury Foundation, a small team from the University of North Carolina at Greensboro, was asked to locate the original prison barracks in hopes of placing the prison site on the National Register of Historic Places. Field excavations are time consuming and expensive, especially if a prime area has not already been chosen through previous archaeological surveying and testing. Utilizing geophysical methods such as Ground Penetrating Radar (GPR) allows for larger areas to be surveyed without ruining the integrity of the site, thus aiding in a more precise and accurate area to excavate. The end result of GPR allows for a three-dimensional analysis of the archaeological features, which can be placed within the landscape. The purpose of this Master's thesis were: 1.) apply geophysical methods to aid in understanding of the prison landscape, with the potential for future archaeological excavations: 2.) improve the accuracy of the current Rowan GIS maps for this site through historic and modern geophysical research: and 3.) assess and compile previous and current archaeological and geographical findings; a cultural resources [or landscape]

study. These objectives were successful, with regard to the GPR displaying cultural remains resembling the old cotton mill turned military barrack.

# GEOPHYSICAL AND GROUND TRUTHING EXAMINATION OF THE CONFEDERATE PRISON IN SALISBURY, NORTH CAROLINA

by

Megan Cope

A Thesis Submitted to
the Faculty of The Graduate School at
The University of North Carolina at Greensboro
in Partial Fulfillment
of the Requirements for the Degree
Master of Arts

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2018

Approved by

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Committee Chair

APPROVAL PAGE

This thesis written by Megan Cope has been approved by the following committee of the Faculty of The Graduate School at The University of North Carolina at Greensboro.

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Date of Final Oral Examination

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Thank you to the Historic Salisbury Foundation for contacting the Geography Department through which my thesis project was accomplished. In particular, the ever-accommodating Susan Sides and Steven Cobb. Other local members of Salisbury I would like to thank are Ed and Sue Curtis and Dr. Bob Tannehill, Dr. Paul Thacker and Ken Robinson from Wake Forest University.

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Lastly, I want to say thank you to my family and friends who have travelled down this very long road with me and have supported every minute. Mainly, I would like to say thank you to my husband Nathan Peters. Every long night in the lab, every breakdown, and with every ounce of frustration he was there to support me and offer words of

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# CHAPTER I

# INTRODUCTION

Geophysical surveying uses non-invasive surface and subsurface mapping methods that provide information for recording, investigating, and managing historical sites (Watters, 2011). Traditional archaeological investigations are costly and time consuming, but employing these methods offers a multitude of benefits. By utilizing geophysical surveying, a larger and more accurate area of the site can be examined in comparison to the limited extent of archaeological excavations. Another advantage is the non-invasive nature of geophysical research or analysis. Geophysical surveying paired with archaeological methods provides an alternative perspective of the current geography and potential archaeological landscape.

The UNCG Remote Sensing Laboratory was contacted by the North Carolina Office of State Archaeology (NCOSA) and by the Historic Salisbury Foundation (HSF) to conduct geophysical investigations. The parcel in question, 313 East Bank Street, is owned by the HSF and is located in the downtown area of Salisbury. The area around East Bank Street (Figure 1) was the location of a Confederate prison. Based on historic maps, members of the HSF had reason to believe that this parcel contained the remnants of the main prison barracks. The lot across the street, 320 East Bank Street, was also surveyed in hopes to discover surrounding buildings. The NCOSA and HSF hoped the geophysical survey could confirm and determine the location of the remains of the cotton mill turned prison barrack

on the property. This study incorporates geophysical surveying to aid in the discovery of the original remains of the Confederate prison. The main goals of this project are to study the historic landscape, locate the prison barrack, and to bring all previous works together.

The introduction will be followed by a literature review detailed in the first chapter. It begins with a brief history of the Confederate prison. A discussion of the previous archaeological and geophysical work follows. Next a description of how ground penetrating radar, the main geophysical method employed in this project, operates. Then, a small section of this chapter reviews other examples of GPR applied to the discovery of cultural remains and frames the methods used to collect the data at lot 313. Further landscape theory will be used to help understand how the area was altered by past communities. Finally, a report of the work that Dr. Joyce and Mr. Ken Robinson completed on lot 313 and in the surrounding area is discussed. The third chapter outlines the methods deemed appropriate to meet the research's goals. The other half of this chapter chronicles how three overlay maps were produced using historic maps, geophysical data, and aerial photography and provides a landscape theoretical perspective, as the prison site is viewed as part of the cultural landscape. Chapter 4 will review the results of combining GPR survey locations and revealed anomalies to collected field and laboratory data derived from Mr. Ken Robinson and Dr. Joyce's past archaeological projects. Chapter 5 will be a discussion on how this new information affects the understanding of site. This will be followed by Chapter 6, the conclusion and future research. The project results will be appraised in light of their potential for archaeological, geographical, and historical

interpretation, resulting in what this could mean for the future of the Salisbury Confederate site.


Figure 1. Area of Interest 313 East Bank Street, Salisbury, North Carolina

# CHAPTER II

# LITERATURE REVIEW

After North Carolina followed suit and seceded from the Union in May 1861, in December that same year, the Confederate prison was erected in downtown Salisbury. An abandoned cotton mill, three stories high and located adjacent to the main railroad, was converted into the prison barrack. There were a few small subsidiary buildings for the officer's barracks and a wooden fence encompassing most of the 16 acres prison (Figure 2). Shortly after the prison's inception, only 127 men occupied the prison. When the Union stopped the prisoner exchange program in August, 1864, inmate population quickly increased. By November 1864, the prison held about 10,000 prisoners of war, and disease quickly spread throughout the overcrowded prison due to a shortage of food and medicine (Brown, 1992). By the end of the month the death rate jumped to 28 percent whereas in the previous months it had remained at a steady 2 percent (Brown, 1992). Bodies were transported by way of wagons to abandoned corn fields where they were placed in a total of 18 mass graves. A first-hand account described by Junius Henri Browne recollects his time at the prison, "There we sat, night after night, in the thick darkness, inhaling the foul vapor and arid smoke, longing for the morning when we could again catch a glimpse of the blue sky." (Browne, Pg 318, 1865).

The new exchange program was finally approved by the Confederate congress in February 1865, formally allowing the prisoners of war their freedom (Brown, 1992). The men were then divided into groups based on health. The larger, healthier group were shipped to Greensboro, North Carolina then onto Wilmington, North Carolina. The smaller, malnourished group was taken to Richmond, Virginia. After the General Lee and the Confederate army surrendered on April 9, 1865, Major General George H. Stoneman destroyed and burned the prison on April 12, 1865, and the remaining bricks were used in the construction of some buildings in downtown Salisbury (Brown, 1992).

The collaboration between geographers and archaeologist leads to a better understanding about cultural landscapes (Stine and Stine 2013). The additional benefit of geophysical analysis within the two fields is locating subsurface features with the minimal amount of excavation. (Conyers, 2016; Campana and Piro, 2008; Kvamme, 2003). Employing these methods allows for a more complete analysis of buried and otherwise invisible geological and cultural materials (Johnson, 2006). Some of the main geophysical instruments include magnetometers, electromagnetic induction and electrical resistivity, and ground penetrating radar. A major advantage of using geophysical equipment is that it is a non-destructive method for uncovering buried cultural remnants.

In the spring of 2013, Turner (2017) conducted a geophysical survey at the House in the Horseshoe State Historic Site. The goals of the project were to employ non-invasive geophysical techniques to aid in the location of the external kitchen as well as potential findings for other cultural remains. Another objective for this project was

discovering the location of the soldiers buried onsite. A 10x10 meter georeferenced grid system was laid east and north of the Alston House, with a total survey area of 2,840 square meters. Magnetic gradiometer transects were collected at 50 traces per meter and GPR transects were spaced at 0.5-meter intervals. Archaeological test units were placed over a variety of anomalies located by the geophysical methods (Turner, 2017). The last methods employed were coring using an auger, soil sampling, metal detection, and probing.

The surveying results at the House in the Horseshoe produced the findings of four structures. Using the GPR proved most successful at locating buried objects' depths and shapes. A benefit in using a combination of geophysical tools is that where one machine declines in visibility, the other will produce a clearer image on the desired features. Neither the location of eight buried soldiers nor the original kitchen were detected using geophysical methods in the laid-out grid.

Structure 3 revealed a pit-like feature approximately 2.5x1.5 meter and a depth of 0.9 meter. According to John Hairr (personal communication, 2013), this was the original placement of the Alston kitchen (Turner and Lukas, 2016). The data produced a sub-rounded rectangle with moderate- to- high amplitude reflections as represented in the slice maps (Turner and Lukas, 2016). Paired with gradiometer and GPR data the features' fill indicated traces of iron suggesting that the surrounding soil was heated to their Curie point temperature and then cooled (Turner and Lukas, 2016). Features such as ceramics within the soil matrix confirm that the pit predates the house by approximately 100 years,

further implying that this feature was not the kitchen the Alston House utilized (Turner and Lukas, 2016). After the American Civil War the pit was more than likely used for a privy, basement, or root cellar (Turner and Lukas, 2016).

Soil samples taken from the House in the Horseshoe displayed a range of moisture content. The variations of soil moisture are directly correlated with the depth in which the data were collected (Turner, 2017). The driest measurement with the minimum volumetric soil moisture observed was 11.1 percent of volume at 0.20 meter below surface. The wettest measurement was a maximum volumetric soil moisture of 37.3 percent of volume at 1.5 meters below surface (Turner, 2017). With the samples provided, the optimal volumetric soil moisture observed for this study appear to be just below the total available water holding capacity of the soil, better known as field capacity (Turner, 2017). In addition, air waves are subtle reflection features visible in profiles and can be produced by air moving from the antenna to objects (Conyers, 2012). Lower frequency objects will transmit waves into the air as opposed to the ground. Energy is transferred directly into the ground when the antenna is flush to the surface. When the antenna travels over a bump and loses the direct contact with the ground, energy travels through the air, which creates coupling errors (Conyers, 2012). To counter these coupling problems, processing techniques can be utilized.

The Battle of Guilford Courthouse was an iconic 18th century battle over contested land during the Revolutionary War (Konstam, 2004). Today, scholars speculate and hypothesize where the location of the courthouse and retreat road reside but the exact

whereabouts remain unknown. The discovery of the courthouse and retreat road would allow an accurate placement of the third line of battle and other military units as well as giving further insight into this iconic battle. Combining two geophysical survey methods, GPR and the Total Station (TLS), allowed for detailed three-dimensional images for both above and below the ground surface. In this case utilizing various geophysical methods proved successful (Cury et al. 2016). Operating in this way allowed for the site to be analysed and mapped without disrupting the integrity of the area of interest. A historic landscape is created by combining the buried road/gully, detected by the GPR, along with the surface features, created with the TLS. Successfully locating the road and the gully is the major element in correctly placing the third line of Battle at the Guilford Courthouse. This is fundamental for allowing a thorough explanation of the battlefield landscape (Stine and Stine 2013).

The examples at the House in the Horseshoe and Guilford Courthouse both employ geophysical methods in the anticipation of discovering cultural remains. One of the challenges faced with the GPR at the Guilford County Courthouse was the wooded area. Areas of interest that are heavily wooded or have high vegetation growth make collecting GPR data very difficult. One reason is natural features within the soil, like roots, that cause the GPR signal to attenuate. In addition, air waves are subtle reflection features visible in profiles and can be produced by air moving from the antenna to objects (Conyers, 2012). Energy is transferred directly into the ground when the antenna is flush with the surface.

All landscapes have cultural meaning (Lewis, 1976). These landscapes show the past and present effects from human interaction. Human impacts on the land can be subtle or dramatic (Butzer, 1982). For instance, ecological changes in the soil-sediment system can lead to changes in: soil loosening, devegetation, soil-water and ground water changes, accelerated soil erosion, and hydrology (Butzer, 1982). The relationship between humans and the environment is reciprocated on each other, and as the community is continuously impacting the landscape, the landscape will be in a constant state of disequilibrium (Charlton, 2008). Landscape is an inherently spatial perspective; this allows for the understanding of distribution and patterns within a complex community (Butzer, 1982). Models are constructed from these patterns, which best describe the utilization of region.

There are many theories that can be applied to certain landscapes to help in the interpretation of their past and current state. Author Pierce Lewis describes rules or axioms for reading landscapes. They are called axioms because they are the essential ideas that underlie the reading of Americans' cultural landscapes (Lewis, 1976). While applying a landscape theory can aid in viewing past landscapes on the surface, geophysical survey methods allow for subsurface features to be identified. GPR sends short pulses of high frequency radio waves from an antenna into the ground and measures the elapsed time and strength of the reflected waves (Clay, 2001). The pulses move as uniform waves down through the soil, and when the signal has detected a feature or buried object, the signal will propagate back to the antenna (Conyers, 2013). The antenna

is pushed along the ground in transects within a grid. Thousands of signals are emitted but only the returned signals are interpreted (Conyers, 2013). The type of antenna chosen is important in regards to the depth and resolution; the higher the antenna frequency, the shallower the depth and the higher the resolution (Neal, 2004). The 400 MHz antenna is able to transmit signals up to 2 meters depending on the type and water content of the soil. The 270 MHz is able to propagate signals greater than 2 meters but does not have as much subsurface resolution as the 400 MHz. The 900 MHz is best used for shallow mapping with signal transmitting down to about a meter. The outcome of the GPR survey is mainly dependent on what lies beneath the subsurface. Soil properties, sediment, water content, depth of buried feature, and vegetation are important factors that could affect the usefulness of the data (Slowik, 2012).

The presence of water in soil is often problematic. Soil moisture can attenuate the signal or produce very high amplified reflections (Conyers, 2013). Moist soil can hide subsurface features and does not allow the signal to penetrate the full depth. Empty voids will often form around the subsurface features, and if the soil becomes wet, the voids will create water pockets, producing a high amplified reflection and often highlight the subsurface features, masking other features. Conversely, poor GPR data have been collected in areas that are dry with high amounts of sand (Conyers, 2013).

The raw GPR data collected in the field contain background noise which is caused by electromagnetic interference, which can produce weaker returns, obscuring the signals (Seren et al. 2008). The techniques to process raw data include: data editing, gain

analysis, background removal, band-pass filtering, and migration (Seren et al. 2008). The materials are processed and the products can be produced as a horizontal profile, a vertical profile or as a data cube. The data cube has the ability to show the survey areas at different depths, and has the ability to display each transect of information. After all results are examined, the best displays are imported into the GIS to produce plans and maps of the surveyed area (Watters, 2012).

Previous archaeological and geophysical survey methods were performed at the prison site by Dr. Joyce and Ken Robinson, but no formal reports were published or could be located on file at the NCOSA. In the summer of 1983 and 1984, Dr. Jane Sally "DeeDee" Joyce led an archaeology field school in hopes of finding remnants of the palisade wall that surrounded the prison. At the end of both summer field sessions, Dr. Joyce and her students had excavated a total of 31 units and discovered a variety of artifacts. Examining the hand drawn maps and students' field notes it appears the site datum was the corner of a cement shed which, is no longer extant (Figure 3). The 1984 excavation units 13-31 appear to be on lots 305, 309, and 313 East Bank Street with one unit located on 310 East Horah Street (Figure 4). The students recovered artifacts including: old nails, pieces of pottery, buttons, marbles and other miscellany (The Salisbury Post, 1984). Some of the cultural remains that were unearthed by the team were post holes most likely associated with the gate that encompassed the prison (Figure 5). Dr. Joyce mentioned to the Salisbury Post that she would like to return in the fall to focus on the location of the old mill (Salisbury Post, 1984) (Figure 6). Dr. Joyce did not return

in the fall for excavation. While no formal report was written, her student's field journals, unit layer sheets, and all other materials were sent to Wake Forest University Archaeology Laboratory (WFUAL) where it has been in the care of Dr. Paul Thacker. These primary documents are currently on loan to the author for analysis, interpretation, and scanning for the purpose of this project. All files and digital records will be returned to WFUAL.

In 2005, Mr. Ken Robinson of Wake Forest University led a number of excavations and surveys at the Confederate prison. The project had four main research areas: 415 East Fisher Street, 409 East Bank Street, the corner of 424 East Bank Street and Shaver Street, and 512 Bank Street (Figure 7). The first location, 415 East Fisher Street, was possibly the location of the officers' quarters (building 11) (Figure 8). An area was surveyed with the GPR, approximately 25x15 meters, to better establish an excavation site (Figure 9). A unit was excavated and revealed a color variation in the stratigraphy along with exposing a small rubble pile in the northeast corner of the unit (Figure 10). A number of small artifacts were recovered from the unit including nails, glass and clay marbles, buttons, pieces of glass, and pottery (Figure 11) (Ken Robinson, personal communication, 2016).

The second location, 409 East Bank Street, was the location of the dead house (building 5) and the hospital (buildings 4 and 6) (Figure 7). The area was surveyed by GPR and a series of manual auger tests were completed to aid in the location of the excavation unit. A 2x2 meter pit was excavated, exposing a linear modern brick feature,

brick rubble, and small artifacts (Figure 12). The 2x2 meter unit was then subdivided and excavated, further exposing three distinct layers in the stratigraphy and the side of the linear brick feature (Figure 13). Eventually the entire unit was levelled off to expose the length of the brick feature and the stratigraphic layers (Figure 14). The middle layer contains small artifacts such as pottery, butchered bone, nails, glass, buttons, and a toy gun (Ken Robinson, personal communication, 2016). The third location excavated was the corner of 424 East Bank Street and Shaver Street (Figure 7). The area was surveyed but there is no further data for this location.

In 2012 Mr. Robinson returned to the prison site to excavate the area of 320 East Bank Street. According to the historic drawn map, building nine was recorded as one of the hospitals (Figure 15). It should be noted that the unit is surveyed in meters and feet. An explanation for having both measurements recorded is that the site is historic and would have not used the metric system at the time of its inception. First, three manual auger tests were completed to locate the area for the excavation unit. The unit was 10 feet (3.05 meters) from the street (Ken Robinson, personal communication, 2018) and approximately 2 meters long by 1 meter wide (Ken Robinson, personal communication, 2016). There are two distinct stratigraphic layers. Exposed is a concentration of bricks with three possible post holes beneath what appears to be a clay overburden (Ken Robinson, personal communication, 2016) (Figure 16). Once the rubble pile was removed, heavy deposits of coal lay under the bricks, suggesting possible burning (Figure 17).

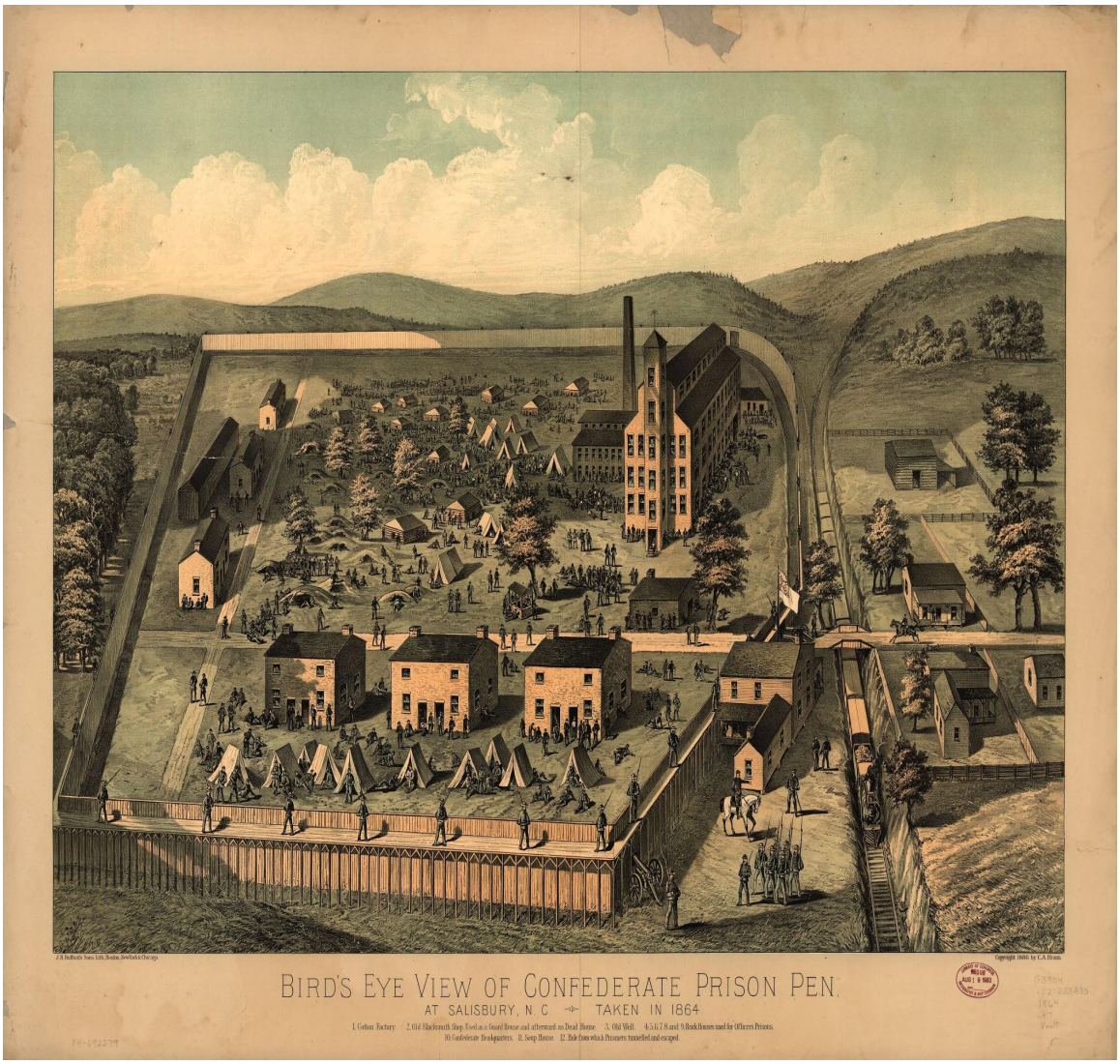



Figure 2. Birdseye View of Prison as it was in 1864. (Illustration by C.A Kraus, 1886, published by J.H Bufford Sons Lith., Boston, New York, & Chicago)


Figure 3. Dr. Joyce's Hand Drawn Map of Units and Datum Collected from Wake Forest University Archives

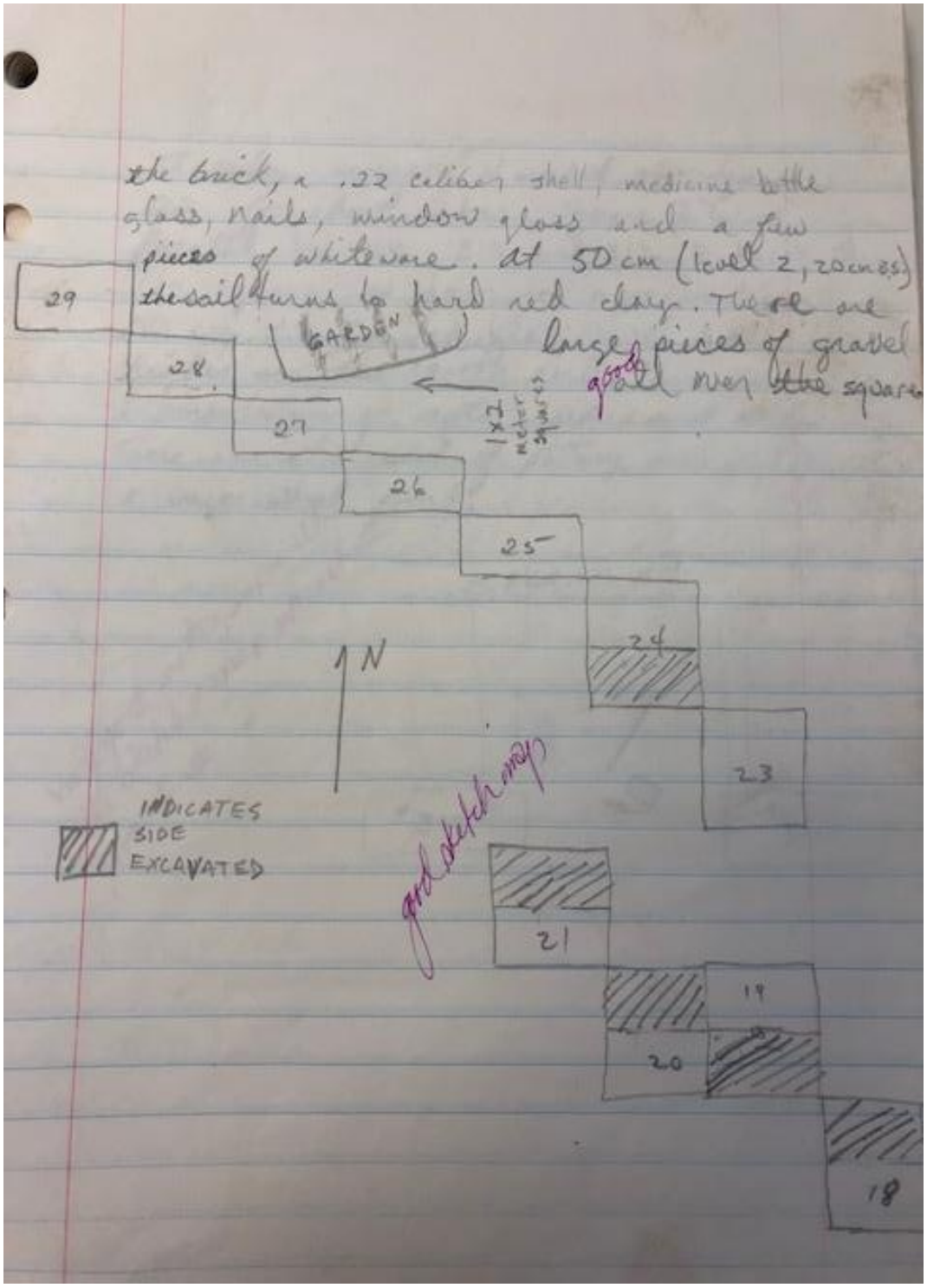



Figure 4. Student J. Leagon Sketches from field

Figure 5. Unit with Cultural Features, most likely Poles Holes Collected from Wake Forest University Archives

# Digging into the Past

Going back in time conjures up images of Buck Rogers, Star Trek or even H. G. Wells' Time Machine. However for anthropology instructor Jane Sally "DeeDee" Joyce '75 and her summer session students the past has come to meet them in the form of excavations.

With mason's trowels, whisk brooms, and plenty of willpower the group tackled two sites, a historic Civil War prison camp in Salisbury, N.C. and a pre-historic river bank near Edenton, N.C.

For Joyce, excavating the Civil War prison site was a "wish come true." While a student at Catawba she had always wanted to look for artifacts at the Civil War camp. Graduate school, work, and several years later she was able to come back and find if anything was actually there.

Bearing a map drawn by a local historian and another taken from official Civil War records, Joyce and her students were able to guess approximately where the old prison had been located.

It was truly guesswork since the old prison had been burned by General Stoneman in his raid on Salisbury in April, 1865. Then years later the city's first urban renewal project was built on top of the site.

The digging crew's guess landed them in the backyard of two houses owned by George Weant who graciously consented for the group to dig on his land. The crew went to work, carefully marking off neat, rectangular beds to start the slow, tedious work of digging into the past.

Careful, painstaking labors are essential since the stubborn clay has to be removed layer by layer with flat masonry trowels. It is the only way to avoid breakage when an artifact is uncovered. The dirt is then run through a screen to make sure nothing is missed.

The crew sought to find post molds where the palisade wall stood. Although the wood would be rotted by now, the soil would be colored by the rot and identify the former presense.

Although the crew was unable to find the wall, they did find "treasures" of old nails, bricks, pieces of pottery, buttons, a rusted pair of scissors, "pea dabs" rolled clay that prisoners used as marbles, and other miscellany. Careful records were made where each item was found on every level of the dig.

The 20th century had also made its way into their findings. Plastic was mixed in with the "treasures" indicating that the disturbance of the topsoil was of fairly recent origin.

Joyce said, "As far as I know we're the first to excavate since the Civil War. It's always exciting when we find something and we always want to know more about the discovery. I contact experts who are specialists in ceramics, bottles, weapons, etc. and they are a big help with our work.

"We didn't find as much as I had hoped, but we did find enough that I plan to come back to the site in the fall when it will be cooler. This next time I think it would be more productive to search out the old mill to discover the foundation and from there branch out to the rest of the area.

"The community has shown a lot of interest and support in the project, and I think we will have several local participants in the dig this fall."

According to Joyce, the prison, at its peak in 1865, contained approximately 9,000 prisoners. There was limited sanitation, several wells had to be dug for water, and the major housing was that of a four-story cotton mill converted into the main prison camp building. The rest of the prisoners sought refuge by actually digging fox holes for warmth and for protection against the elements.

After two weeks at the historic site the crew packed up and headed east to Edenton, N.C. where they began to dig on a prehistoric riverbed. One of the students enrolled in the workshop had found artifacts on the surface of the surrounding area while he was a boy visiting his aunt. He felt certain that there was cause to excavate in the area.

The group again carefully prepared the area and after the same painstaking pace found pottery and stone tools dating back to 1200 a.d. According to Joyce this would place the origin of these artifacts in the Woodland Period, a time where the people lived in wattle and daub huts and were agriculturalists.

This site proved to be a haven for the crew since after digging in the 90 degree heat they got to finish the day by taking a swim in the nearby Albemarle Sound.

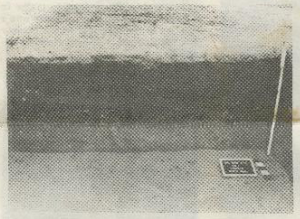
Joyce said the workshop was unbelievably successful since the crew got to dig in two separate time periods and find something in each.

She said, "The crew was a joy to work with. We all got along extremely well and truly enjoyed what we were able to accomplish. Members of the crew were John Holleman '85, Robert Miller '83, Scott Mitchell '84, Mark Sweazie '84, and John Touchberry '86. Peter P. Cooper, III '75, son of the late anthropologist Peter P. Cooper, Jr. '49, was also invaluable during the summer digs. These guys were just as excited as I about the finds. A couple of them have started to investigate careers in the field of anthropology."

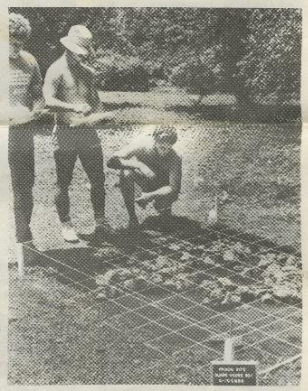
Joyce is concerned about the prehistoric and historic sites that are being looted. However, in recent years the government has stepped in and started to hand out stiffer penalties to the offenders to protect these buried past civilizations.

Although anthropology is no longer a major at the College, courses are still being offered on the subject.

*Scott Mitchell '84 and Mark Sweazie '84 use quarter inch mesh to uncover artifacts.*



*Excavation unit shown at prehistoric woodland site showing soil stratigraphy.*



*Mapping in the location of a rock formation believed to have been a guard house. Left to right: John Touchberry '86, John Holleman '85, Mark Sweazie '84.*

Figure 6. News Article from 1984 about the Prison Excavation

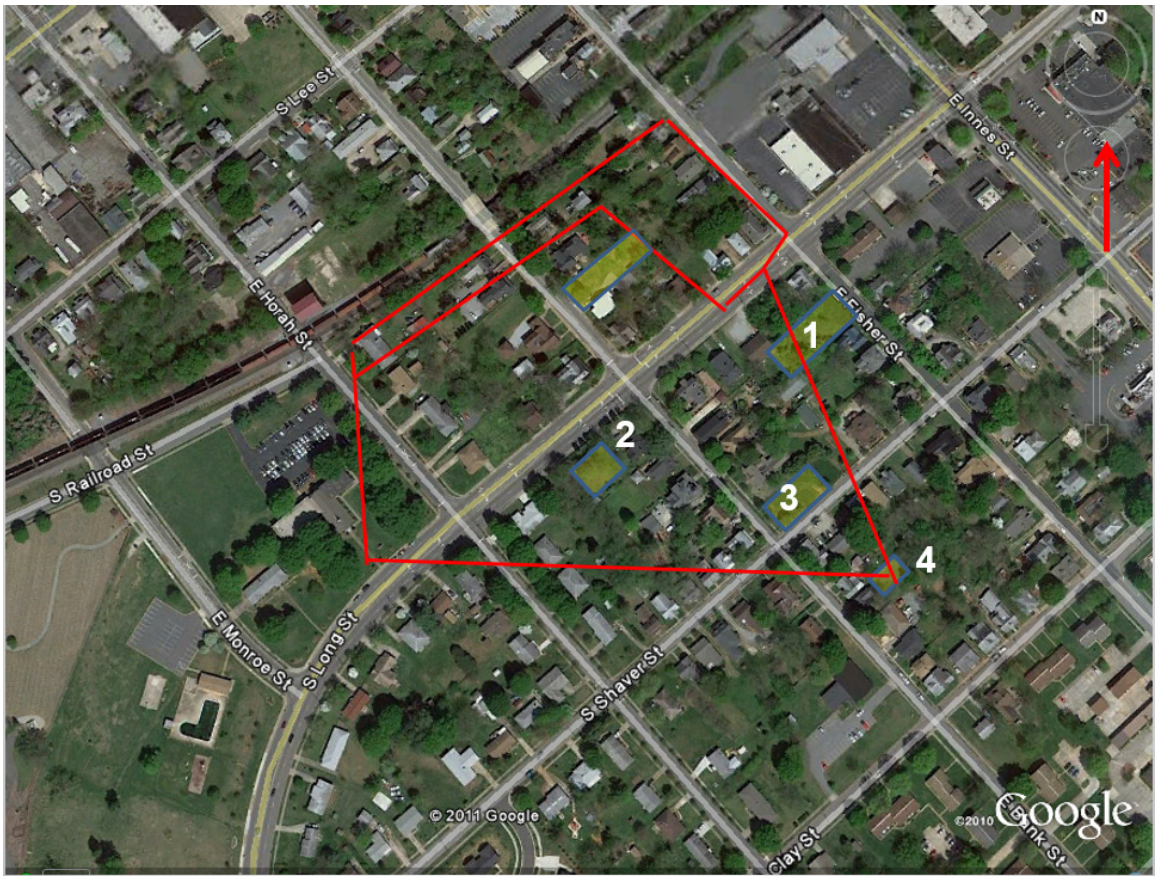



Figure 7. Image from Ken Robinson PowerPoint Identifying the Four Locations Excavated in 2005

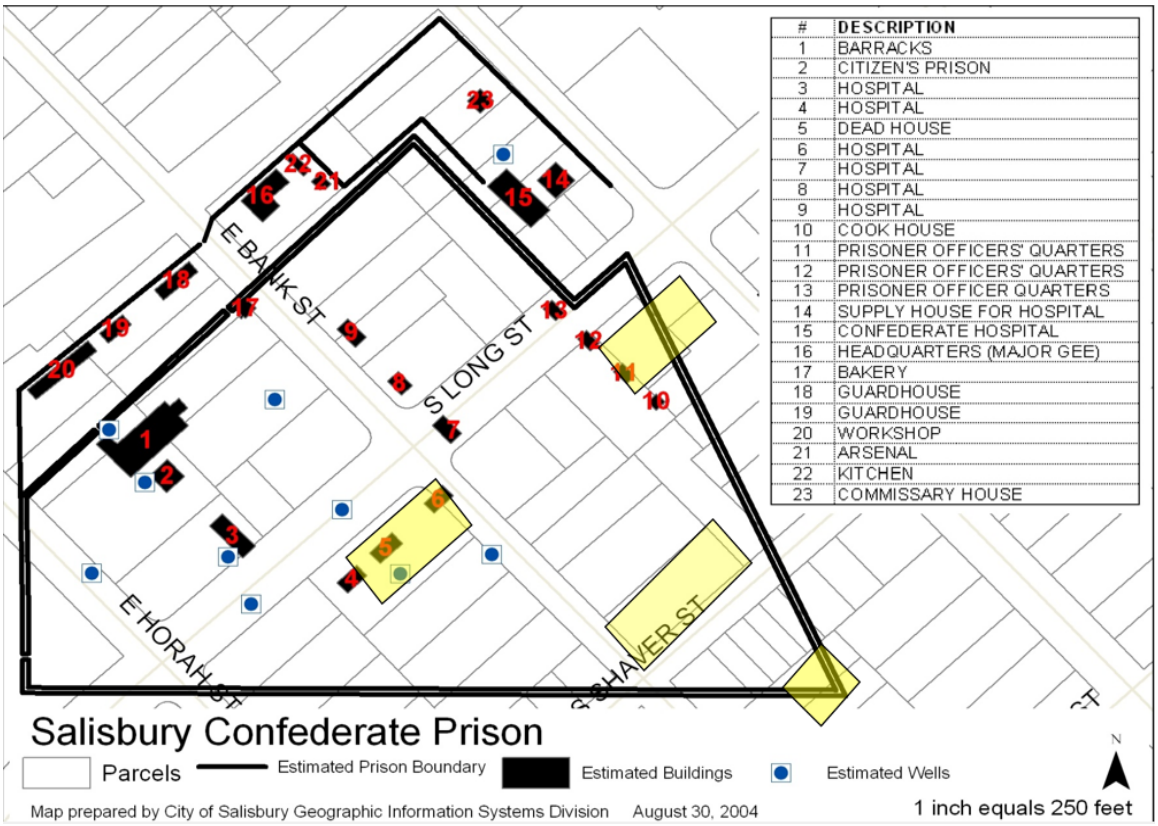



Figure 8. Displays the Prison Walls with Buildings along with the Areas that Ken Robinson Excavated. This Image Comes from Ken Robinsons PowerPoint Presented in 2016


Figure 9. 415 East Fish Street Excavation Area with GPR Data (GPR data extracted from Ken Robinson PowerPoint 2016)

Figure 10. Ken Robinson Unit at 415 East Fisher Street with Exposed Brick

Figure 11. East Fisher Lot Artifacts


Figure 12. 2x2 Meter Unit Located at 409 East Bank Street Exposing Linear Brick Feature, Small Artifacts, and Brick Rubble


Figure 13. The Subdivision of the 2x2 on East Bank Street

Figure 14. Exposed Brick Feature and in Situ Artifacts


Figure 15. Ken Robinson Excavation Area in 2012. Lot 320 East Bank Street with the Prison Building Overlay

Figure 16. Unit 5 at lot 320 East Bank Street with Concentration of Bricks and Possible Post Holes

Figure 17. Displays the Removed Brick and the Traces of Coal

# CHAPTER III

# METHODS

Before field work was conducted, a detailed review was made of all Sanborn maps, historic maps, primary sources, and field notes to help identify locations that were either excavated or surveyed. These locations were then placed into ArcMap. Originally used for assessing fire insurance, Sanborn maps included detailed information about the buildings, like size and location, which makes them an asset in seeing changes in the landscape (Figure 18, 19, and 20). Sanborn maps were placed into ArcGIS 10.2.1 and were georectified to correspond with the modern images. Then Image-to-Map rectification occurred to properly overlay the historic Sanborn maps onto the current aerial photos (Lukas and Stine, 2017). This process chooses points from a Sanborn map with no spatial reference and then pairs those points to their known counterparts, located on the NC One Map (Lukas and Stine, 2017). The result is a land use timeline, showing the different structures on the area of interest throughout certain years. Georeferencing allows the user to define the image's location using the map coordinates system that is assigned in the data frame, thus aligning the non-referenced image to the raster (Jensen, 2016).

There were some initial complications integrating the maps from Robinson. The prison outline and land parcels did not exactly match the 2016 Rowan county parcel data

that were presently being used. An explanation could be the gap in time from 2004 to 2016 where property lines could have changed. Difficulties also arose when trying to locate the exact locations of survey grids and excavations units. Since no formal documentation was given, estimations from Robinson's PowerPoint presentation pictures taken on that day gave the best insight as to where the units should be placed. A planar view of Robinson's processed GPR survey that was collected at 415 East Fisher Street was georeferenced into ArcMap 10.4. Although the location might slightly vary from the original site, the size of the grid is accurate. In an interview with Mr. Robinson on July 6, 2018, he and the author worked together to best place his units in the GIS. Figure 22 shows the parcels and areas of excavation and/or geophysical surveying that took place in 2005 and in 2012 performed by Ken Robinson (Figure 21). Also, from this figure the variation between the boundary of the parcel and the location of the actual excavation is noticeable. This can especially be seen at 512 Bank Street where the parcel is nowhere near the excavated site.

A trip to Wake Forest University was required to retrieve Dr. Joyce's research. All documents were read through and scanned into the computer. One of the most vital pieces of information was the hand drawn site map. The map showed the excavation unit placement with a marked concrete datum. The hand drawn site map was then georeferenced into ArcMap 10.4 and a point was created as close to the center of the hand drawn datum (Figure 22). It is important to note that this point is not spatially accurate because the actual coordinates of the datum were not given and the only

reference is the hand drawn datum. Another vital piece of documentation was the 1984 transit form. This form listed all of the northeast and southwest unit corners in degrees and distance as measured from the datum (Figure 23). This list included all of the units from the 1984 session (units 13-31). To create these points in ArcMap the Direction-Distance tool was used. The Direction-Distance allows the analyst to create a point with the known distance and direction from an existing point (ESRI help). The field notes, listed in degrees and minutes and distance, were modified to decimal degrees as required by the Direction-Distance tool. Also, the tool is configured using feet and the distances recorded were collected in meters, so a conversion from meters to feet was required. All calculations were completed in Excel. The corners of the archaeology units were placed into ArcMap to create a digital version of Dr. Joyce's hand drawn map (Figure 24). All northeast and southwest unit corners were measured until Dr. Joyce made a note that the northeast corner of unit 28was to be the new datum for units 29, 30, and 31. This was due to sight problems with the transit. Since there was no transit sheet for units excavated in 1983, only the 1984 units could be placed from the datum, although Figure 24 allows a rough estimation of where these units were placed. Figure 25 displays Dr. Joyce's units from the 1984 summer excavations with the 2014 aerial photography overlay.

Lot 313 East Bank Street is located directly in the historic section of downtown Salisbury, North Carolina. Owned by the Historic Salisbury Foundation the project area lies on flat topography and is approximately 1,021.7 square meters. Environmentally, the lot had mowed grass and was free of obstructions except along the south fence line. There

vegetation growth was heavy and contained a protruding earth mound located near the center of the parcel. The lot and surrounding area is comprised of Cecil urban land complex, CfB, 2 to 8 percent slopes. Cecil series are typically located on ridges and side slopes of the Piedmont uplands and consist of deep well drained permeable soils (https://soilseries.sc.egov.usda.gov). These soils are constantly disturbed either in the upper layer or throughout due to the presence of urbanization and constant reuse of the soil. Common Cecil urban land complex horizons are comprised of a: A horizon or Ap consisting of sandy clay loam, B horizon with Bt clay and Bc clay loam, and a C horizon of sandy loam. These horizons range from dark yellowish-brown surface layer (Ap horizon) to red clay subsoil (Figure 26).

The field survey was conducted on two different days and a total of three grids were collected on lot 313 and one on lot 320 (Figure 27). A Topcon GTS 233W total station was used to mark all grid corners in relation to the temporary datum. This was paired with a Topcon GR-3 Global Positioning System (GPS). The combination of both these instruments would establish real-world coordinates to the arbitrary grids. GPR data were collected on both dates using a GSSI SIR-3000 GPR using a 400 MHz antenna fixed upon a three wheel cart (Figure 28).

On September 30, 2016 Grids 1 and 2 were laid out and collected (Figures 29 and 30). Prior to collecting data, the GPR cart and antenna were calibrated. The first step after the initial setup of the GSSI SIR-3000 was to calibrate the wheel that measures the distance travelled and enters this into the data recorder. This calibration accounts for the

topography in which the machine will travel. The wheel is calibrated by walking the same set distance three to five times, allowing the operator to get an average set of readings based on subtle changes in the surface (Geophysical Survey Systems, 2009). A 10 meter distance was tested three times for accuracy, and the respective readings were: 1673, 1684, and 1676. This gave an average reading of 1677.66, which was used as the wheel calibration value in setting up the parameters within the data collection computer.

Next, the area was surveyed to set gains within the readings that offset the effects of attenuation. The signal becomes weaker as the scan goes deeper into the earth. Applying the gains allow for the subtle variations in weaker data to be more visible (Geophysical Survey Systems, 2009). These gains are collected at ground control points with a clear signal as determined by the operator. Three ground control points were used to establish the following gains: GP1: -12, GP2: 28, and GP3: 55.

Grid 1 measured 14x25 meters and ran from the edge of the sidewalk that led to the steps of the former residence. The X direction lengthwise trended from the northeast to the southwest (Figure 29). The data were collected with lines placed at half meter intervals (Figure 29). Grid 2 was 14x27 meters. The transect spacing was placed at half a meter, with some transects stopping just short of the 27 m length due to brush along the fence at the northwest corner (Figure 30). The dielectric constant was set to 8 and data were collected in 16-bit format.

On November 12, 2016 two grids were collected using the TerrSIRch option. The TerraSIRch mode allows for a more complete control over data collection parameters

(Geophysical Survey Systems, 2009). Instead of setting up grid with definite parameters, as in the 3D Grid option on the main menu, the operator collected individual transect files. The machine was calibrated following the same procedures as on September 30, 2016. This recollection was primarily due to the amount of moisture in the soil on the first collection date which caused the GPR signal to attenuate. The second date provided dryer conditions and produced clearer and more precise data. On this date, the 10 meter distance calibration resulted in the values 1689.5, 1686.2, and 1687.4. This gave an average reading of 1687.7 which was used as the wheel calibration value in setting up the parameters within the data collection computer. The gains used for Grid 4 were: Gp1 -18, Gp2 27, and Gp3 45. Grid 4 measured 14x 35 meters. This grid began 35 meters from the end point of Grid 2, so that the new grid would show both grid 2 as well as the 7 meters of grid 1 all in one image (Figure 31). These data were collected with a transect spacing at half a meter. The dielectric constant was set to 8 and data were collected in 16-bit format. Grid 5, located at 320 East Bank Street measured 4x40 meters and collected with lines placed at half meter intervals in X and Y directions (Figure 32). A total of 650 square meters were surveyed across both parcels on this date. Grid 5, located at 320 East Bank Street, measured 4x40 meters. This area was previously excavated in 2005 by Ken Robinson. The collected data from both dates was saved to the Remote Sensing Lab drives at UNC-Greensboro for analysis.

Relative dielectric permittivity (RDP) values were generated in the lab using Radan 7 software once the field data were collected. The RDP can determine the objects

reflectivity to the radio waves by measuring the electrical conductivity and magnetic susceptibility (Hunter, 2010). These values will change with depth of soil and soil moisture content. The RDP will also affect the wave velocity depending on the RDP material; waves produced by the same antenna will have shorter wavelengths when propagating through soil with higher RDP compared to a lower RDP (Radzevicius et al., 2000).

The ground penetrating radar data were processed using GSSI Radan 7 software to normalize surface, velocity, and other standard corrections. The first post-processing step was to set the data time to zero. Time windows are programmed in order to ensure that the first reflection recorded by the antenna is not exactly at time zero but lags just a bit below it in order to make sure the ground surface can be identified in reflection profiles (Conyers, 2013). A background removal was completed to remove extraneous horizontal reflections but can also result in the decrease in amplitudes of the remaining reflections (Conyers, 2013). For this project, all band-pass filters were set at a low frequency of 600 MHz and a high of 200 MHz. The last step in the post-processing process is migration. During migration, reflections from point sources that appear as hyperbolas in the two-dimensional data are removed. This is done to correct any distortion created by these reflections (Conyers, 2013). This processing is accomplished by utilizing a “ghost hyperbola” in RADAN to outline one or more defined parabolas in the data displayed. These hyperbolas then display data including the velocity of the signal at that reading, the time it takes the signal to be transmitted, reflected, and received by the

antenna in nanoseconds, and the distance from zero of the hyperbola. These are then used to find the average relative dielectric permittivity, or dielectric constant (RDP), which can then be programmed in RADAN 2016 to produce an image with higher accuracy of below ground surface features. Using the below formula, the reflection of the RDP of the soils were calculated (Conyers, 2013).

$$k = (\frac{c}{v})^2$$

Where: K= Relative Dielectric Permittivity

C= speed of light in a vacuum, 0.2998 m/ns

V= velocity of radar energy through soil, m/ns

Applying this formula to each reflector, a slice map export was calculated from the mean RDP and each slice was examined at a 0.10 meter thickness. The grids were saved as .tiff files and could then be analyzed for excavation planning and dimensional analysis using ArcMap (Turner and Lukas, 2016; Lowry and Patch, 2010; Tuner, 2017; Stine and Stine, 2015; Radan7 Users' Manual, 2011).

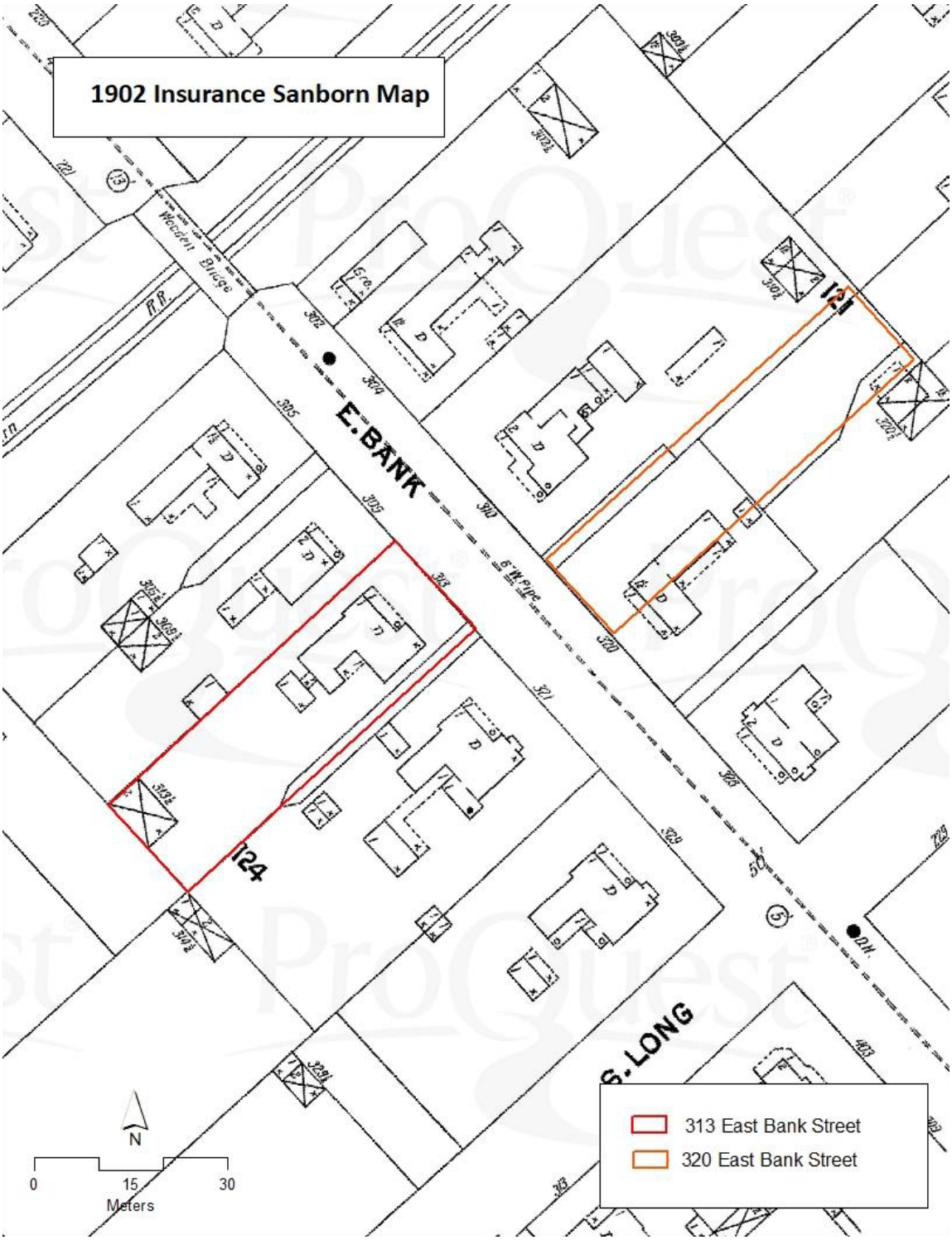



Figure 18. 1902 Fire Insurance Sanborn Map with Areas of Interest


Figure 19. 1913 Fire Insurance Sanborn Map with Area of Interest


Figure 20. 1931 Fire Insurance Sanborn Map with Area of Interest

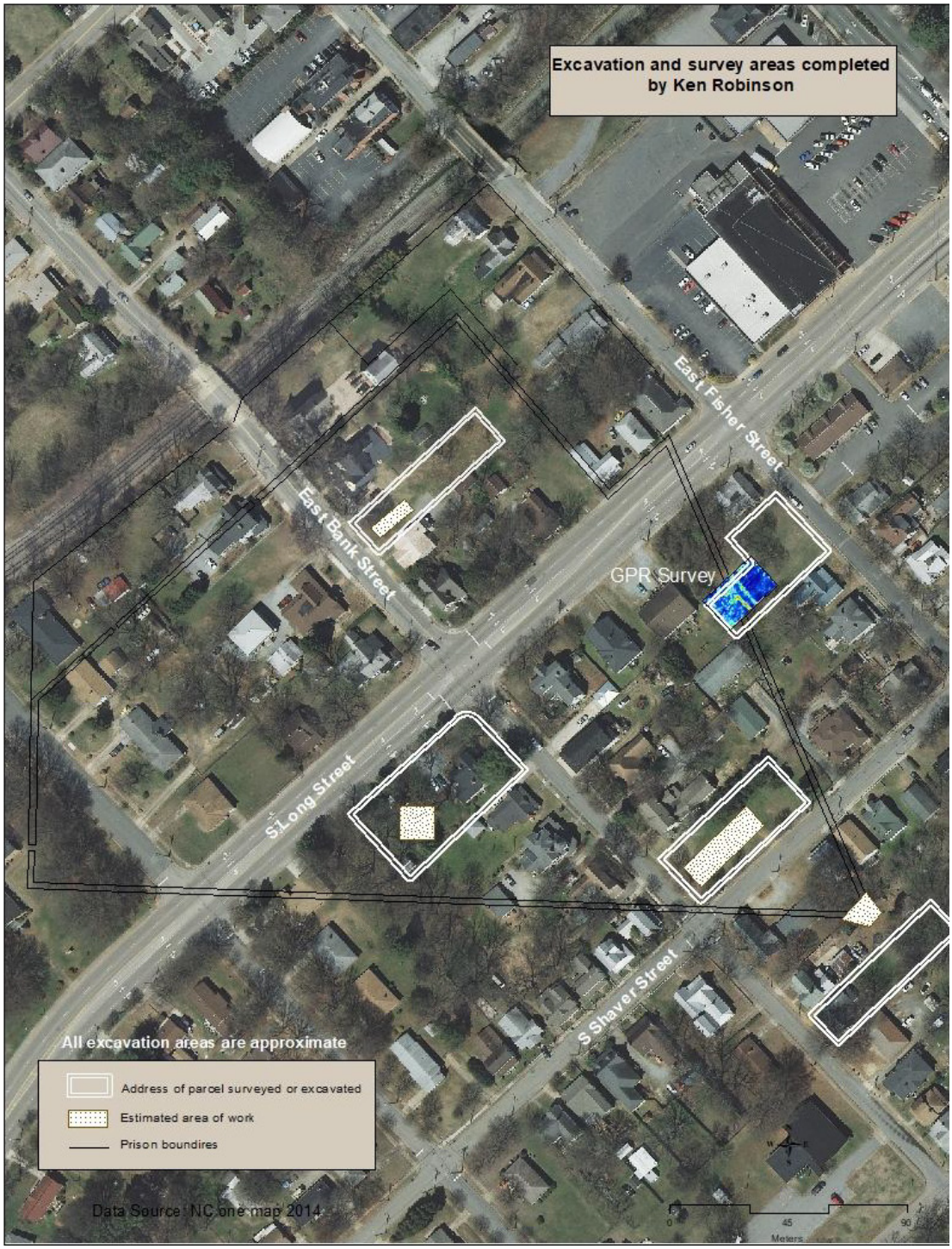



Figure 21. Map of Ken Robinsons Survey and Excavation Areas in 2005 and 2012


Figure 22. Georeferenced Scanned Transit Form with Newly Mapped Datum

TRANSIT MEASUREMENTS---SUMMER 1984 PRISON SITE

Datum location
19°55" North corner of cinderblock shed at 12.78 cm (shed corner closest to squares)
56°45" South corner of cinderblock shed closest to squares

Square 13
32°20" SW corner of 2 X 2 meter suqare at 5.73 meters
36°32" NE corner of 2 X 2 meter square at 8.55 meters

Square 14
18°55" NE corner of 2 X 2 meter square at 9.4 meters
8°30" SW corner of 2 X 2 meter square at 7.0 meters

Square 15
6°39" NE corner of 2 X 2 meter square at 11.04 meters
353°50" SW corner of 2 X 2 meter square at 9.05 meters

Square 16
355°10" SW corner of 2 X 2 meter square at 11.04 meters
4°40" NE corner of 2 X 2 meter square at 13.04 meters

Square 17
356°20" NE corner of 1 X 2 meter square at 14.08 meters
347°25" SW corner of 1 X 2 meter square at 13.36 meters

Square 18
349° 5" NE corner of 1 X 2 meter square at 13.37 meters
340°49" SW corner of 1 X 2 meter square at 14.98 meters

Square 19
343°11" NE corner of 1 X 2 meter square at 16.88 meters
335°30" SW corner of 1 X 2 meter square at 16.70 meters

Square 20
338° 4" NE corner of 1 X 2 meter square at 18.50 meters
331° 4" SW corner of 1 X 2 meter square at 18.41 meters

Square 21
333°50" NE corner of 1 X 2 at 20.21 meters
327°35" SW corner of 1 X 2 at 20.38 meters

Square 22
located on Horah Street under driveway of Mr. Floyd Wilkens
called "tunnel square" also -- see notes and forms for location

Square 23
345°45" SE corner of 2 X 2 at 18.71 meters
342°10" NW corner of 2 X 2 at 22.23 meters

Square 24
342°55" NE corner of 1 X 2 at 23.18 meters
337°25" SW corner of 1 X 2 at 22.92 meters

Square 25
339° 5" NE corner of 1 X 2 at 24.78 meters
334° 5" SW corner of 1 X 2 at 24.65 meters

Figure 23. Dr. Joyce's Transit Measurements from 1984 Summer Excavations

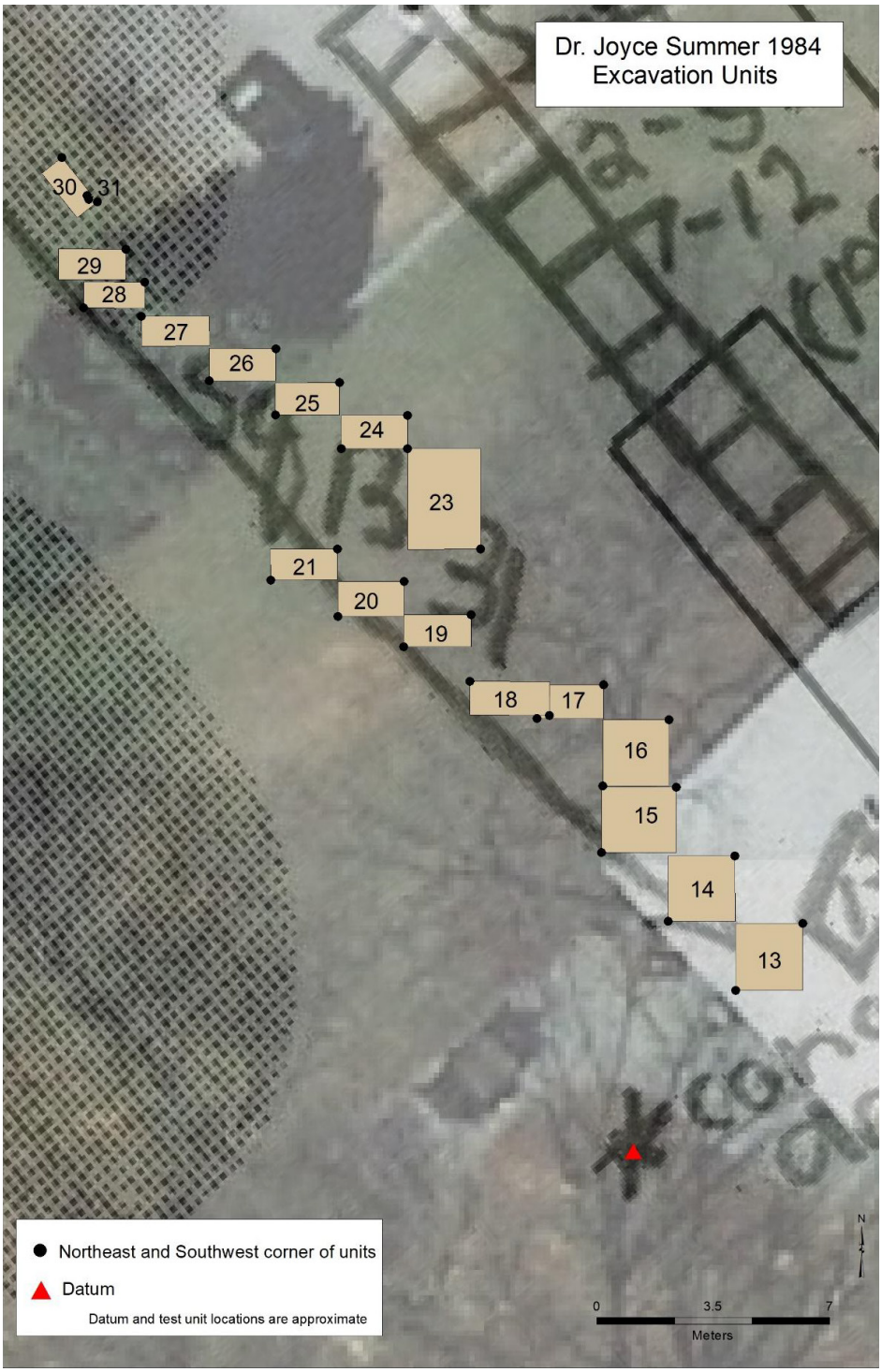



Figure 24. Dr. Joyce Summer 1984 Excavation Units in Reference to Datum


Figure 25. 1984 Excavation Units with Confederate Prison Building Overlay


Figure 26. Lot 313 and 320 with Geophysical Survey Grids with SSURGO Soils Overlay


Figure 27. Overview of Survey Area with Confederate Prison Buildings and Walls Shapefile

Figure 28. GSSI 3000 Ground-Penetrating Radar (GPR) with a 400 MHz Antenna

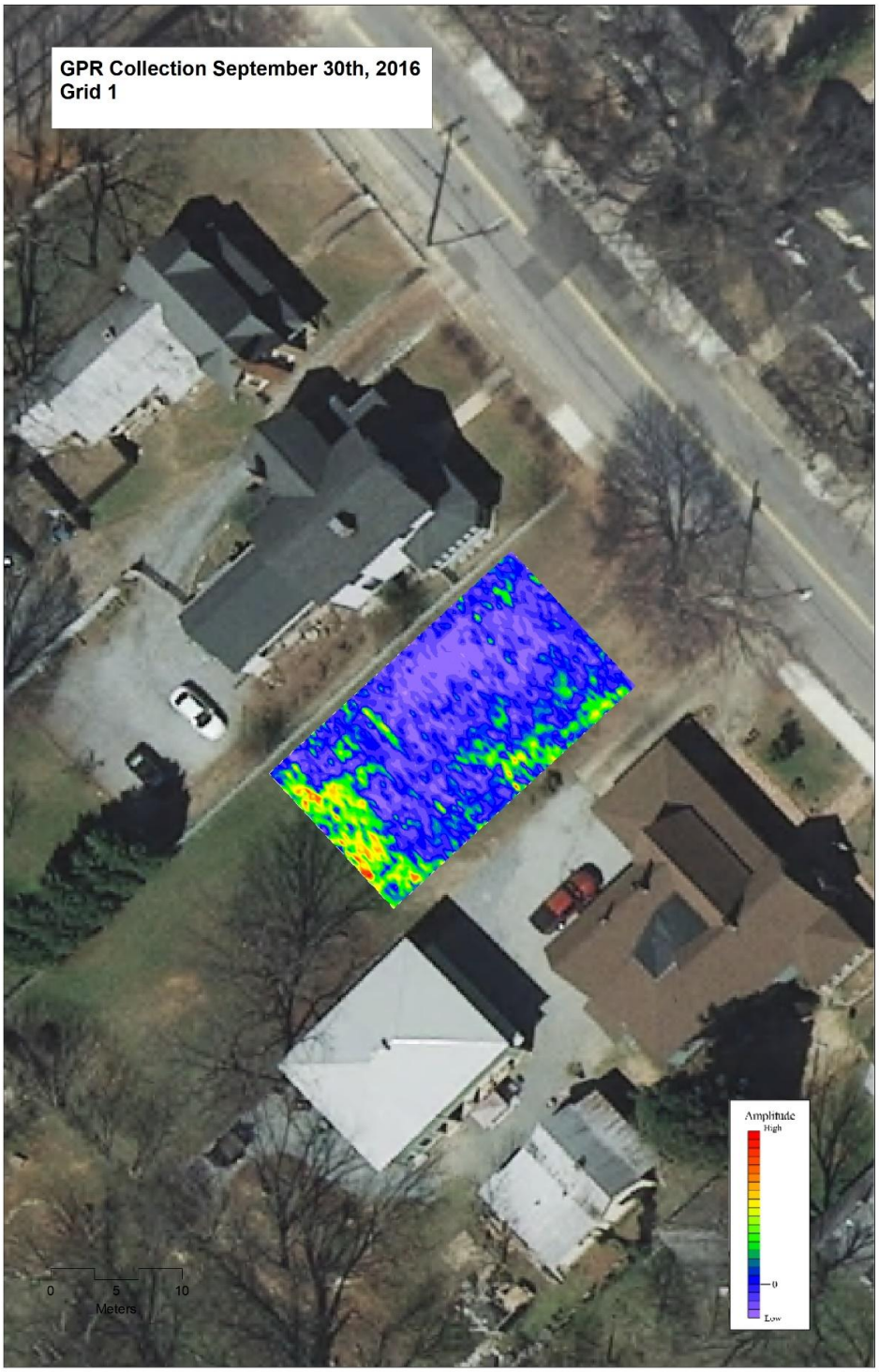



Figure 29. Grid 1 from September 30, 2016


Figure 30. Grid 2 from September 30, 2016

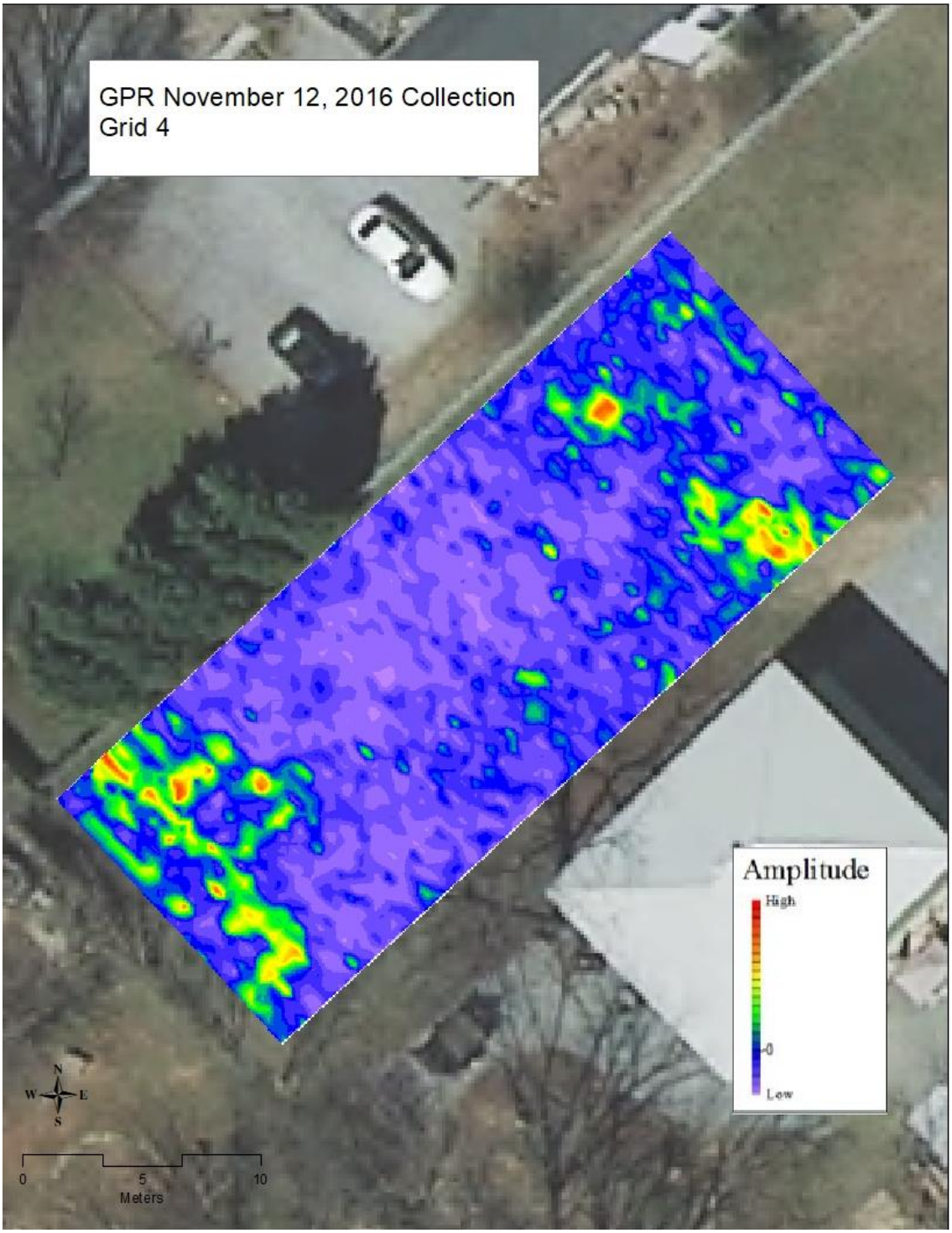



Figure 31. Grid 4 from November 12, 2016


Figure 32. Grid 5 from November 12, 2016

# CHAPTER IV

# RESULTS

The GPR survey conducted at lot 313 East Bank Street revealed subsurface structures/features that could potentially be the Confederate prison barracks'. To eliminate the possibility of this feature being from a previous modern structure located in the same area, the Sanborn maps were reviewed. Originally used to assess insurance claims mainly due to fire, the Sanborn maps offer insight into what structures may have been on the property throughout the years. In reviewing the 1902 and 1913 Sanborn maps, a small structure was located in the rear southwest corner of parcel 313 (Figures 20 and 21). However, this figure does not appear in the 1931-1950 map. The 1931-1950 map depicts a narrow structure in the southernmost corner of the parcel. From these maps, the neighbouring structure located on the property was originally constructed in 1899. It can be assumed that the residential house appearing on three historical Sanborn maps were constructed around the same time. Other evidence that was used to compare the past and current landscape was aerial photography. Aerial photographs of the site were collected from NC One Maps and the Rowan County GIS. Allowing the aerial photography to be analysed from different periods of time created an informal method of change detection.

The GPR horizontal slice map in Figure 33 contains the well which is another known feature and appears as a high amplitude reflection. The location of the well was

known due to survey maps and this information was also communicated by the HSF. Once the well was no longer needed it was back-filled with various materials. This can be clearly seen in the GPR profiles over this location as well as the horizontal slice map (Figure 33). The other feature is the location of a rubble pile from the home that had burned on the lot. The rubble from the home was pushed toward the middle of the lot, into a low lying area to create a smoother surface and can be seen in the geophysical data along the south of Grid 1 (Personal communication Acey and Carol Worthy November 12, 2016) (Figure 29). Another explanation for the high amplitude reflection in Grid 1 could possibly be back fill from Dr. Joyce's 1983 summer excavation units. Figure 34 shows the possibility for both of these theories with Dr. Joyce's units as well as structure that once stood are just adjacent to the high amplitude reflections.

Grid 2 and Grid 4 were both obtained with a 400 MHz antenna (Figure 30 and 31). Upon examination of the horizontal depth slice from both grids (Grids 2 and 4), a high amplitude return can be seen in the rear southwest corner of both grids and is consistent with the outline of the north end of the cotton mill as depicted in historical maps and paintings (Figure 30 and 31). On the planar map the dimensions of the feature are approximately 11 meters long and 6 meters in width at its widest point. When looking at a vertical profile, the reflections show that this feature is located approximately 0.29 cm below the ground surface (Figure 35). Grid 4 also indicates a feature consistent with a rubble pile, which can be seen in the vertical profile beginning less than 0.25 meter beneath the surface (Figure 35). The profile view of transect 11 collected from Grid 4

displays an assortment of high amplitude reflections which are consistent with the outline of the north end of the cotton mill as depicted from historical evidence.

Parcel 320 was purchased by the Confederate Prison Association and preserved due to its historic significance. Grid 5, located at 320 East Bank Street, indicates a strong reflectance in transect 4 beginning roughly 7 meters from zero, and extending to approximately 20 meters from zero (Figure 32). The deepest point is approximately 1.5 meters below the surface, sloping to approximately 0.25 meters below the surface at the 14 meter mark. This is approximately the same area that Ken Robinson indicated as the location of a trench he dug in 2012 (Ken Robinson, personal communication, 2018). The shape of the slope is consistent with the location of the wall of the trench (Figure 36). In the northeast corner of Grid 5 anomalies first appear roughly 10 cm below the surface. The reflections in the profile view are consistent with what one would expect to see when viewing a compact living surface such as a floor in a home or similar structure (Lukas and Stine, 2017). This may mark the location of one of the outbuildings that can be seen in the 1931 to 1950 Sanborn map (Figure 29, 30, and 37). Another possibility could be that one of the Confederate Prison's structures was placed incorrectly in the GIS shapefile and the resulting high amplitude reflection is a result of this feature (Feature 1) (Lukas and Stine, 2017).

The assumed location of the prison barracks created by the Rowan GIS in comparison with the geophysical survey results suggest that the prison is slightly southeast of the original location. Figure 38 displays the Rowan county GIS placement of

the prison along with the UNCG remote sensing lab geophysical survey results. The new placement of the entire prison was achieved by employing the same Direction-Distance tool as mentioned in the methods. By taking the northeast corner and shifting the entire prison, direction 199.89, distance 27.23, the new image lays out the prison according to the geophysical survey results. To compare the new shift of the prison, before and after maps were produced to review all the previous and current work done to the prison with the Rowan GIS (Figure 39) and then with the newly placed prison from the geophysical survey (Figure 40). It should be noted that Ken Robinson units and the GPR grid are estimations from the information that was given. The same applies to Dr. Joyce's 1984 summer excavation units. The datum was placed from a hand drawn map done by Dr. Joyce and from there the corners were measured out to create the units.

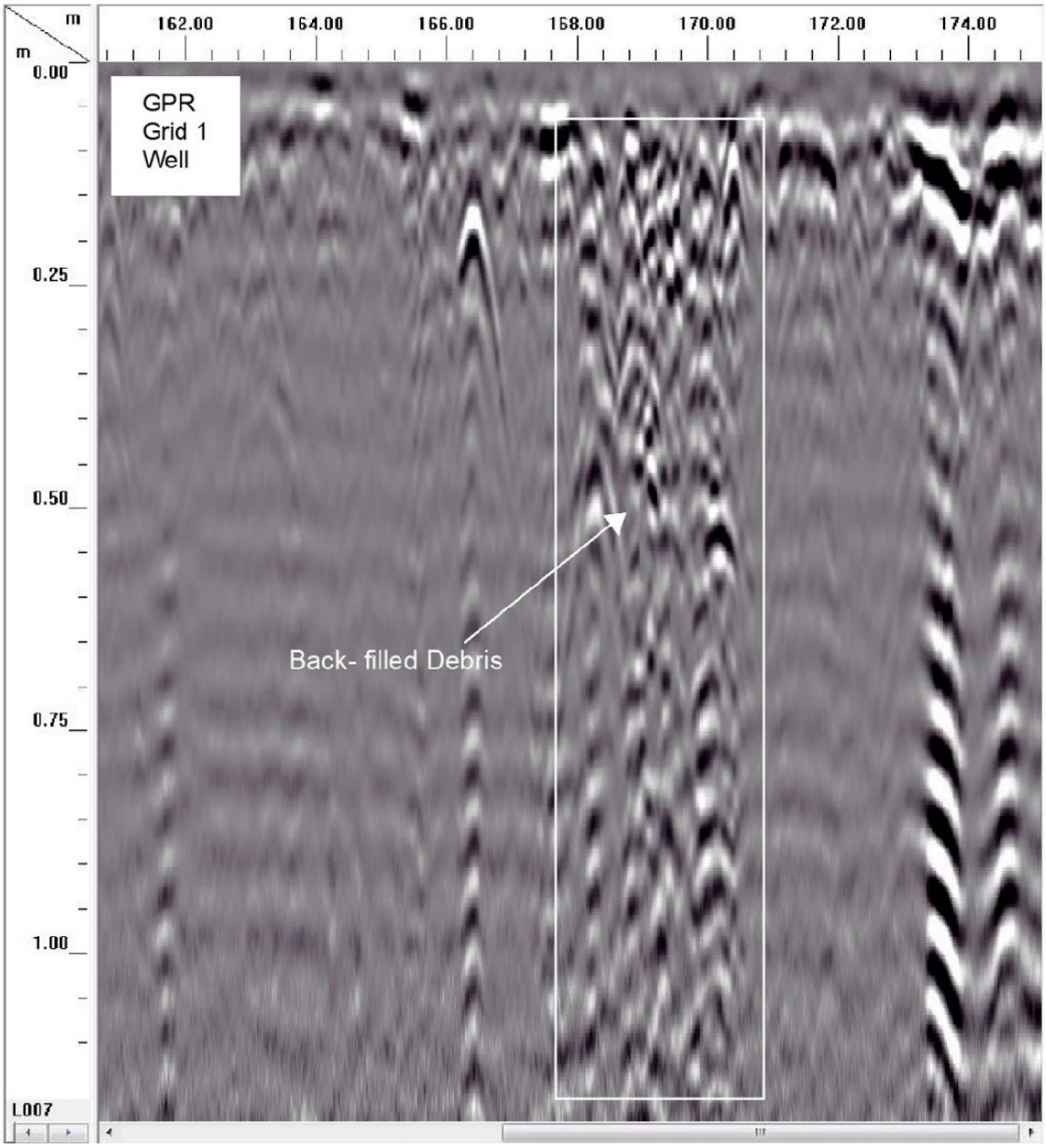



Figure 33. GPR Profile of Well; Identified by Multiple Small Reflections caused by Back Fill

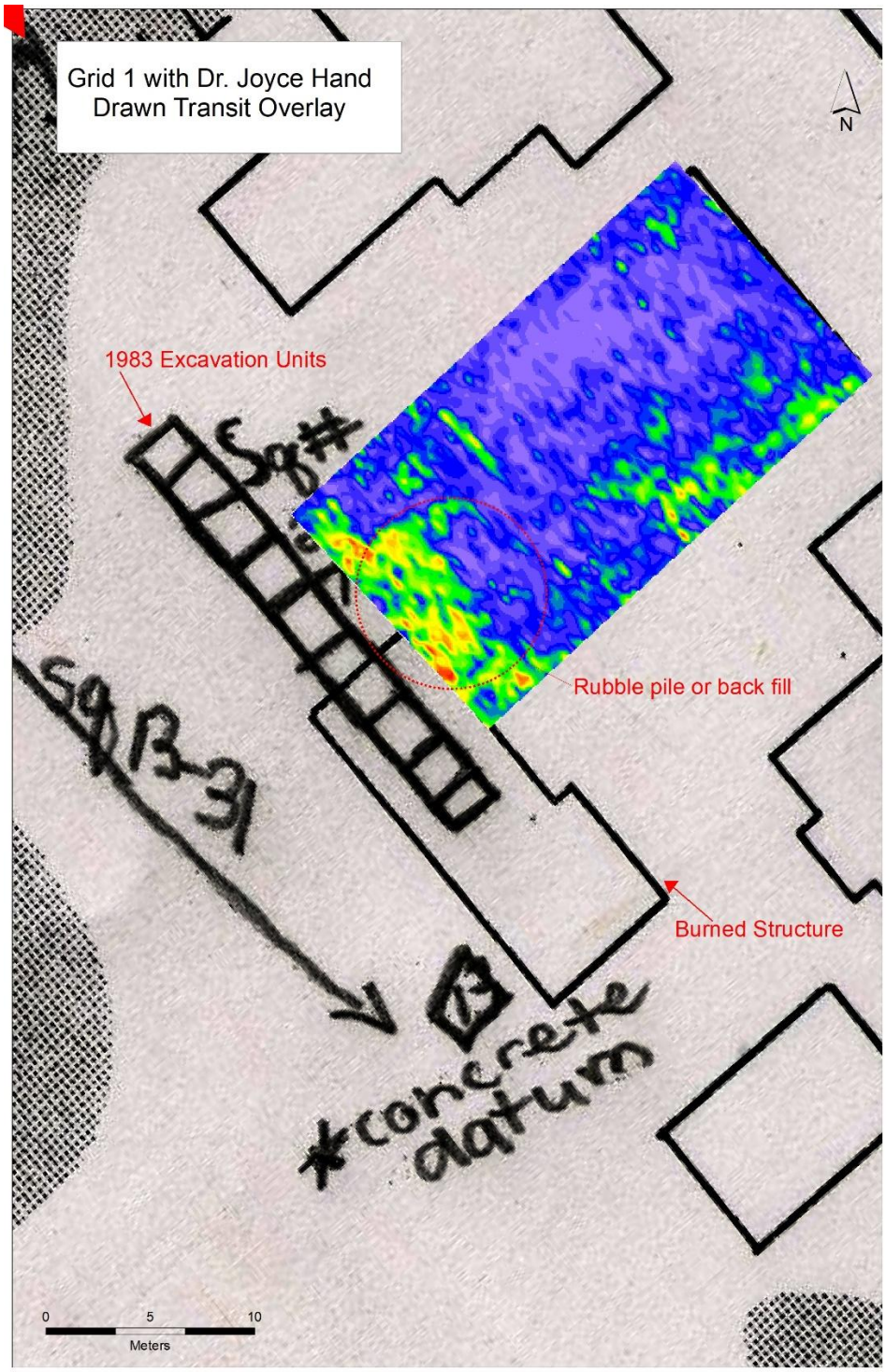



Figure 34. Displays Dr. Joyce's 1983 Test Unit and Burned Structure alongside Grid 1

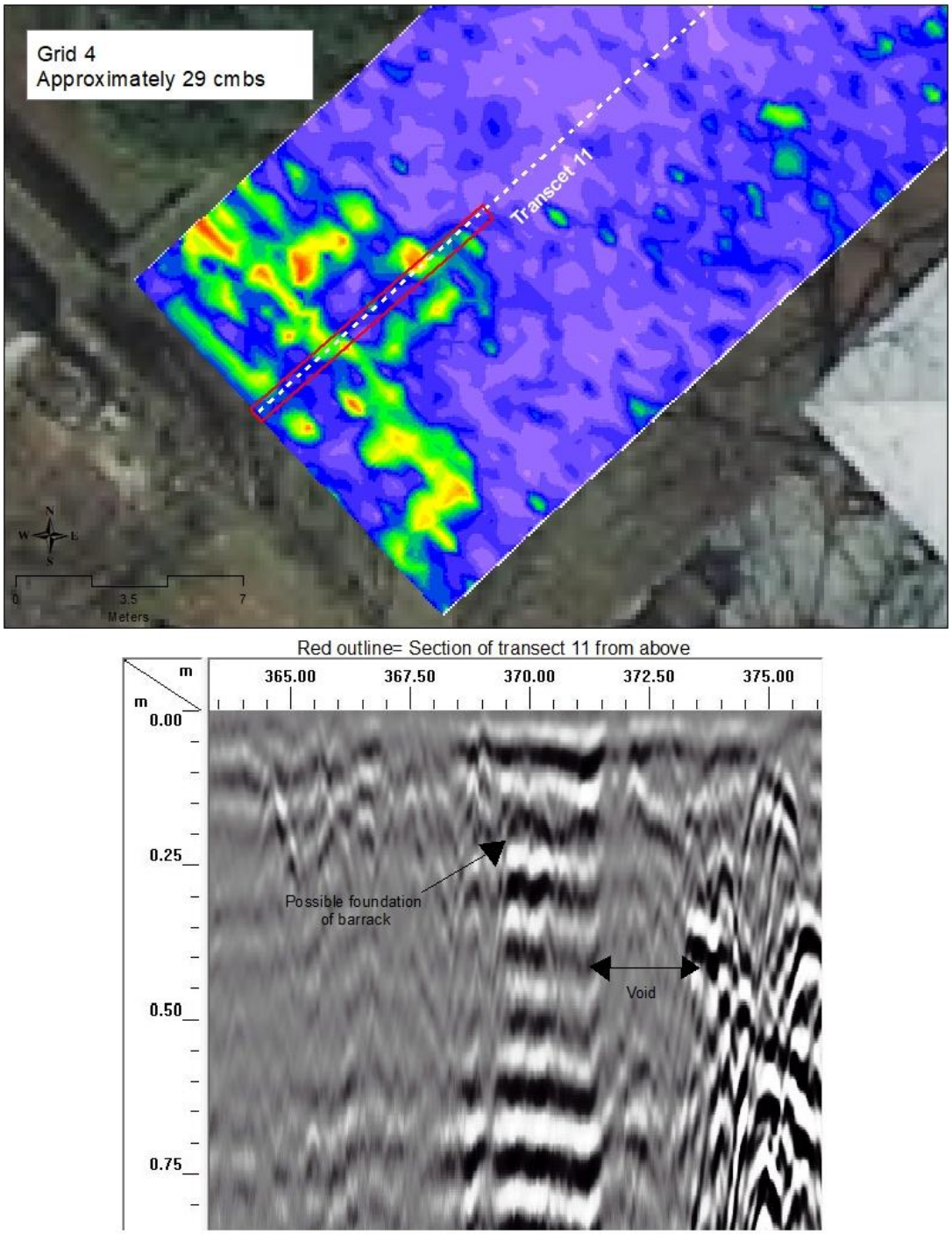



Figure 35. GPR, Grid 4, Horizontal Depth Slice with Associated Vertical Profile. Approximate location of the Entrance to the Barracks.

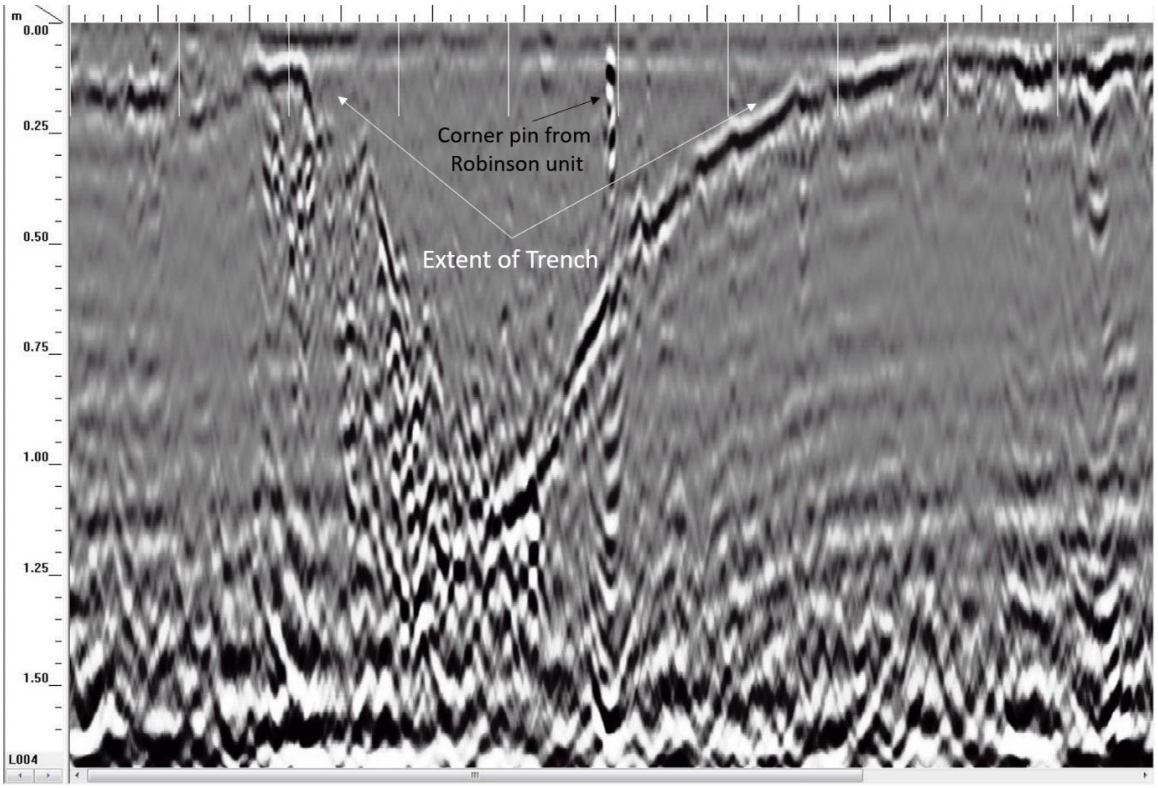



Figure 36. Profile of Ken Robinson Trench from Grid 5

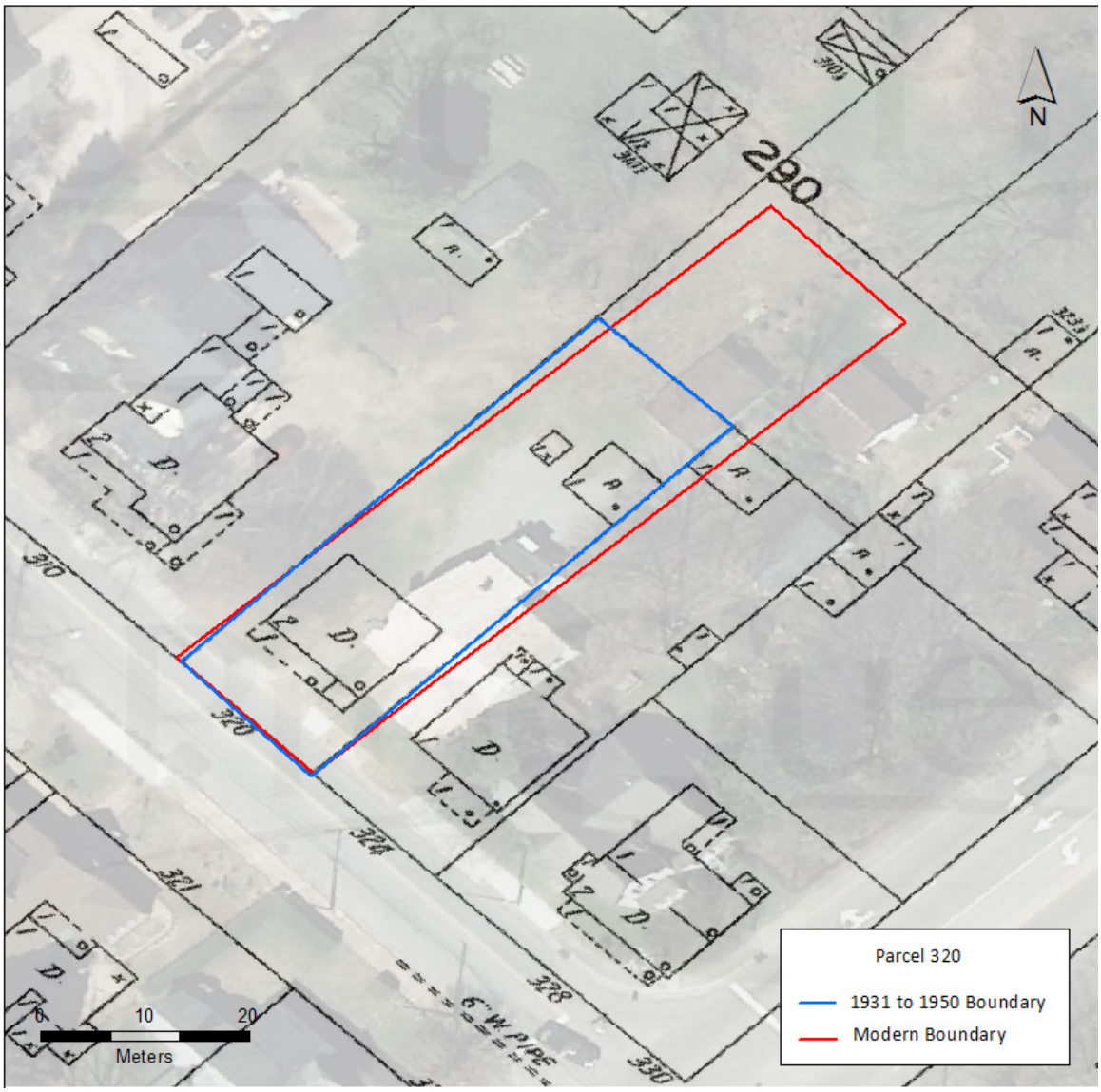



Figure 37. 1931 to 1950 Sanborn Map with Parcel 320 Highlighted


Figure 38. Displays the New Placement of the Prison after Geophysical Survey


Figure 39. Displays the Place of the Prison by the Rowan County GIS and all Previous Work Conducted at the Site


Figure 40. Displays the Prison Shift According to the Geophysical Survey

# CHAPTER V

# DISCUSSION

One of the goals for this survey was to use geophysical methods to identify and locate the 1861 Confederate Prison potentially located on the property that is owned by the Historic Salisbury Foundation. Another goal was to bring together all the previous archaeological and geophysical survey work completed on the site into one cohesive report. The previous works conducted on the site produced no official reports. The archaeological work that Dr. Joyce performed in the summer of 1983 and 1984 was stored at Wake Forest University under the care of the anthropology and archaeology department. The research included student field journals, unit layer forms, photographs, and hand drawn maps. Ken Robinson conducted both archaeological and geophysical surveys in numerous areas of the prison. The only report located was a printed copy of Mr. Robinson's PowerPoint presentation given to the Salisbury Prison Foundation. Robinson also gave a copy of his digital PowerPoint presentation he presented at the open field day and was willing to meet the author during research. Bringing together the past and present work to create one report has allowed a better understanding of the historical and cultural landscape along with the changing topography.

The research reveals that Grid 2 and Grid 4 display high amplitude reflection towards the southwest corner of the grid. The planar GPR are similar in appearance to the

outline of the prison barracks (Figure 41). It is possible that the GPR signal is producing high amplitude reflection because it is reflecting the foundation of the barracks which would have been made of brick or stone. The depth of the feature in both grids remains the same but when looking at a planar view there are distinct differences in appearance. On the first collection date, September 30, 2016, the soil moisture content was high causing the produced data to be less pronounced. When some clay types are wet, they become more electrically conductive and therefore act as an attenuating agent (Ponziani et al. 2010). Regardless of which collection day, the subsurface feature clearly resembles the outline of the prison barracks. With the aid from historical drawings, Sanborn insurance maps, and the GIS shapefile, the sub surface feature clearly resembles the north facing doorway or portico (Brown, 1992) based on historical evidence. If the current prison were to be shifted to the southeast, it would mirror the GPR data (Figure 42).

The RDP values for Grid 2 were high, this is most likely due to the water content within the soil. Some clay types that have high ionic displacement, and are typically know as swelling clays, and have the ability to hold water in their atomic structure and therefore swell when wet (Conyers, 2009). Clay is the dominant soil needed to have had a high RDP because of the amount of retained water (Conyers, 2009). The radar energy travelled through the clay, but at a low velocity because it was a nonconductive medium (Conyers, 2009). Conyers (2004) has noted that a totally dry clay layer will have a RDP of 2.5. In comparison, a saturated clay layer has a RDP value of 42. Looking back at the values collected from Grid 2 and Grid 4, Grid 2 had high higher RDP point values and a

higher average RDP, 28.2304. Grid 4 had two high point values and a low value lowering the overall RDP, 18.3412. Although the soil was not entirely dry to the touch on the second collection day, the RDP values were indicating relatively dry soil.

Dr. Joyce of Catawba College excavated a number of units with the goal to uncover any physical remains of the prison. Dr. Joyce was successful in locating the escaped tunnel from unit 22 used by the prisoners along with post holes and smaller artifacts. Unit 22 was located between 310 and 312 Horah Street (Figure 43). According to student field journals, the unit contained a number artifacts including nails, small bones, and a wagon wheel. In this same unit, around 52-70 cm below the surface, the soil was soft and exposed a trench (Figure 44). Further excavation concluded it was a part of the escape tunnel. Prior to placing Dr. Joyce's excavation units, the data from Grid 1 suggested that the high amplitude reflection was possibly caused due to backfill from the house or the excavation units. However, when the units are overlaid with the GPR data collected in 2016 it appears that the reflections are more likely caused by a previous structure as opposed to back fill from Dr. Joyce's 1984 excavations. Figures 45, 46 and 47 display Dr. Joyce's units on top of the 1902, 1913, and 1931 Sanborn maps. Even with the units not being completely spatially accurate, the size of the feature indicates a modern structure that was burned in that area (Figure 48). Since the 1934 excavation, lot 313 and the surrounding lots have undergone residential construction. Many of the dated structures were torn down and replaced with modern buildings. The amount of construction could be the reason as to why the GPR did not detect Dr. Joyce's excavation

units. The position of the prison barrack's remained unfound at the end of Dr. Joyce's field school.

The feature detected in grid 5 is not only consistent with the location, provided by Ken Robinson (2016), from his previous excavation and discovery of the foundation of one of the cottages, but is also consistent with the maps provided by the Historic Salisbury Foundation that depicted a structure in this area (Lukas and Stine 2017). The feature contained post holes and a collection of bricks. These remains could have belonged to the Confederate hospital which was located in that area. The other areas where Ken Robinson worked in 2005, 415 East Fisher Street, 409 East Bank Street, the corner of 424 East Bank and Shaver Streets; and, 512 Bank Street, all yielded findings either relating to the prison or a past modern structure (Figure 8). Ken Robinson surveyed numerous areas within the prison before selecting a site to excavate. The GPR results from 415 East Fisher Street show a linear feature visible at 8-19 cm below surface (Figure 49) and from the historic map it was the location of the prison wall but following excavations, a terra cotta pipe was discovered. Conducting geophysical surveys is not a guaranteed method to know what lies below the surface and that is why ground truthing is a vital element in geo-archaeological surveying (Ken Robinson, personal communication, 2016).

Once the prison was shifted in ArcMap according to the geophysical survey data, further analysis could be made. The initial step was examining how the shift effected the work of Dr. Joyce. When examining Dr. Joyce's units with prison layout created by the

Rowan GIS, the units should have uncovered some of the prison barracks portico entrance but there was no subsurface feature found (Figures 24 and 25). This gives way to the possibility that the prison is located to the southeast of its current estimated postition. In 2005 Ken Robinson completed geophysical and archaeological work at 415 East Shaver Street and uncovered a feature that was composed of brick and other small artifacts. Some of the other remains were post holes which he had concluded might have belonged to the prison's outer defense wall. With the Rowan GIS layout and the new geophysical layout, this is still a strong possibility due to the fact that both theoretical wall positions run through this excavation area. In regards to the rest of his research areas, with the new geophysical prison shift, it is unlikely that any of Ken Robinson's excavations units would have been associated with prison including his work in 2012 at 320 East Bank Street. This is based on the assumption that the new prison shift provided by the geophysical data is spatially accurate.

The fact that the term landscape can be tied to a variety of meanings is becoming an issue that archaeologists are addressing more and more everyday (Taylor, 2016). Simply using the term landscape is ambiguous therefore it is the author's job to define how the term is being applied (Meining, 1979). Applying a historical landscape paradigm allows for a better understanding of how past and present communities utilized the landscape. It also helps provide how the landscape was affected by the communities and how the surrounding area was affected by the use of the land (Anschuetz et al 2001). When a landscape theory is implemented, the understanding of the historical landscape

and the current landscape then becomes an experience (Greffe, 2008). Another important idea is the sense of place and the personal attachment to the landscape (Taylor, 2016). Breaking down the timeline: a cotton mill was constructed adjacent to the railway in downtown Salisbury for easy access to transport goods, then the cotton mill was abandoned, following that in 1861 the Confederate Army repurposed the mill into the barracks for prisoners of war until the time of its demolition in 1865. The 'The Burra Charter' defines integral as the "recognition of associations between people and places where 'Associations mean the special connections that exist between people and a place' (Burra Charter Pg 3, 2013). It is important not only to know how the prisoners associated themselves with the prison landscape, but also the staff working within the prison as well as the everyday citizens of Salisbury. These values change depending on the individual's perspective. Historical landscapes aide tying together the space and place associations with the physical change in the landscape (Pauls, 2006). Landscapes are not static and will continue to reflect the needs of the community during that time, as it did during the time of the Confederate prison (Biger, 1992). Due to the fact that there is no visible building on lot 313 East Bank Street today, questions must be asked about the landscape obscurity. The messages that are carried within the landscape allow a primary explanation of the cultural landscape (Lewis, 1976). At the Salisbury Confederate Prison, not only was the land physically changed by the prison's existence; the individuals were changed by the prison, in their association with that particular space and place.

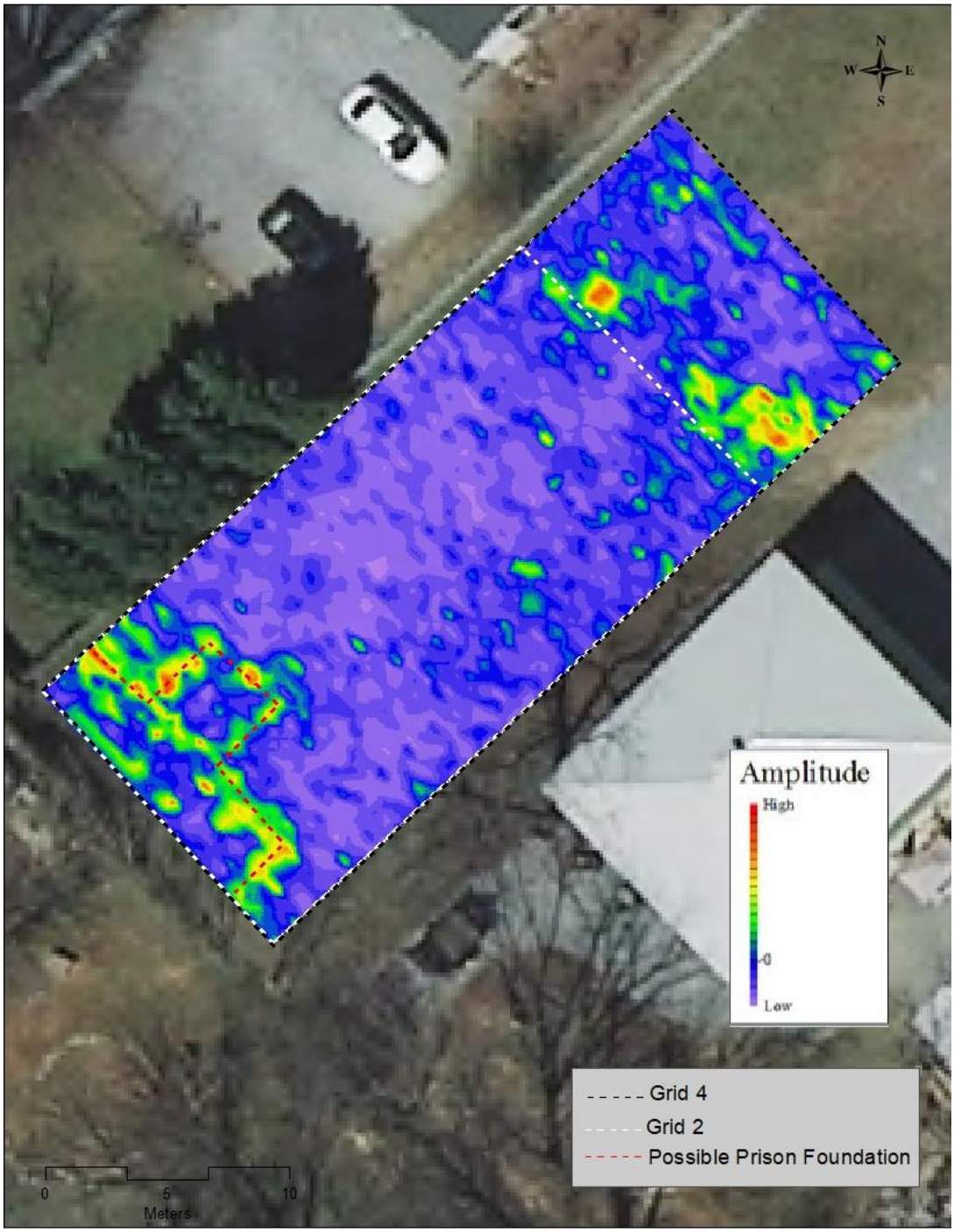



Figure 41. Grids 2 and 4. Possible Location of Barrack's Foundation in Southwest Corner of Grids


Figure 42. GPR Horizontal Depth Slice of Probable Correct Location of Barracks


Figure 43. Unit 22 with Estimated Location of Escape Tunnel Based from Field Journal Drawings

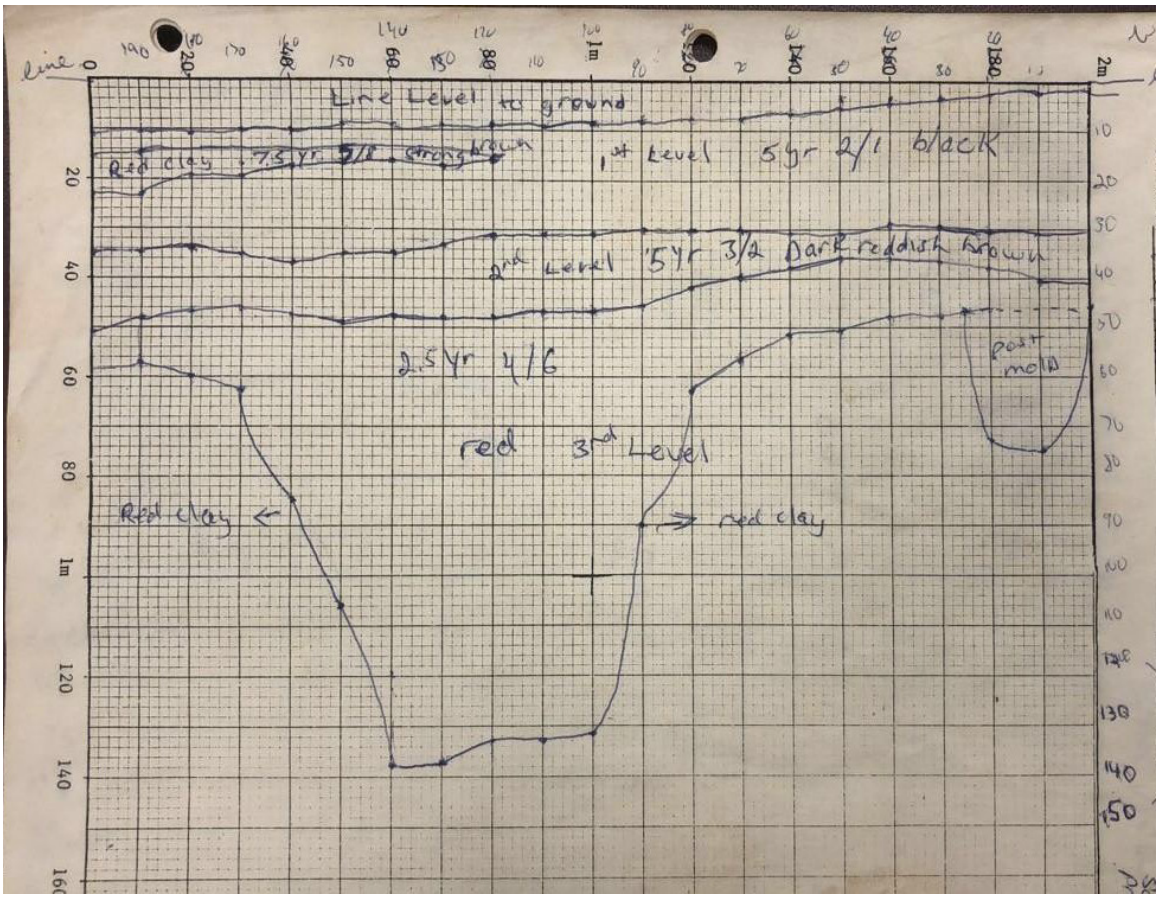



Figure 44. Unit Layer Sheet from Unit 22 Illustrated by Keith Thompson and Brett Garland

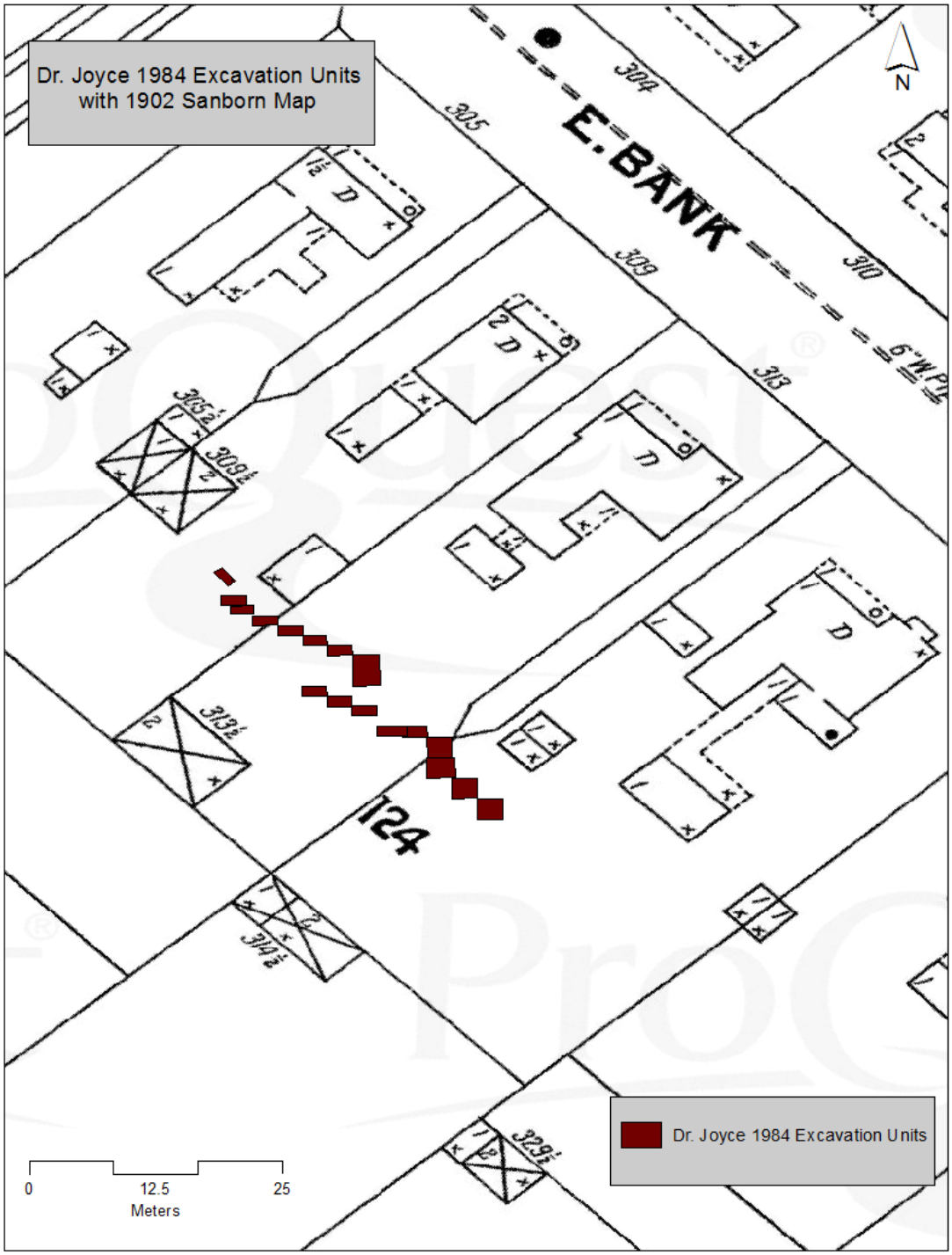



Figure 45. Displays 1902 Sanborn Map with Dr. Joyce's Excavation Units

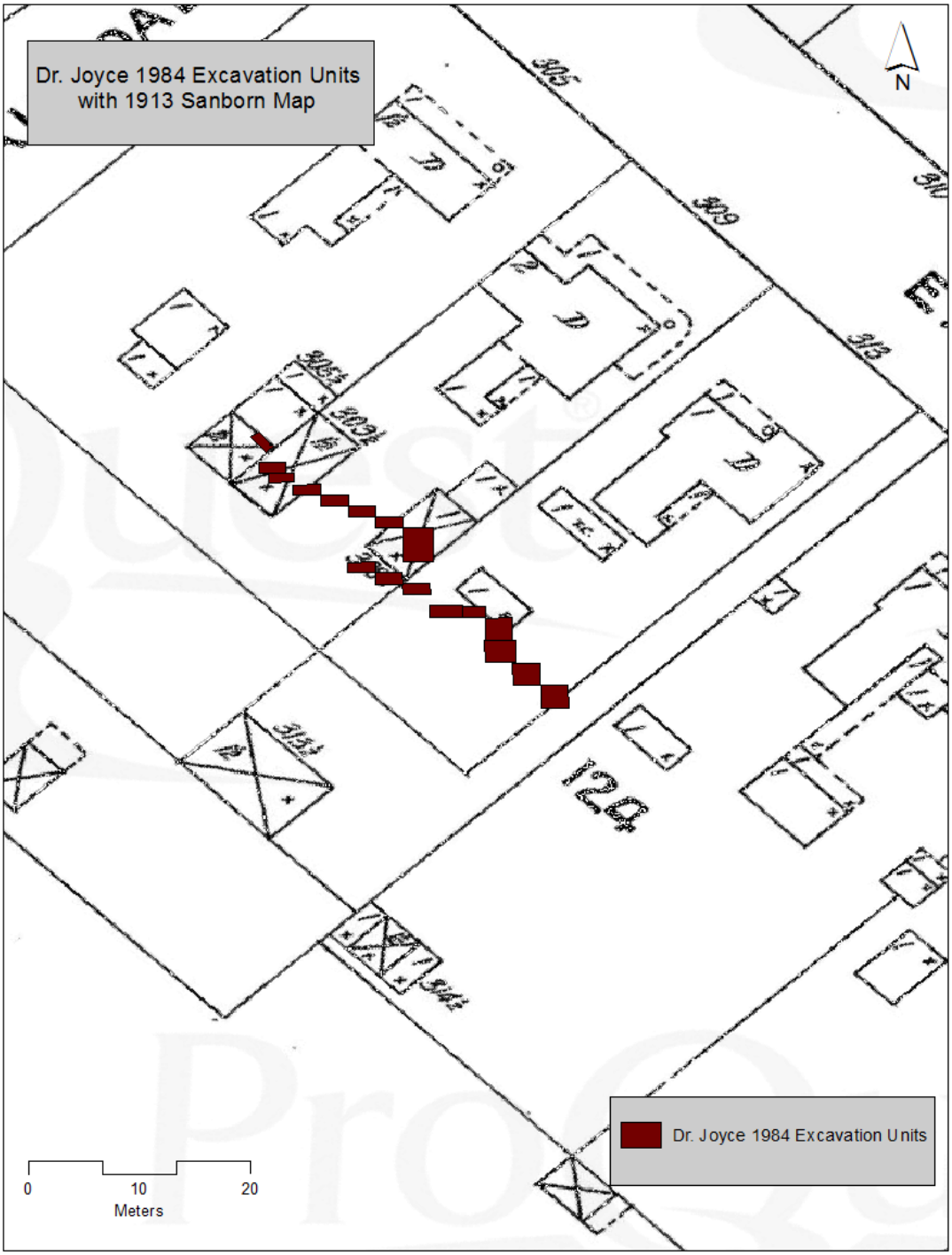



Figure 46. Displays 1913 Sanborn Map with Dr. Joyce's Excavation Units

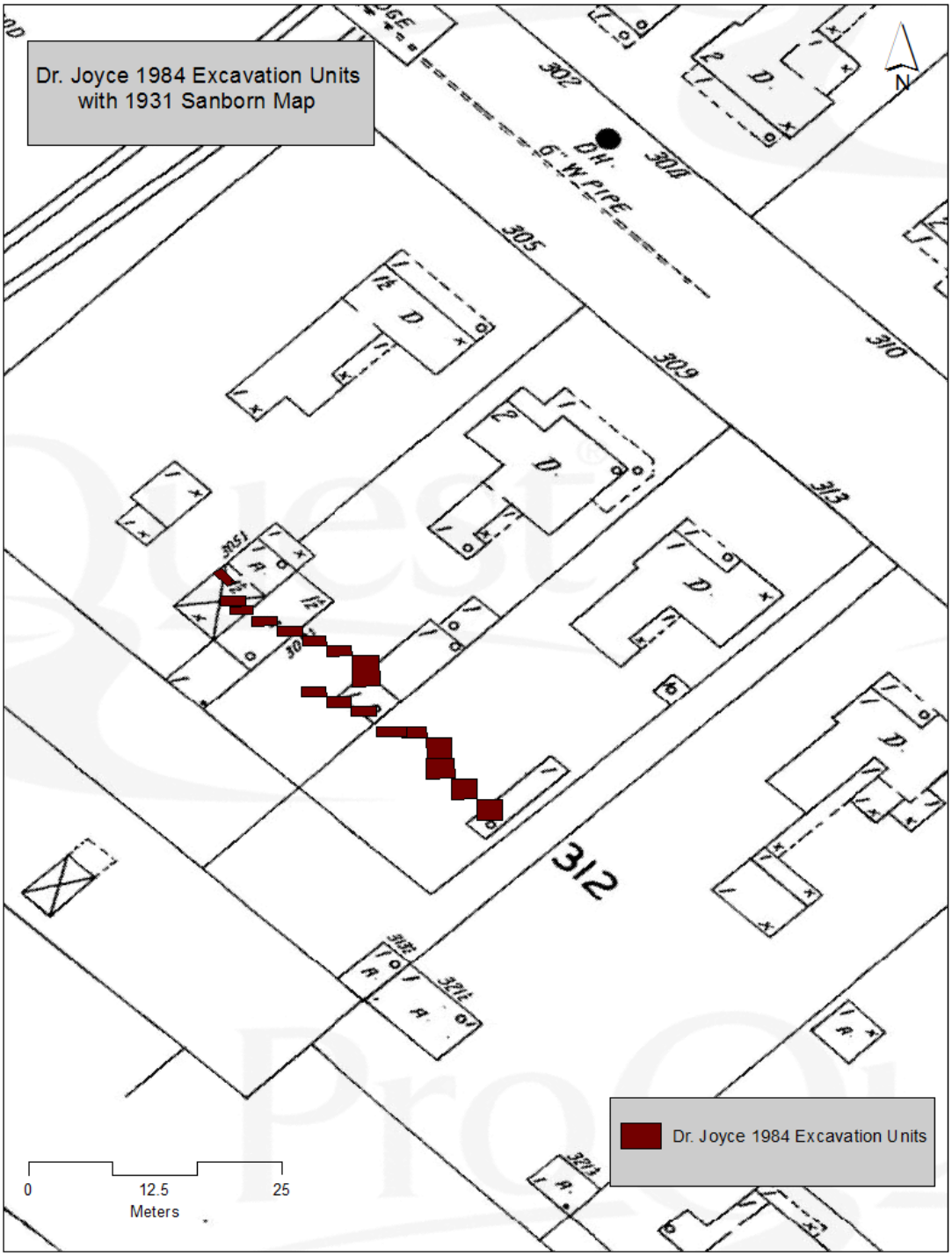



Figure 47. Displays 1931 Sanborn Map with Dr. Joyce's Excavation Units

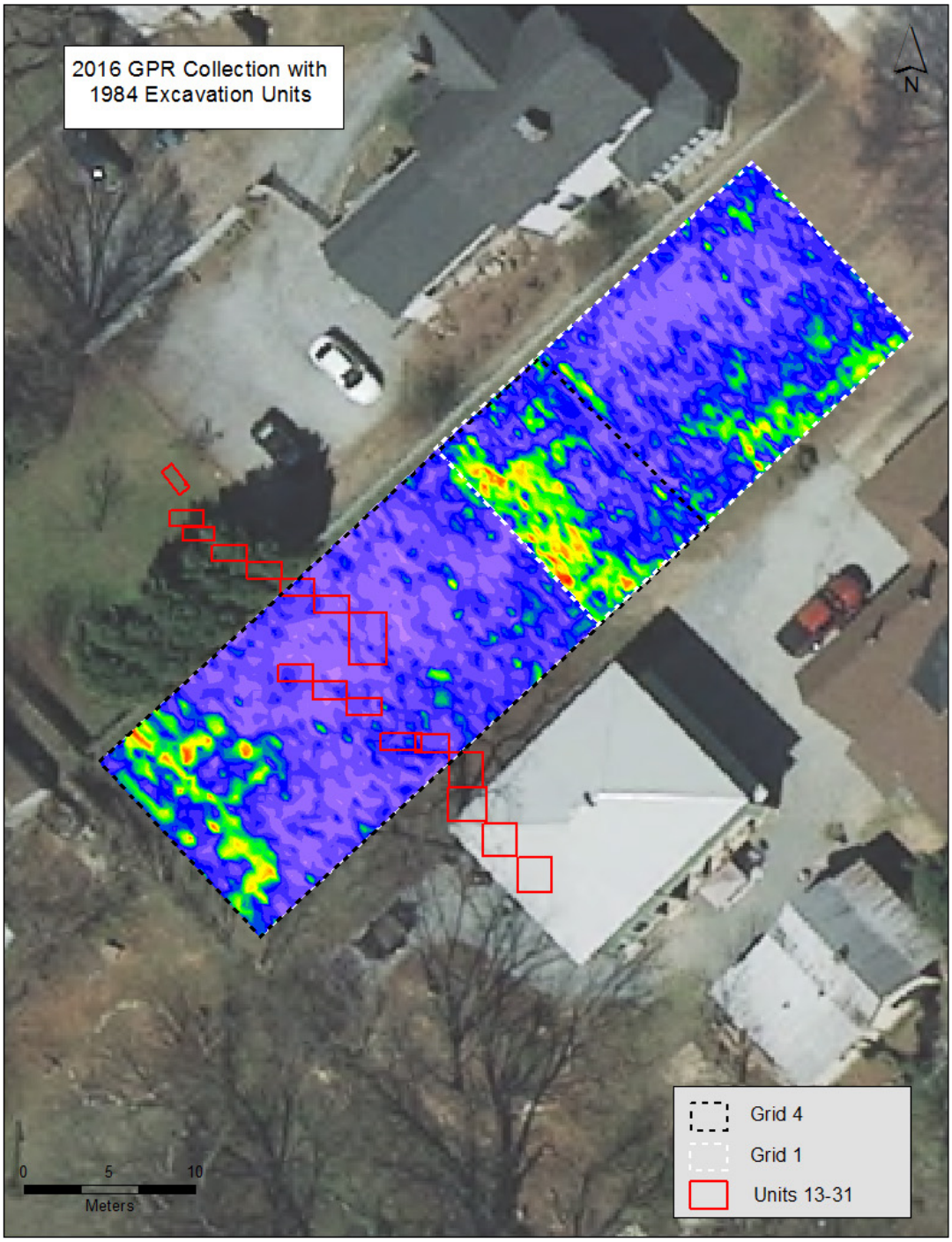



Figure 48. Dr. Joyce 1984 Units with 2016 GPR Overlay

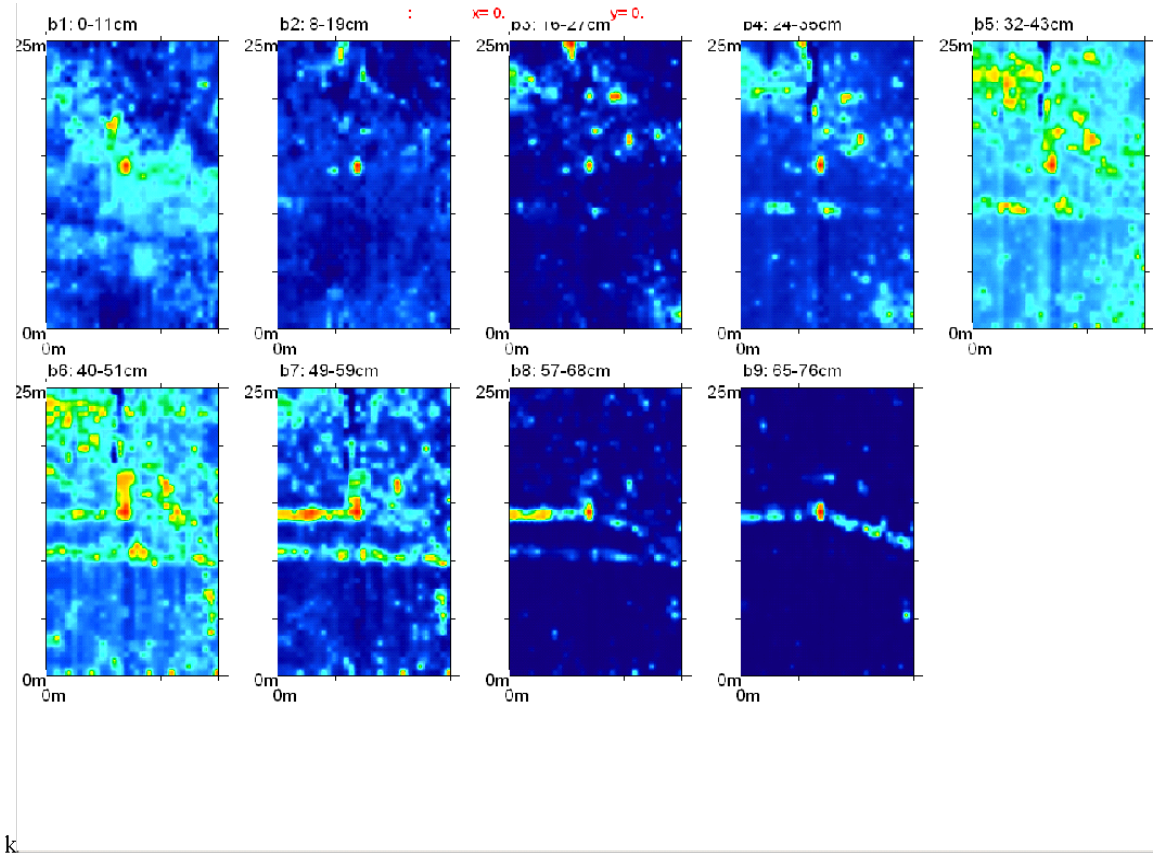



Figure 49. GPR Data from 2005 Investigations at 415 East Fisher Street. Shows a Linear Feature. (Ken Robinson, personal communication, 2016)

# CHAPTER VI

# CONCLUSION/FUTURE RESEARCH

The ground penetrating radar survey undertaken on October 30, 2016 and November 12, 2016, at the request of the Historic Salisbury Foundation, successfully identified several structures located below the surface on parcels 313 East Bank Street. Based on literature, historical map analysis, and the GPR survey results it is highly likely the foundations of the Cotton Mill turned barracks from the Confederate prison (1861-1865) are present below the surface of parcel 313 East Bank Street (Figure 42). Grid 4 (Figure 41), located on parcel 313, displays the strongest evidence for the location of the Confederate prison barracks (Lukas and Stine 2017). As seen from the provided shapefile the footprint of the cotton mill turned prison barrack, closely resemble the GPR data. Historical paintings indicate that there was a doorway or a portico extending from approximately the middle of the northern facing wall (Brown, 1992). The high amplitude reflection detected in both the GPR horizontal slice map and vertical profile of the area in the southwest corner of Grid 4 is consistent with this footprint; matching almost perfectly once the shapefile was placed on top of the GPR horizontal slice map (Lukas and Stine 2017).

Conducting geophysical survey before proceeding with a full-scale excavation is extremely beneficial. Employing methods such as GPR is non-destructive to

archaeological sites (Kern, 2008). Another benefit for managed sites, is the area does not have to close, as it would if excavation was occurring, but can remain open for daily operations (Kern, 2008). These methods are also more accurate than traditional excavations. As opposed to using imprecise survey methods and subsurface testing, these can now be reserved for site verification as opposed to site discovery (Kern, 2008). Another benefit to geophysical research is the ability to make subsurface testing more cost effective (Ewen, 2016). Traditional excavations are costly but methods such as GPR can help direct the excavation and provide the maximum amount of data at a substantially lower price (Kern, 2008).

Each geophysical method has specific limitations based on environmental factors (Kern, 2008). The site's geomorphology, especially soil type and condition affect the GPR. One of the difficulties experienced during this research project was the amount of soil moisture from the first collection date, September 30, 2016. The RDP values were high, indicating high water content in the soil. Having a high soil moisture content can affect the strength of the GPR's antenna causing the signal to attenuate. The water can often pool on the top of subsurface features, exaggerating the data (Conyers, 2009).

The work conducted by Dr. Joyce and Ken Robinson contributed to uncovering the parts of the original prison. Dr. Joyce worked in the summers of 1983 and 1984 excavating a total of 31 units. The units were chosen by traditional archaeological methods and based from historical drawings and maps. Ken Robinson included both geophysical methods and archaeological excavations in 2005 and 2012 to investigate

areas around the prison. These locations were first based from historic maps created by the Rowan GIS and following GPR surveys which determined the best areas for excavation. Figure 40 shows all of the geo-archaeological work completed by Dr. Joyce, Ken Robinson, and UNCG Department of Geography. With this map completed it gives a better understanding of where work has been completed and where new work can begin.

This work introduces a new boundary for the prison as a whole and the barracks in particular. It allows for a new perspective to if the cultural remains that were found in the previous works were actually associated with the Confederate prison. This work needs to be tested with archaeological excavation to help confirm or reject the new location of the barracks. Figures 39 and 40 allow for a comparison between the current and proposed boundaries based on the geophysical survey results. Dr. Joyce excavation units, 21, 25, and 26 all should have uncovered some of the prison's portico entrance but no feature was found relating to the prison (Figures 24 and 25). Due to the fact that no subsurface feature was found this points to the prison being in a different location. Ken Robinson excavated many areas within the prison. One area that correlates with both the Rowan GIS placement and the new geophysical data placement is 415 East Shaver Street. This area would have been part of the wall giving strong indication that the poles found in Mr. Robinson's unit in this area were possibly from the prison's wall.

Future goals for this project include excavation and ground truthing the geophysical data found at lot 313 E Bank Street. The objective would be to confirm or reject the results of this work and the previous UNCG study (Lukas and Stine 2017). This could be

accomplished using a combination of geophysical survey and archaeological excavations. Excavating the surveyed area could shed light on the cultural history of the city of Salisbury. Unearthing the Confederate prison could allow lot 313 East Bank Street to be placed on the national historic registry allowing for the history of Confederate prison to live on throughout the ages.

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