INTERIM REPORT ON GEOPHYSICAL AND ARCHEOLOGICAL INVESTIGATIONS OF A PORTION OF THE PRINCETON BATTLEFIELD AT MAXWELL'S FIELD, ON THE INSTITUTE FOR ADVANCED STUDY CAMPUS

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Executive Summary

The Ottery Group has prepared an interim report to present the preliminary findings of the archeological investigation of Maxwell's Field on the campus of the Institute for Advanced Study prior to the construction of faculty housing on the approximately seven-acre tract of undeveloped land adjacent to the Princeton Battlefield State Park. Maxwell's Field is a significant archeological site and historic landscape associated with the Battle of Princeton, which took place in January of 1777 and represents a pivotal point in the Revolutionary War. The interim report provides a summary of the research design, documents the field and laboratory methods utilized, and presents the results of the field investigations. The report also provides a discussion of on-going aspects of the investigation. The interim report is intended to encourage continued research and dialogue among the professional archeological community and members of the public that have an interest in the archeology associated with this historic landscape.

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1.0 Introduction

This report presents the preliminary findings of the archeological evaluation of a portion of the Institute for Advanced Study (IAS, the Institute) campus known as Maxwell's Field, located in Princeton Township, Mercer County, New Jersey (Figure 1.1). The IAS intends to construct faculty housing on an approximately seven-acre tract of undeveloped land on Maxwell's Field, which is situated adjacent to the Princeton Battlefield State Park. The investigation was conducted at the request of the Institute for Advanced Study, as part of its commitment to the Princeton Regional Planning Board, which acted under advice from the Princeton Township Historic Preservation Commission (Capozzoli 2011). There was no federal involvement in the undertaking, and the New Jersey Historic Preservation Office (SHPO) was not directly involved in consultation on the planned development project.

Maxwell's Field is known to contain remnants from the Battle of Princeton, which took place in January of 1777 and is considered a turning point in the Revolutionary War. Prior archeological interest in the tract includes periodic metal detecting by collector Keith Bonin, starting in 1989 and continuing during the 1990s, and a more systematic, but still intermittent, survey by the Deep Search metal detecting club—precursor to the Battlefield Restoration and Archeological Volunteer Organization (BRAVO)—between 1993 and 2000 (Sivilich and Phillips 2000). Professional investigations on the tract were conducted for IAS by Hunter Research (Hunter) in 2003, and the Louis Berger Group (LBG, Berger) in 2004-2005, with additional fieldwork in the immediate vicinity of the project area by LBG in 2011 and 2012 (Grzybowski, Bowers and Beadenkopf 2007, Fortugno and Beadenkopf 2011, 2012). John Milner and Associates (JMA, Milner) prepared a military terrain analysis for the entirety of the Princeton battlefield for the Princeton Battlefield Society under a grant from the American Battlefield Protection Program in 2010, which did not entail new archeological fieldwork (Selig, Harris and Catts 2010). The current phase of archeological investigations was performed by The Ottery Group under contract with the Institute for Advanced Study.

The planned development project entails the construction of fifteen new housing units for IAS faculty, consisting of eight townhouses and seven single-family detached dwellings. This housing will be clustered on a 7.07-acre tract, which constitutes the current project area (Figure 1.2) and is separated from the battlefield park by a 200 foot-wide buffer where no ground disturbances will take place. This buffer was subjected to a metal detection survey by LBG in 2004-2005 (Grzybowski, Bowers and Beadenkopf 2007). In 2012, IAS developed an archeological protocol for the archeological mitigation of the effects to archeological resources resulting from the faculty housing project that entailed a pre-construction phase incorporating systematic subsurface testing and a metal detection survey of the project area, a construction phase of archeological monitoring of ground-disturbing activities during construction, and a post-construction phase of research to be coordinated with new archeological surveys, if any, of the Princeton Battlefield State Park. This phase included the preparation of interpretive signage on Institute land adjacent to the Battlefield Park, as well as the provision that all data and artifacts collected will be permanently curated, by the State of New Jersey or another appropriate permanent repository for archeological collections (IAS 2012). The plan for archeological monitoring of construction was accepted by the Regional Planning Board. The pre-construction plans were detailed in the Request for Proposals (RFP) for pre-construction archeological services issued by the Institute in 2014, which in turn became the basis for the research design and fieldwork, which also incorporated a geophysical survey of the project area and provided for the excavation of test units as warranted by the results of the geophysical and subsurface surveys. In July 2014, following the start of archeological fieldwork, the Princeton Battlefield Society (PBS) distributed a press release that included comment on the methodology for the archeological fieldwork to be carried out at Maxwell's Field, while also expressing the desire that the data generated by the current investigation be shared with the public and professional communities.

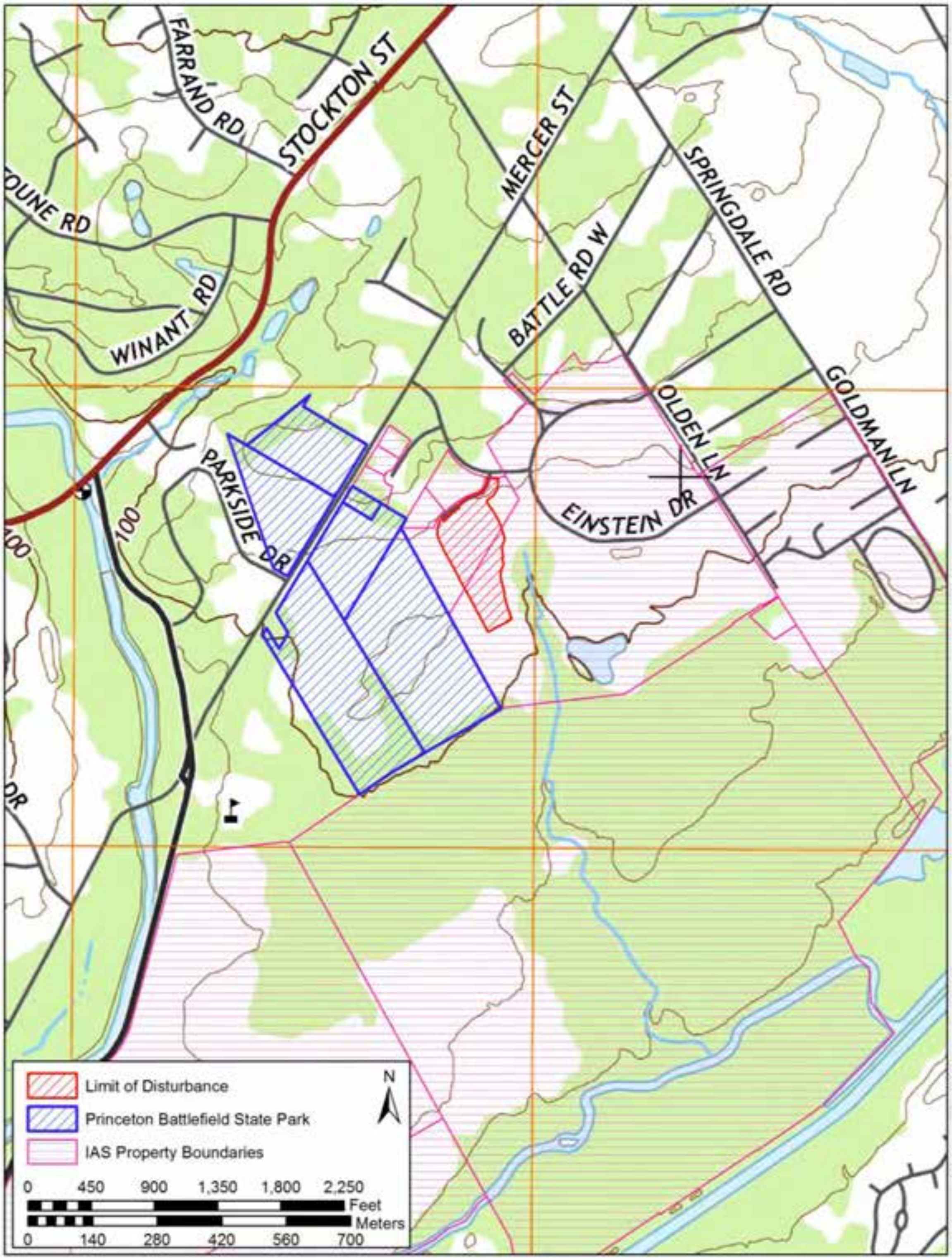

Figure 1.1: Location of the Limit of Disturbance for the IAS Faculty Housing Project, with IAS Campus and Adjacent Princeton Battlefield State Park Boundaries (Princeton, NJ 7.5' USGS Quadrangle).

Figure 1.2: Limits of Disturbance for the IAS Faculty Housing Project.

The pre-construction phase of the current investigation consisted of systematic shovel testing within the approximately seven-acre limits of disturbance at 50-foot intervals, concurrent with a geophysical survey of the tract, and two systematic metal detection surveys. In addition, three 3-foot by 3-foot test units were excavated to supplement the shovel testing and identify anomalies indicated by the geophysical survey. The archeological fieldwork was completed in general conformance with the prior investigations of the tract in order to allow for comparability of results, and also follows the standards for professional practice established by the New Jersey Historic Preservation Office (2004), the standards published by Advanced Metal Detecting for the Archeologist (AMDA) (Espenshade et al. 2012).

This report presents the preliminary results of the pre-construction phase, and provides a discussion of the on-going aspects of the archeological investigation. The construction phase will involve the presence of an archeological monitor during ground-disturbing phases of construction. Archeological monitoring is not likely to result in significant data to enhance the results of the battlefield documentation, but rather, is designed to accommodate the concern that, despite the multiple surveys of the land in question, construction will lead to unanticipated discoveries.

2.0 Project Location and Description

The Institute for Advanced Study campus is located on Einstein Drive in the municipality of Princeton in Mercer County, New Jersey. The faculty housing project area lies within Maxwell's Field, an open meadow named for Robert C. Maxwell who sold 130 acres of land to IAS in 1945. Maxwell's Field lies west of the core IAS campus, extending south from Stone House Drive. Princeton Battlefield State Park is situated to the west of Maxwell's Field. A municipal Historic Preservation Buffer Overlay Zone extends for 200 feet east from the property line that IAS shares with the state park; the eastern limit of this historic preservation buffer constitutes the western boundary of the current project area.

Topography within the project area is level or slightly rolling, with gentle slopes tending towards the south; elevations range from ca. 120 feet at Stone House Drive, to somewhat less than 100 feet above mean sea level (AMSL) in the southern portion of the project area (see Figure 1.1). The southern end of the faculty housing site is wooded, and further south lie the Institute Woods and Farmlands, a permanently-conserved 589-acre nature reserve of mixed hardwood forest and meadows extending to Stony Brook, a tributary of the Millstone River. Stony Brook is located approximately 3,000 feet south of the project area, and flows northeast to join with the Millstone River approximately 2.5 miles from the project area. Running parallel with Stony Brook is the Delaware and Raritan Canal, which was constructed starting in 1830 to connect Bordentown on the Delaware River and New Brunswick on the Raritan River.

Soils within the project area consist of Bucks Silt Loam (BuB and BuC), a deep, well-drained soil type, which is highly suitable for agriculture, found in sloping or gently sloping uplands of the Piedmont physiographic province (Jablonski 1972:14). Upper soil layers typically consist of an eight-inch plow zone, with some soil deposits resulting from loess movement or wind-blown soils, underlain by five inches of dark yellowish-brown silty loam. Subsoil, consisting of a heavy dark-brown silty loam, appears at slightly more than one foot beneath the ground surface and is underlain by lower subsoil of strong brown shaly silty loam that extends from about 27 inches to a depth of 40-60 inches, at which point the subsoil grades into weathered rock, and then hard bedrock (Jablonski 1972:14-15).

The current project area falls within the area designated as the IAS Site (28ME363) in the New Jersey State Museum (NJSM) Archeological Site Registration Program. The site is registered as a multi-component archeological site containing evidence of Archaic through Woodland period Native American occupations, Revolutionary War artifacts associated with the 1777 Battle of Princeton, and other historic artifacts from the 18th, 19th, and 20th centuries. The IAS faculty housing project area lies adjacent to the Princeton Battlefield and Stony Brook Village Historic District. Princeton Battlefield was listed as a National Historic Landmark in 1966, and entered on the National Register of Historic Places (NRHP) in 1972, with a boundary increase in 1989 to include Stony Brook Village in the historic district (NRHP 1977, 1989). The NJHPO determined in 2006 that Site 28ME363, which contains the IAS faculty housing project area, is eligible for listing on the NRHP through a boundary increase to the Princeton Battlefield/Stony Brook Village Historic District. In the same 2006 memorandum, the IAS campus with boundaries overlapping the current project area was also determined eligible for listing on the NRHP as a historic district, because of its associations with the immigration of European scientists and mathematicians to the United States prior to and during World War II, and its importance to the advancement of scientific and mathematical inquiry in the United States more generally (Guzzo 2006, NJDEP 2015).

Fifteen archeological sites in the New Jersey State Museum inventory occur within approximately one mile of the current study area. These consist of five pre-contact Native American sites potentially associated with the Paleoindian through Woodland Periods, two multi-component sites with Native

American and historic Euro-American contexts, and eight historic sites associated with the 18th-20th centuries, including a number of 18th century domestic sites, a smithy, a grist mill with associated waterworks, a late 19th and early 20th century electric trolley alignment, and a 19th and 20th century school building. Several of these sites fall within the Princeton Battlefield and Stony Brook Village Historic District, but none are known to contain Revolutionary War artifacts or deposits. Revolutionary War artifacts have only been identified at Site 28ME363 (Grzybowski, Bowers and Beadenkopf 2007), and the adjacent Princeton Battlefield State Park (Sivilich and Phillips 2000, Sivilich 2006), though unidentified archeological evidence of the Revolutionary War battle is likely to exist over a much wider area (Selig, Harris and Catts 2010).

3.0 Previous Archeological and Historical Investigations

This section summarizes information compiled about the Battle of Princeton from archeological and historical sources. Previous archeological surveys related to the IAS faculty housing project, and military terrain analysis of the extended battlefield combined with the broad review of documentary sources by JMA, funded by the American Battlefield Protection Program (ABPP), provided a comprehensive background for the research presented in this report. Relevant elements of the previous studies are presented below.

The Battle of Princeton marked a historical turning point in the Revolutionary War, and followed losses of harborage, territory, and resources in New York and New Jersey to the British, which led Washington to retreat across New Jersey late in 1776, and culminated in flight across the Delaware River to Pennsylvania in the first weeks of December. The British took control of New York City, Staten Island, the Hudson River and its palisades in the summer of 1776. Loyalists in New Jersey sought pardons from and reconciliation with the British Crown, particularly in northern New Jersey (Bill 1964, Collins 1906, Fischer 2004, Hunter and Burrow 2005, Lefkowitz 1999).

> The rebel cause seemed on the verge of collapse… Thousands of New Jersey residents had declared allegiance to the king, and some had taken up arms against the patriots. Even the state legislature had dispersed…New Jersey, with its stores of produce, strategic location, and ambivalent revolutionaries, seemed secure for the crown (Lender 2005:47-48).

Enlistments in the Continental army were due to expire on December 31, 1776, threatening to critically weaken the American fighting force. Washington pledged bounties from his own personal fortune to Continental soldiers who remained in service for six additional weeks beyond the expiration of their enlistment (Bill 1964:35), and made plans to reenter New Jersey as the British forces went to winter quarters.

Harassment of the British by American military forces in portions of New Jersey accelerated during December 1776, with frequent skirmishes and sometimes more substantive engagements. In this encouraging climate, Washington recrossed the Delaware River in the last days of December and won an important victory in a surprise attack on Trenton on December 26, 1776, capturing 800 Hessians, armaments, and other spoils, with only four Americans wounded (Bill 1964:27-33). Following an exchange with British forces under General Cornwallis on January 2, 1777 in the Second Battle of Trenton, the American forces under Washington escaped under cover of darkness and moved directly to attack Princeton, where British stores promised substantial spoils, and a second victory would bolster confidence in the Revolution. These victories were also important for securing French assistance (Bill 1964:36-38, Smith 1967:16-19).

3.1 Overview of the Battle of Princeton

The opening engagement of the Battle of Princeton took place at sunrise on January 3, 1777. American troops marched from around midnight until daybreak, departing from the Assapink Bridge near Trenton where the Americans had held their position until sundown.

Milner's *Battle of Princeton Mapping Project* (Selig, Harris and Catts 2010), a military terrain analysis and historical narrative for the Battle of Princeton, is the most recent and comprehensive synthesis of available primary historical sources and landscape evidence regarding the events of the battle. The authors propose that Washington utilized a back road towards Princeton called Sawmill Road, which ran towards Princeton at some distance south from the Post Road, a highway connecting New York and Philadelphia that also connected Princeton and Trenton. This road was depicted on a plan of Princeton dated December 31, 1776, known as the "Spy Map" (Figure 3.1). Washington's forces travelled in three divisions, and upon reaching Stony Brook they were divided such that one division composed of approximately 1,200-1,400 men moved towards Princeton to flank the town on the right or east side, one division composed of two brigades under Brigadier Generals Fermoy and Mifflin moved up Stony Brook towards the Post Road to demolish the Post Road crossing at Stony Brook, and a third division of approximately 400 Continental Line troops under Brigadier General Hugh Mercer and another thousand militia from New Jersey, Delaware and Pennsylvania under Brigadier General John Cadwalader moved to approach Princeton from the left or western flank.

On the morning of January 3rd, as American troops were approaching Princeton on Quaker Road and then the Sawmill Road, Crown forces under the command of Lieutenant Colonel Charles Mawhood were moving from Princeton towards Trenton on the Post Road. These forces sighted one another, and Mawhood turned back towards Princeton on the Post Road. The ensuing encounter pitted Washington's third division against the 17th Regiment of Foot and mounted and unmounted elements of the 16th Light Dragoons, south of the Post Road at a farm and orchard owned by William Clarke.

Continental troops under Mercer advanced ahead of Cadwalader and met Mawhood's force in an attempt to cut off their retreat towards Princeton (Selig, Harris and Catts 2010:62). But, Mercer's troops were overrun by the 17th Regiment and retreated towards Cadwalader's militia; Mercer himself was bayoneted and died nine days later from his injuries. Included in Cadwalader's brigade was a battery of two three-pound iron cannon under command of Captain Joseph Moulder, from Philadelphia. Moulder's battery took up a position on high ground near the home of Thomas Clarke, south of the William Clarke farm and orchard where the first shots of the battle had been fired. Grape shot fired from those cannon prevented the mounted Dragoons from flanking Mercer and Cadwalader on the west, and halted Mawhood's main force as it moved south across the battlefield, bayonets fixed. British artillery consisting of five guns attached to the 17th Regiment of Foot also fired grape shot during this stage of the battle, but accounts indicate that the British overshot the American forces, scattering grape shot to no effect (Selig, Harris and Catts 2010:31).

Washington moved his first division into position to support the troops under command of Mercer and Cadwalader, and elements of the second division also moved to engage the British, who were pushed back by these combined forces. The Americans were then able to advance towards Princeton using the Post Road, capturing Nassau Hall in Princeton later in the morning.

The account presented in JMA's study (Selig, Harris and Catts 2010:34-76) makes explicit arguments about the course of the battle from a variety of sources including numerous first-person accounts of the battle. Milner's study therefore provides a framework for setting up problem-oriented research designs in which archeological data can test aspects of the historical narrative presented therein. The previous investigations discussed below were directed at better understanding the battle via archeological data, and they make an equally important contribution to the current investigation.

3.2 Previous Investigations

The earliest known efforts to locate evidence of the Battle of Princeton at Maxwell Field were occasional metal detection surveys carried out from 1989 and during the 1990s by collector Dr. Keith Bonin and his son Alex Bonin (reported in Grzybowski, Bowers and Beadenkopf 2007:64) and from 1993-2002 by the Deep Search metal detecting club, which later became BRAVO. It is very likely that the vicinity of Maxwell's Field, next to the battlefield park, has been subjected to amateur

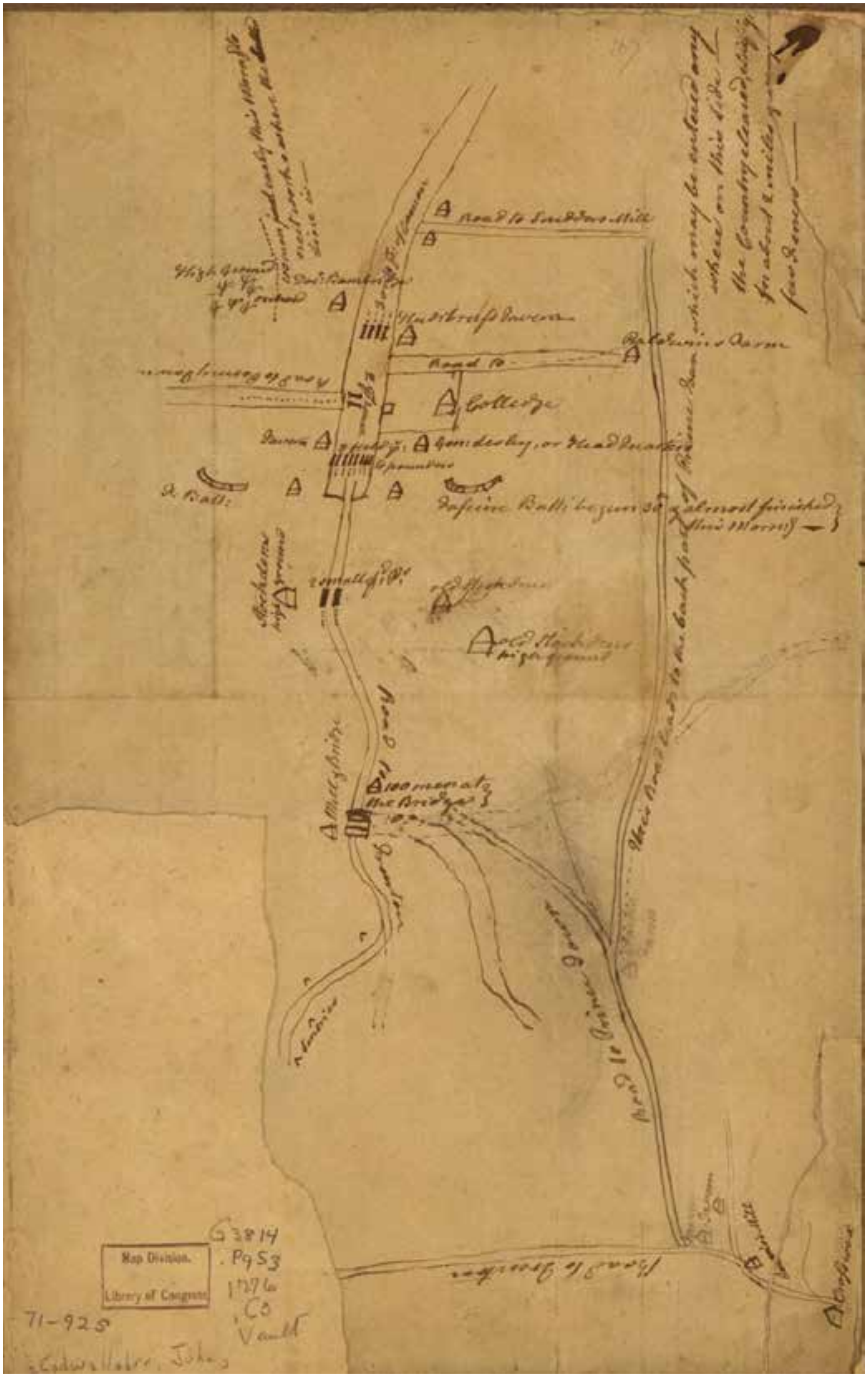

Figure 3.1: ***Plan of Princeton, December 31, 1776*****, Cadwalader's Spy Map of the Roads into Princeton.**

collecting and metal detecting frequently during the second half of the twentieth century (Sivilich and Phillips 2000:5, 7).

Sivilich and Philips (2000) and Sivilich (2006) have submitted reports to the New Jersey Historic Preservation Office describing the MDS carried out as a club activity of Deep Search/BRAVO at Princeton Battlefield State Park; their surveys extended onto Maxwell's Field and portions of the faculty housing project area on IAS property. Revolutionary War artifacts discovered during the surveys by Deep Search/BRAVO were mapped with a total station and data recorder, and a detailed catalog of the finds is included with each report; many of the artifacts are indicated to be housed at Princeton Battlefield State Park, but some are in the collections of private individuals. They include ten lead balls with diameters measuring between 0.60 and 0.69 inches; of these, five recovered near the site of the William Clarke House and measuring between 0.60 and 0.65 inches were deformed from impact indicating that they had been fired. Five musket balls with diameters greater than 0.65 inches were scattered across the park property. Additional finds include four pieces of grape shot, three in proximity to the high-elevation area adjacent to the Thomas Clarke House, where Moulder's Battery is said to have taken up a position to fire on British troops, and one on IAS land approximately 640 feet north of this position. Ten horseshoes or horseshoe fragments, and five buttons were also recovered during the survey, but these were not considered to be associated with the Battle of Princeton (Sivilich and Phillips 2000:7).

BRAVO carried out one additional MDS in 2002, with the stated purpose of locating and removing replica munitions dispersed at the site by reenactors. This survey recovered four historic artifacts, including one piece of grape shot, and one lead ball measuring 0.65 inches in diameter. These were both found in the field to the northwest of the Thomas Clarke House, on state park lands. While the Deep Search/BRAVO surveys did not locate a large number of Revolutionary War artifacts, their data may shed light on the results of previous and current metal detecting surveys of the faculty housing site, and help to clarify the distribution and patterning of militaria associated with the Battle of Princeton (Sivilich 2006).

The occasional metal detecting by Bonin is unreported, but some detail is available the cultural resource survey and assessment of effects for the IAS faculty housing project prepared by LBG (Grzybowski, Bowers and Beadenkopf 2007:64, Appendix D). This information was drawn from research notes obtained by LBG from Hunter Research, and from an exhibit of Revolutionary War artifacts in the Swan Historical Foundation Collection at the Washington Crossing State Park Visitor Center and Museum during the summer of 2003, containing artifacts collected by Bonin (Hunter Research 2004:2.B.i). The Bonin artifacts on exhibit at the museum included nine lead balls reportedly recovered from the IAS campus. Hunter Research plotted the locations where Bonin discovered these artifacts, though the source of this data is not known and the mapping of these finds must be considered less precise than other previous surveys described in this chapter. The descriptive data for these munitions is similarly incomplete.

Systematic surveys of portions of the IAS faculty housing site have been carried out by Hunter Research and LBG. Both firms employed metal detecting, and both firms attempted 100 percent coverage of their respective survey areas. Figure 3.2 depicts the boundaries for the MDS conducted by Hunter Research in 2003, and the cumulative MDS area for fieldwork completed by LBG in 2003-2004, with additional surveys unrelated to the faculty housing project but contiguous with the current project area in 2011, and 2012, as well as the wider project areas as reported by these two firms.

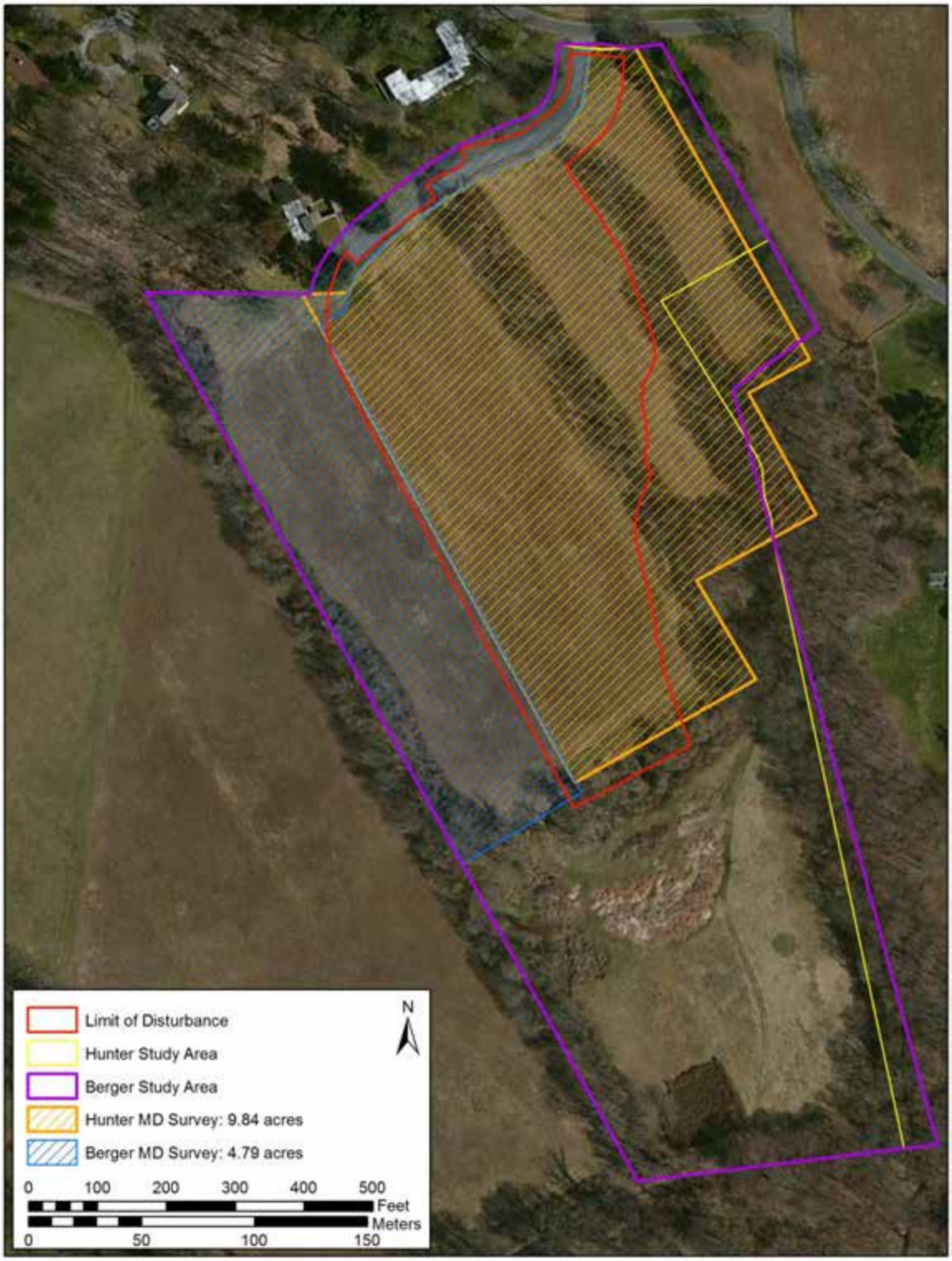

Figure 3.2: Plan Depicting Overlays of Metal Detection Survey Areas and Wider Study Areas for Hunter Research (2003) and LBG (2004-2012).

3.2.1 Hunter Research

The first professional, systematic survey of the IAS faculty housing site was completed by Hunter Research, with assistance from Daniel Sivilich and members of BRAVO, who carried out a metal detection survey of approximately ten acres in 2003. The current project area falls almost entirely within the area surveyed by Hunter Research (see Figure 3.2). The results of the MDS and surface collection completed by Hunter Research (Hunter Research 2004) were reported by LBG (Grzybowski, Bowers and Beadenkopf 2007).

Hunter Research carried out their fieldwork in two phases, in July and August of 2003. Two metal detection surveys were completed, one in July after the survey area had been mowed, and a second survey in August after the survey area – exclusive of wooded areas and wetlands – was plowed, disked, and allowed to weather in order to improve recovery of more deeply buried artifacts, and permit effective surface collection. A site grid consisting of 100-foot blocks aligned with the eastern boundary of the historic preservation buffer zone was established by Hunter Research to organize the survey and record proveniences, and the locations of all finds were mapped with a total station.

Hunter Research was successful at identifying 41 Revolutionary War artifacts from surface soils within the faculty housing area. Their finds include 15 lead balls in various sizes and conditions of deformity, 14 grape shot, lead flint wraps, a short bayonet fragment, a brass ramrod holder, a portion of a cartridge box, and other militaria. The combined assemblage from all fieldwork undertaken by Hunter consists of 395 artifacts, including some Native American materials, and other 18th, 19th and 20th-century artifacts. Figures 3.3 and 3.4 show a portion of the munitions collected by Hunter Research, including iron grape shot, lead balls that are round and unimpacted, presumably dropped, and lead balls that are deformed to varying degrees from impact after having been fired from small arms.

Hunter Research also excavated 16 shovel test pits (STPs) in order to characterize soil stratigraphy. These STPs were distributed randomly across the project area, and were each expansions of excavations for metal detecting targets; the STPs permitted the recovery of two lead balls and two pieces of grape shot, but these are enumerated as part of metal detecting finds by Hunter Research.

Figure 3.5 depicts the overall distribution of all metal detecting finds by Hunter Research in 2003, with Revolutionary War munitions indicated, and also compares the boundaries on the project area for archeological investigations by Hunter Research and The Ottery Group. Note that the area subjected to MDS by Hunter Research identified in Figure 3.5 is an approximately 10-acre subset of the larger project area addressed in their 2003 fieldwork. Figure 3.6 depicts the locations of all STPs excavated by Hunter Research in 2003.

Figure 3.3: Revolutionary War Munitions Recovered by Hunter Research, Consisting of Iron Grape Shot and Unimpacted or Lightly Impacted Lead Balls (photo courtesy of IAS and Hunter Research).

Figure 3.4: Revolutionary War Munitions Recovered by Hunter Research, Consisting of Deformed or Impacted Lead Balls, and Two Possible Lead Flint Wraps (photo courtesy of IAS and Hunter Research).

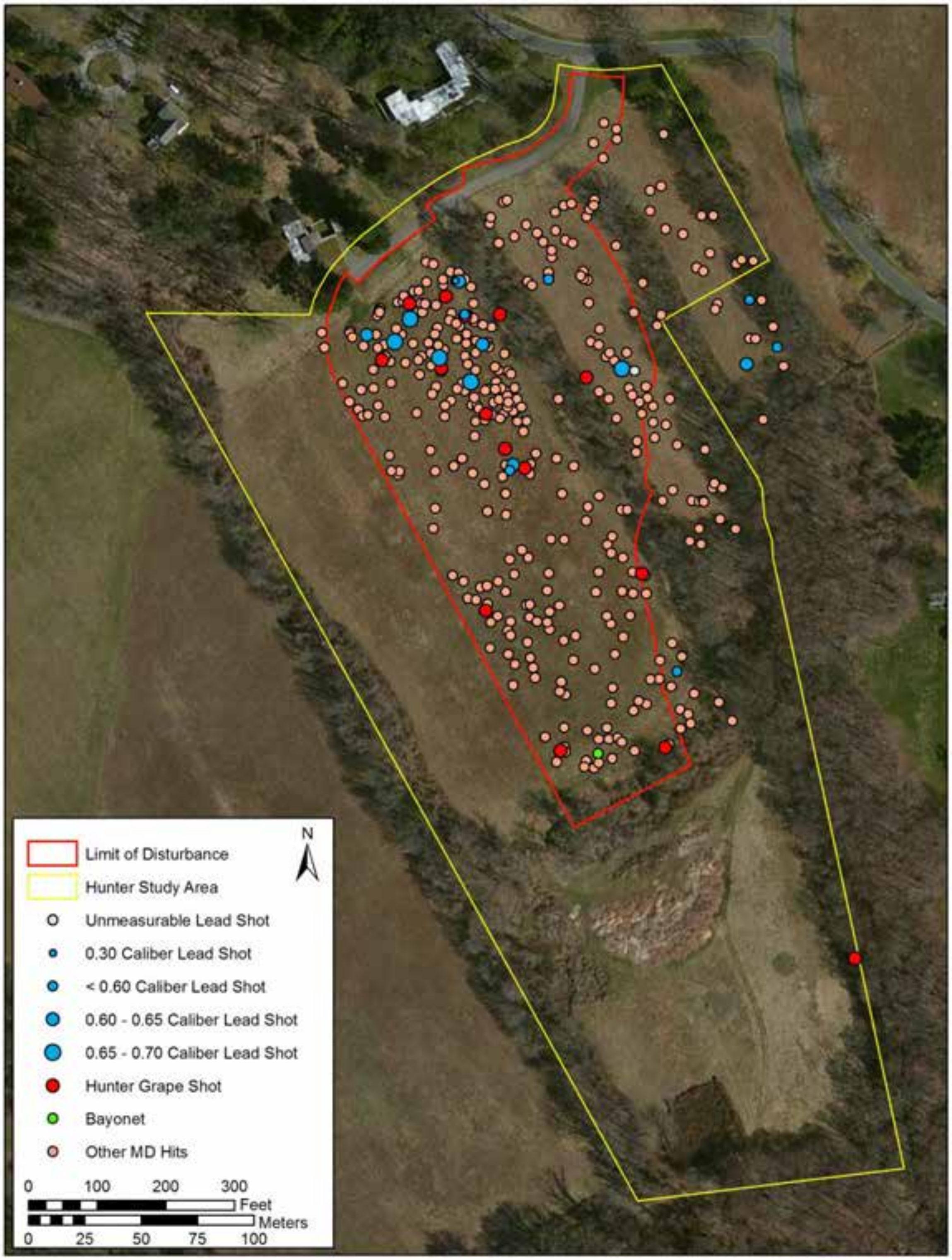

Figure 3.5: Plan of All Metal Detecting Targets Recovered by Hunter Research in 2003, Indicating the Locations of Revolutionary War Munitions.

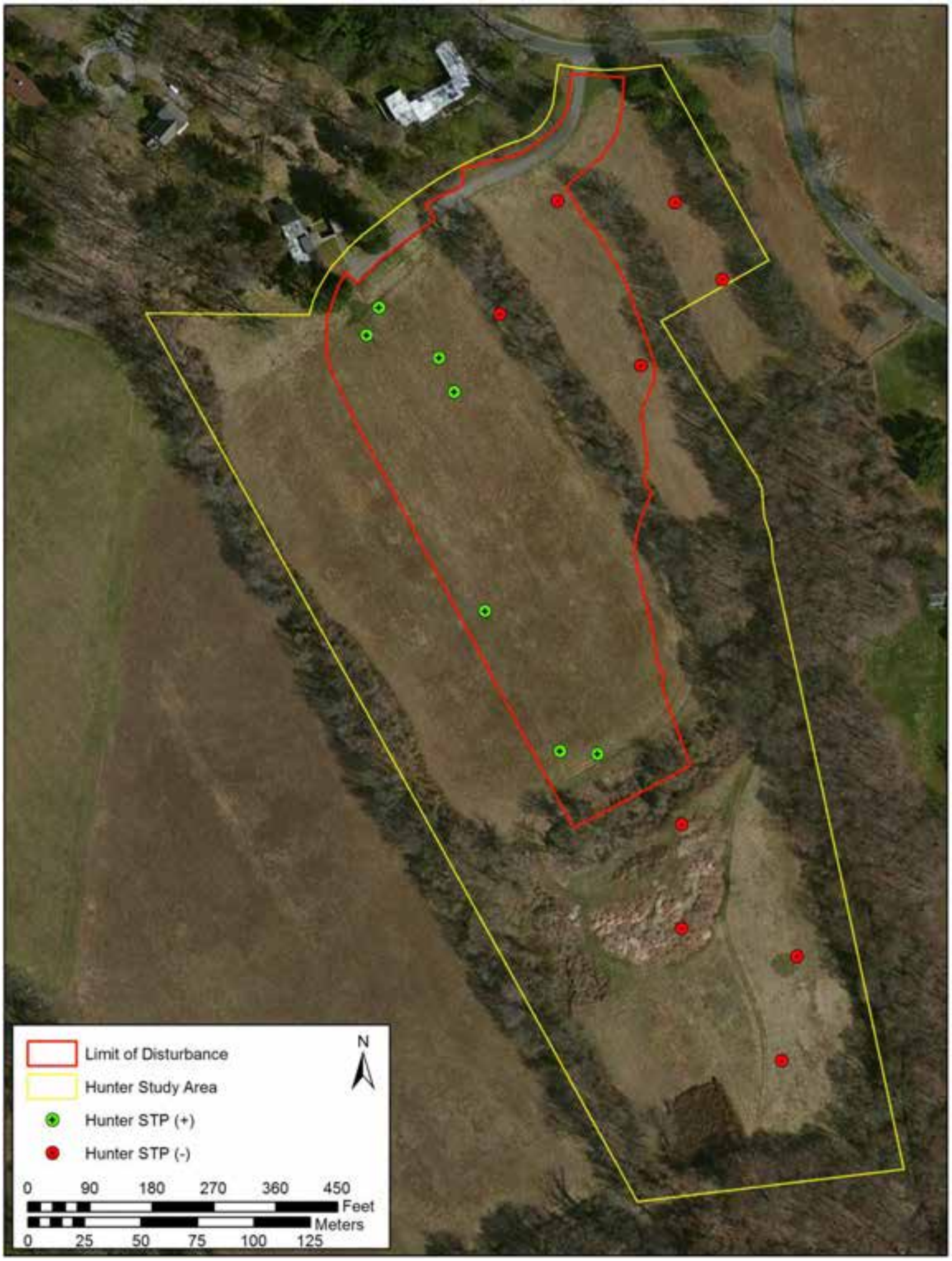

Figure 3.6: Plan of Positive and Negative STPs Excavated by Hunter Research in 2003.

3.2.2 Louis Berger Group

Grzybowski, Bowers and Beadenkopf (2007) present a synthesis of archeological research at the IAS faculty housing site prior to and including fieldwork carried out by LBG in 2004-2005. Berger was responsible for reporting on fieldwork carried out by Hunter Research in 2003. Berger obtained the artifact collection along with research materials from Hunter Research, but it is not clear that they examined the Hunter Research artifacts, but rather may have simply integrated the catalog produced by Hunter Research into their own. Subsequent fieldwork in the vicinity of Maxwell's Field by LBG, but unrelated to the faculty housing project, is reported by Fortugno and Beadenkopf (2011, 2012).

The 2004-2005 investigation consisted of STP survey, metal detecting, and limited test unit excavation (see Figure 3.2). Metal detecting took place within the 200-foot buffer extending along the northeastern boundary of Princeton Battlefield State Park, which had not been subjected to metal detection survey during previous investigations, excepting the periodic metal detecting carried out by Bonin in 1989 and into the 1990s (Grzybowski, Bowers and Beadenkopf 2007:64). LBG also conducted metal detecting adjacent to Stone House Drive for the entirety of its approximately 500-foot length. Shovel test pit survey was completed by LBG within the northern portion of the current study area, between the 200-foot buffer line and the hedgerow and two-track road that extends across the current study area from southeast to northwest. Shovel test pits were excavated on a 30-foot interval within an approximately one-acre area, measuring 200 feet by 230 feet and focused on concentration of prehistoric artifacts previously identified by Hunter Research. Two three-foot by three-foot test units were excavated within this area adjacent to positive STPs. Of the 52 prehistoric artifacts collected by LBG throughout their 2004-2005 field investigation, 47 consisted of pieces of fire-cracked rock (FCR) or thermally-altered pieces of sandstone, the remainder being identified as a possible sandstone hammerstone, three quartz flakes, and one piece of quartz shatter; the authors note that "none represent *in situ* deposits or features associated with Native American use of the area" (Grzybowski, Bowers and Beadenkopf 2007:97).

Metal detecting by LBG consisted of an attempted 100 percent coverage via 10-foot-wide transects, first detected in the north-south direction, then detected again in 10-foot-wide transects oriented east-west (Grzybowski, Bowers and Beadenkopf 2007:70). Presumably the corridor for Stone House Drive was detected with one transect along each side of the asphalt roadway. Detecting by LBG yielded a total of 327 artifacts, exclusive of modern refuse that was discarded. This number includes non-metal artifacts recovered during unearthing of metal detector targets, including clay tobacco pipe fragments, historic ceramics, and Native American lithic debitage. The majority of artifacts recovered by LBG through all applied methodologies (n=399) appear to post-date the Battle of Princeton, allowing that a number of non-military metal artifacts could be contemporaneous with the battle or nearly so.

LBG recovered ten horseshoes ranging in size from pony to plowhorse, at least two of which seemed to be wrought iron, a number of handwrought nails and two handwrought spikes, one possible two-tined fork fragment, and a single kaoline clay pipe bowl fragment retrieved while excavating a metal detector target. The majority of metal artifacts recovered were unidentifiable ferrous objects (Grzybowski, Bowers and Beadenkopf 2007:97). Ultimately, the authors conclude that:

> No buried features or living surfaces, military earthworks, refuse middens, military trenches, or the like were noted during Berger's field investigations. No military-related items associated with the Battle of Princeton were recovered during Berger's additional fieldwork (Grzybowski, Bowers and Beadenkopf 2007:82).

A number of military artifacts likely associated with the Battle of Princeton were found within the area metal detected by LBG by collector Keith Bonin from 1989 through the 1990s, including a cluster of nine musket balls within the northern end of the 200-foot buffer between the state-owned park and the IAS. Also, two unidentified lead artifacts were recovered by LBG, which may represent badly deformed or fragmented lead balls.

Two subsequent surveys by LBG (Fortugno and Beadenkopf 2011, 2012) were small in scale and yielded no identified artifacts associated with the Revolutionary War battle. The first, carried out in March 2011, was an archeological evaluation of a number of geophysical testing sites consisting of nine auger holes and six geophysical test pits. LBG conducted additional metal detecting at each auger and test pit location, and evaluated a proposed drain field that lies south of the current seven-acre project area. LBG conducted metal detecting and excavated two shovel test pits within an area measuring approximately 60 feet by 31 feet. A total of 21 metal artifacts was recovered during the 2011 study, none associated with the Revolutionary War. The results of the LBG metal detecting surveys are depicted in Figure 3.7.

The May 2012 survey by LBG consisted of metal detection and archeological monitoring within the alignments of proposed new buried sewer and electric utilities, and other ground disturbances associated with the rehabilitation of a dwelling at 35 Stone House Drive, on the north side of this road. The metal detecting yielded 34 metal artifacts, consisting of mid- to late-19th century agricultural equipment, hardware, and unidentifiable pieces of metal, and non metal artifacts found incidentally while excavating metal targets. LBG concludes that the artifacts are associated with agricultural and domestic uses of the property during the mid-19th to late 20th centuries (Fortugno and Beadenkopf 2012).

The area subjected to MDS by LBG identified in Figure 3.2 is a 4.79-acre subset of the larger project area addressed in the series of studies by LBG. Figure 3.7 depicts the overall distribution of all metal detecting finds by LBG from 2004-2012, and also compares the boundaries on the project area for archeological investigations by LBG and The Ottery Group. Figure 3.8 presents the extent of the systematic shovel testing, and Figure 3.9 indicates the locations of test units excavated by LBG.

3.2.3 John Milner Associates

JMA completed a historical analysis of the Princeton Battlefield with support from the American Battlefield Protection Program (ABPP) of the NPS. Funding provided by the ABPP for the study was administered by the PBS. Milner's study utilized the KOCOA analytical framework, an acronym that refers to its major elements: Key Terrain, Cover and Concealment, Obstacles, Avenues of Advance and Retreat. KOCOA analysis is promoted by the National Park Service as a framework that ensures comparability in the analysis of battlefield landscapes across many different historic contexts. The framework rests in part on the Principle of Inherent Military Probability, which means that the tactical variables on a landscape, once accounted for, can be viewed and interpreted today in much the same way they would have been at the time of a battle. This principle is a critical approach to battlefield analysis, in that "often well-worn and accepted accounts of a particular battle will be found to be impossible given the terrain, timing, and other factors, and by placing yourself in the position of what a knowledgeable individual or officer could have accomplished in a similar situation" (Selig, Harris and Catts 2010:3).

JMA utilized historical documentary sources including over 160 firsthand accounts of the Battle of Princeton representing both American and British perspectives on the battle, in conjunction with available historical accounts of the battle, and also created an inventory of relevant landscape data falling under the parameters of KOCOA. The landscape elements such as structures, roadways, high and low-lying terrain, waterways, and also conditions such as weather, time of day, and so forth, were compiled into a Geographic Information System (GIS). Researchers can then discern the importance

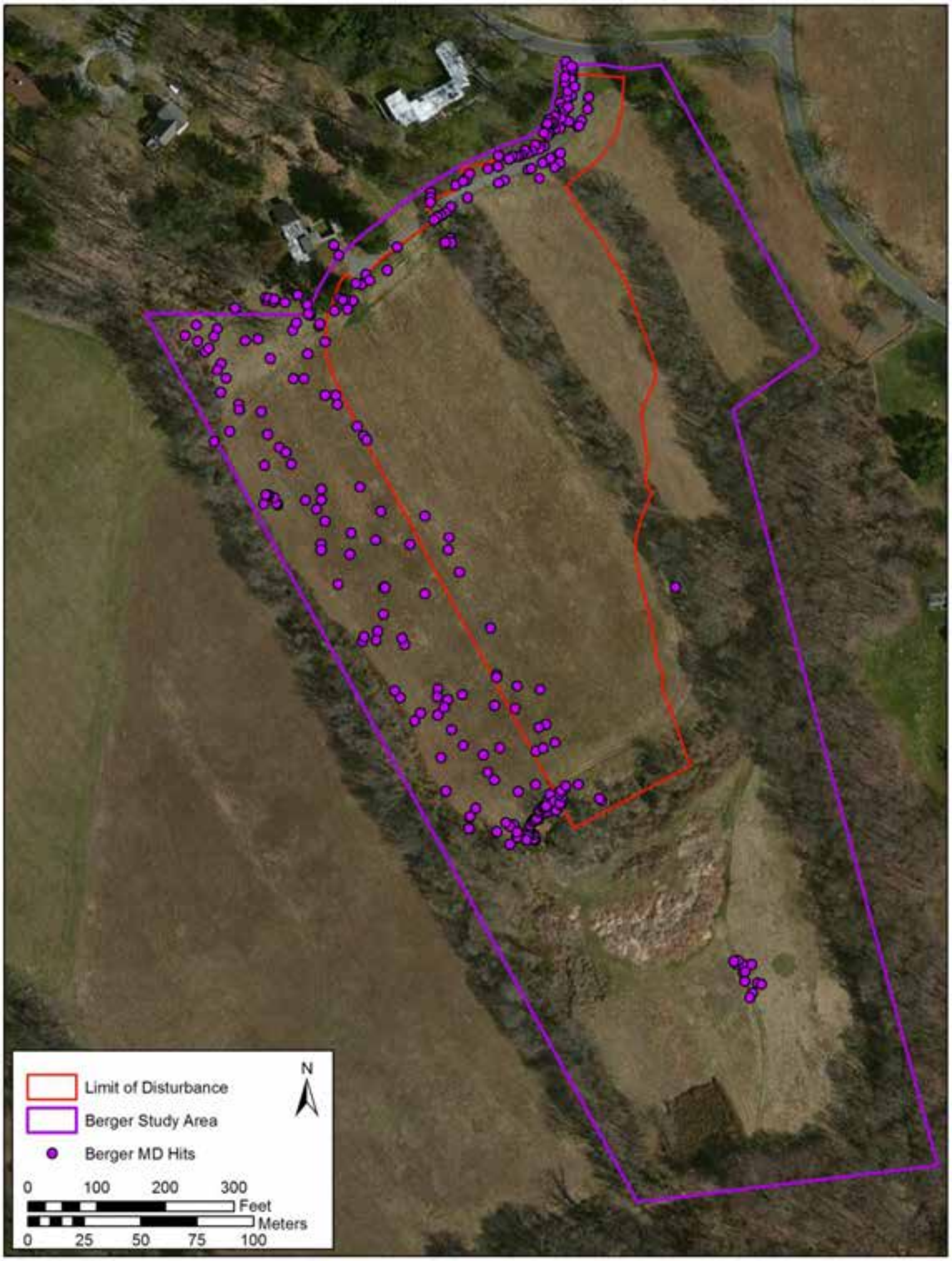

Figure 3.7: Plan of All Metal Detecting Targets Recovered by LBG, 2004 to 2012.

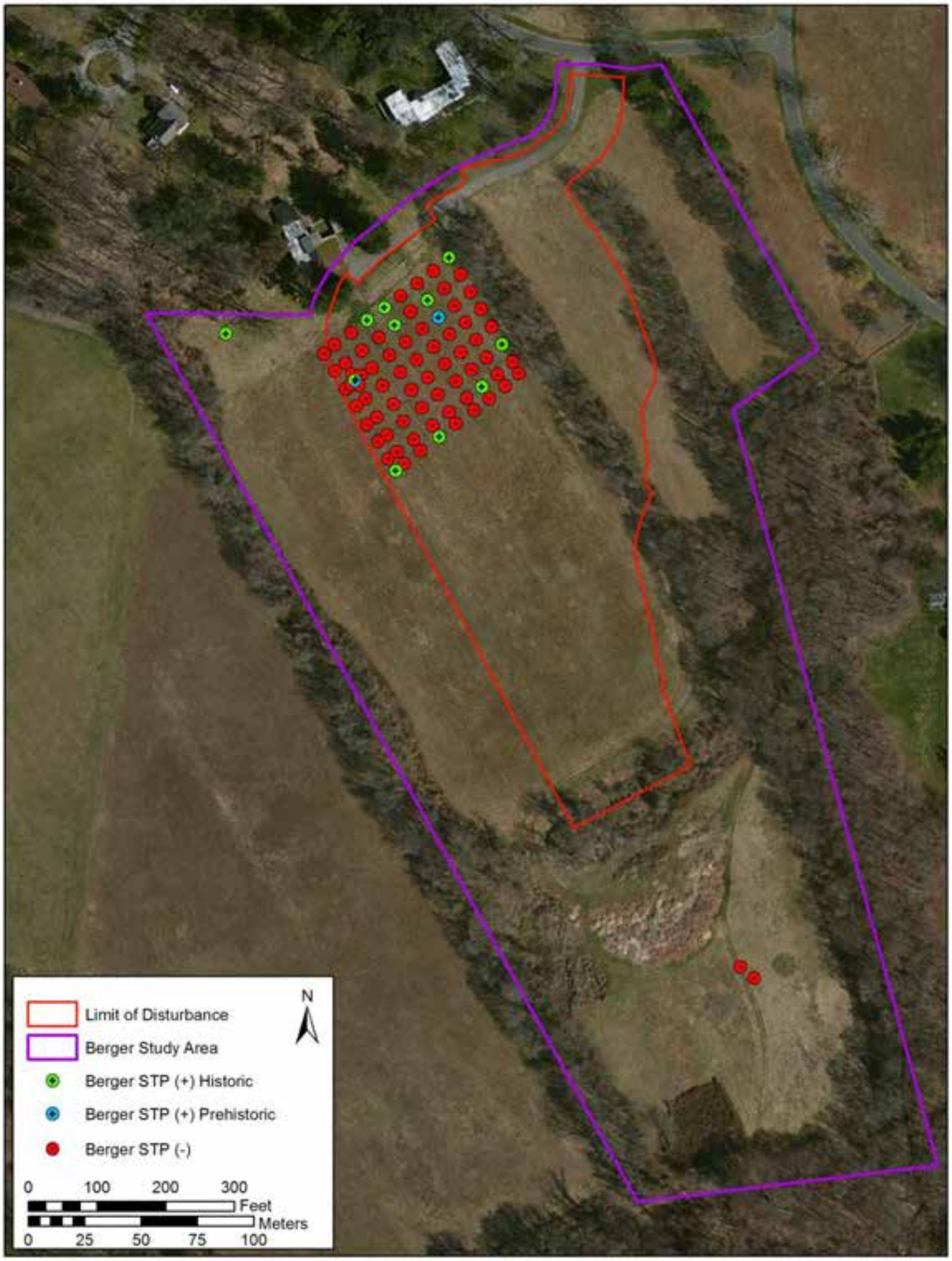

Figure 3.8: Plan of Positive and Negative STPs Excavated by LBG, 2004 to 2012.

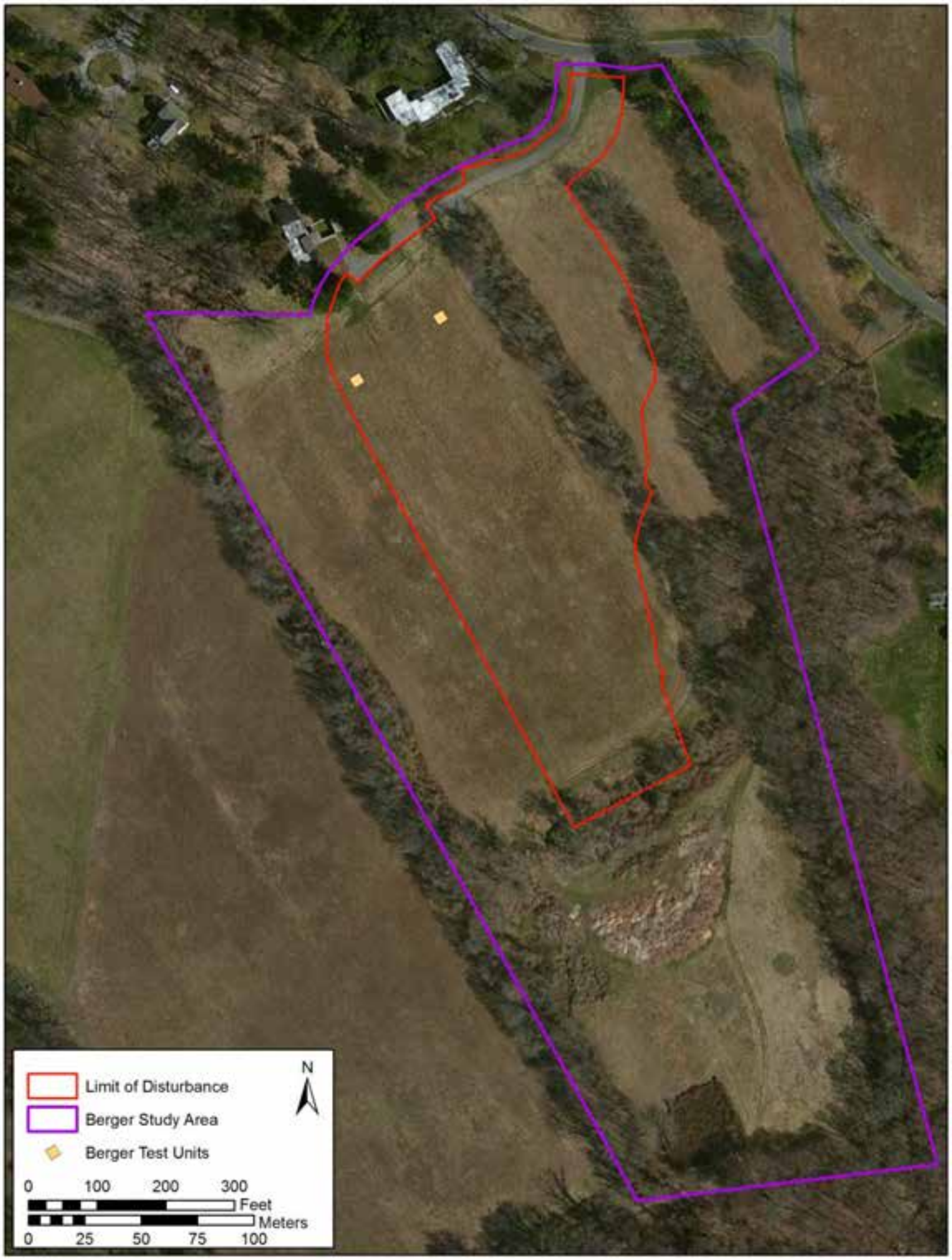

Figure 3.9: Plan of Test Units Excavated by LBG, 2004 to 2005.

of these variables from contemporary accounts of the battle, and gain a greater understanding of what individual units could perceive and accomplish, and how the battle would have progressed given real-world conditions and parameters, such as distances traversed, sighting and weapon ranges, available cover, and so forth. JMA offered "several important changes to the standard interpretation of the chronology and geographical distribution of opposing forces before the Battle of Princeton and their subsequent movements as the battle unfolded" (Selig, Harris and Catts 2010:Executive Summary). The map images contained in JMA's study derive from their GIS, though the ABPP declined to make this dataset available for the current study (personal communication, Kristin McMasters, ABPP to Matthew Palus, 09/16/2014).

3.3 Summary

A considerable amount of archeological fieldwork has been completed at the IAS faculty housing project area, yet these studies only represent a starting point towards developing the archeological research potential of the Princeton Battlefield. Recovery of lead balls and grape shot from the Princeton Battlefield State Park and from the faculty housing project area on IAS property supports the association between these lands and the violence of the battle. Ongoing analysis of the combined artifact assemblages from previous studies on IAS land will contribute to future research. Similarly, while the JMA study made use of existing archeological data, including the most substantive sources discussed in this section of the interim report, there was no archeological component to the *Battle of Princeton Mapping Project*, and the study thus opens considerable room for archeology to contribute to battlefield interpretation through the KOCOA framework.

4.0 Research Design and Methods

4.1 Research Design

The Ottery Group conducted its archeological survey of the IAS faculty housing project area in order to recover a representative sample of historical artifacts associated with the Battle of Princeton, to contribute towards an assessment of the association with, and significance of this parcel of land to the battle, and to locate any important subsurface cultural features associated with the period of the battle. Site 28ME363, the IAS Site, has been determined by the NJHPO to be eligible for listing on the National Register under Criteria A (association with important historical events) and D (research potential) (Guzzo 2006, 2007). The site is generally presumed to maintain significance under Criterion A independently of the ability of the site to "have yielded, or may be likely to yield" significant information (Criterion D) through archeological investigation (NRHP 1997). The primary goal of the investigation was to mitigate adverse effects to archeological resources within the faculty housing project area resulting from construction and earth moving activities associated with that project. The research design and methodology employed in this study is not aimed at identifying or mitigating any effects that may alter the ability of the historic landscape to convey significance under Criterion A. Archeological mitigation is provided for by expanding existing collections of Revolutionary War artifacts recovered from the project area, and analysis of the resulting, cumulative assemblage in order to address substantive questions about the relationship of these resources to the historical battle. This analysis would include those assemblages recovered by Hunter Research and LBG during previous surveys of the project area, and would ultimately contribute to a representative sample of military artifacts for the project area. Finally, the *Battle of Princeton Mapping Project* report acknowledges an "alleged burial area for slain American and British troops", located in an area of residential development east of the alignment of the former Post Road, today U.S. Route 206 (Selig, Harris and Catts 2010:79). The geophysical testing conducted would identify any anomalies potentially representing individual or mass graves containing casualties from the Battle of Princeton, should such features be present.

This project included archival research, field investigations consisting of systematic shovel test pit survey, test excavations, geophysical survey, surface collection, metal detecting, and an analysis of recovered artifacts. Archival research was conducted in order to locate previously identified cultural resources in the surrounding area and to understand the universe of available data associated with the Battle of Princeton.

4.2 Archival Research

Background research for the current study entailed the review of the Archeological Site Registry of the New Jersey State Museum Bureau of Archeology and Ethnography in Trenton; available SHPO reference materials filed with the New Jersey Historic Preservation Office (NJHPO) were also examined in order to locate previous surveys and investigations that have taken place in proximity to the current study area or related to the investigation of Revolutionary War sites. Members of The Ottery Group staff visited the Thomas Clarke House at Princeton Battlefield State Park where artifacts associated with the battle are displayed, and also the Washington Crossing Visitors Center Museum in Titusville, New Jersey, in order to examine additional finds of munitions recovered from the battlefield, some from IAS property. Ottery Group staff also engaged colleagues with interest or direct experience at the Princeton Battlefield, including colleagues at the New Jersey State Museum and the NJHPO. Kate Marcopul and Jesse West-Rosenthal of the NJHPO visited the site while fieldwork was ongoing in January 2015. Ian Burrow of Hunter Research also visited the site.

Background research for the current study included examination of published histories of the Battle of Princeton (e.g. Bill 1965, Collins 1906, Smith 1967), especially the textual portions of the *Battle of Princeton Mapping Project* (Selig, Harris and Catts 2010), and also previous archeological studies of the IAS faculty housing project area (Hunter Research 2004, Grzybowski, Bowers and Beadenkopf 2007, Fortugno and Beadenkopf 2011, 2012). Thorough archival research on the cartographic and land-use history of the IAS faculty housing project area is presented in these sources.

4.3 Site Grid

A grid was laid over the study area to establish proveniences for all excavations and artifacts, and the grid was aligned with the line demarcating the eastern limit of the 200 foot buffer for Princeton Battlefield State Park. This line provides the orientation of "site north", designating cardinal directions different from true north or magnetic north, which are convenient to the shape and orientation of the study area in space, and approximately 30 degrees west from true north. This measure of creating an arbitrary site north was also applied during previous metal detecting by Battlefield Restoration & Archeological Volunteer Organization (BRAVO), working in partnership with Hunter Research in 2003, and by the Louis Berger Group in their subsequent fieldwork. Throughout this report, references to grid coordinates use the established site north rather than true north, while overview figures show the true orientation of the site grid in respect to the cardinal directions.

The study area was staked by IAS prior to the beginning of preconstruction archeological fieldwork, with the area outlined by wooden stakes approximately 100 feet apart. These stakes indicate the limits of disturbance (LOD), and also the extent of the 200-foot buffer from the state battlefield park. A site datum point was placed on IAS property outside of the limit of disturbance along the westernmost boundary of the current study area, 200 feet from the eastern boundary of Princeton Battlefield State Park, using steel rebar. This point represents grid coordinates N2000 E2000; the E2000 grid line is thus aligned with the 200 foot historic preservation buffer boundary, and STP and MDS transects oriented east-west are perpendicular to the 200 foot buffer boundary. This and all subsequent grid points were located and set in place with assistance from a laser transit.

4.4 Systematic Subsurface Survey

The fieldwork phase of the archeological investigation was carried out in several discrete phases. The Ottery Group conducted a subsurface STP survey of the entire 7.07 acre project area from July 14-18, 2014. Geophysical survey of the project area took place over this period of time, allowing the results of that survey to be registered spatially with the site grid established by The Ottery Group. A small number of test units were excavated on April 21-22, 2015 in order to identify a number of anomalies identified during geophysical survey of the project area.

The NJHPO has established guidelines indicating that the high, medium, and low potential portions of the Area of Potential Effect (APE) for a project should be covered with an average of 17 one-foot diameter subsurface probes per acre. This density of shovel test pits (STPs) is equivalent to placing STPs on a 50 feet rectilinear grid. If rectilinear grid sampling is employed, then the STP grid interval should be smaller in high potential areas and larger in low potential areas. The STP interval utilized during this project was in conformance with the NJHPO guidelines (NJHPO 2004).

STP survey is noted as a poor method for locating significant deposits or distributions of military artifacts, which often confound conventional interval-based testing (Espenshade et al. 2002, Reeves 2011). In the current study, STP survey is employed to systematically characterize soils throughout the project area, in order to understand the suitability of remote sensing techniques—including metal detection survey—for locating subsurface cultural artifacts, deposits or features. STP survey is also directed at identifying potential non-military archeological contexts within the study area, such as pre-contact Native American cultural resources, or historic resources unassociated with the Revolutionary War.

STPs were excavated on a 50-foot interval throughout the 7.07-acre project area. STPs were laid out with pin flags, using 300-foot tapes and wooden stakes fixed at grid points established with the total station. Subsequently, all STPs were mapped individually using the total station. Test pits were approximately one foot in diameter and excavated to 1.5 to 2.5 feet in depth, reaching culturally sterile subsoil. Excavated soils were sifted through one-quarter-inch mesh hardware cloth to recover any cultural artifacts; artifacts were collected in polyvinyl bags labeled with provenience information including the project name, STP grid coordinates or other STP designation, and other pertinent information.

Initial archeological field survey conducted in the course of this investigation was conducted between July 14 and 18, 2014. A total of 122 shovel test pits were excavated at 50-foot intervals across the project area (Figure 4.1). The majority of STPs excavated within the project area evidenced essentially similar soil stratigraphy consisting of a plowzone deposit (Ap Horizon) directly overlaying a culturally sterile B Horizon. Of the 122 STPs excavated, 16 were positive for historic period artifacts, the remaining 106 STPs did not contain cultural artifacts. The results of the STPs survey are discussed in greater detail in the following report chapter.

4.5 Geophysical Survey

A non-invasive geophysical survey of the proposed project area was conducted by Dr. Tim Horsley, from July 14-21, 2014, concurrent with STP survey of the project area. The geophysical survey applied Magnetometry, Electromagnetic induction (EMI) and a limited amount of Ground-penetrating Radar (GPR) to identify the location of subsurface anomalies and potentially intact archeological resources (Figure 4.2). Magenetometry, EMI and GPR are well-established geophysical methods that produce subsurface images of the study area. Dr. Horsley assessed all of the data that this survey yielded, and also compared these results with soil stratigraphy observed during The Ottery Group STP survey.

The magnetometer survey was undertaken using a *Bartington Grad601-2 dual fluxgate gradiometer*. An area of 6.8 acres was covered with this method. Magnetometry is currently the most rapid geophysical method and can detect a broad range of both prehistoric and historic archeological features based on contrasts in *magnetic susceptibility* (MS) and/or the presence of a permanent magnetization. Magnetic Susceptibility is the ability of a material to become magnetized when placed in a magnetic field; in soils, this is related to the naturally occurring iron minerals present. These minerals can be converted to more magnetic forms through many anthropogenic activities, such as heating and the decomposition of organic material. In addition to pits, ditches, larger postholes, and many burnt remains, it is often possible to identify areas of occupation using a magnetometer by through their increased 'noise' levels. Heating soils to high temperature can cause a strong, permanent magnetization to be retained, such that kilns and furnaces can be detected, as well as accumulations of brick and tile. Historic sites are therefore usually more easily identified on account of the higher concentration of magnetic material in the form of brick, tile and ceramics, in addition to iron objects. Due to the speed with which measurements can be made this method is well suited to characterize magnetic anomalies over large areas at high resolution.

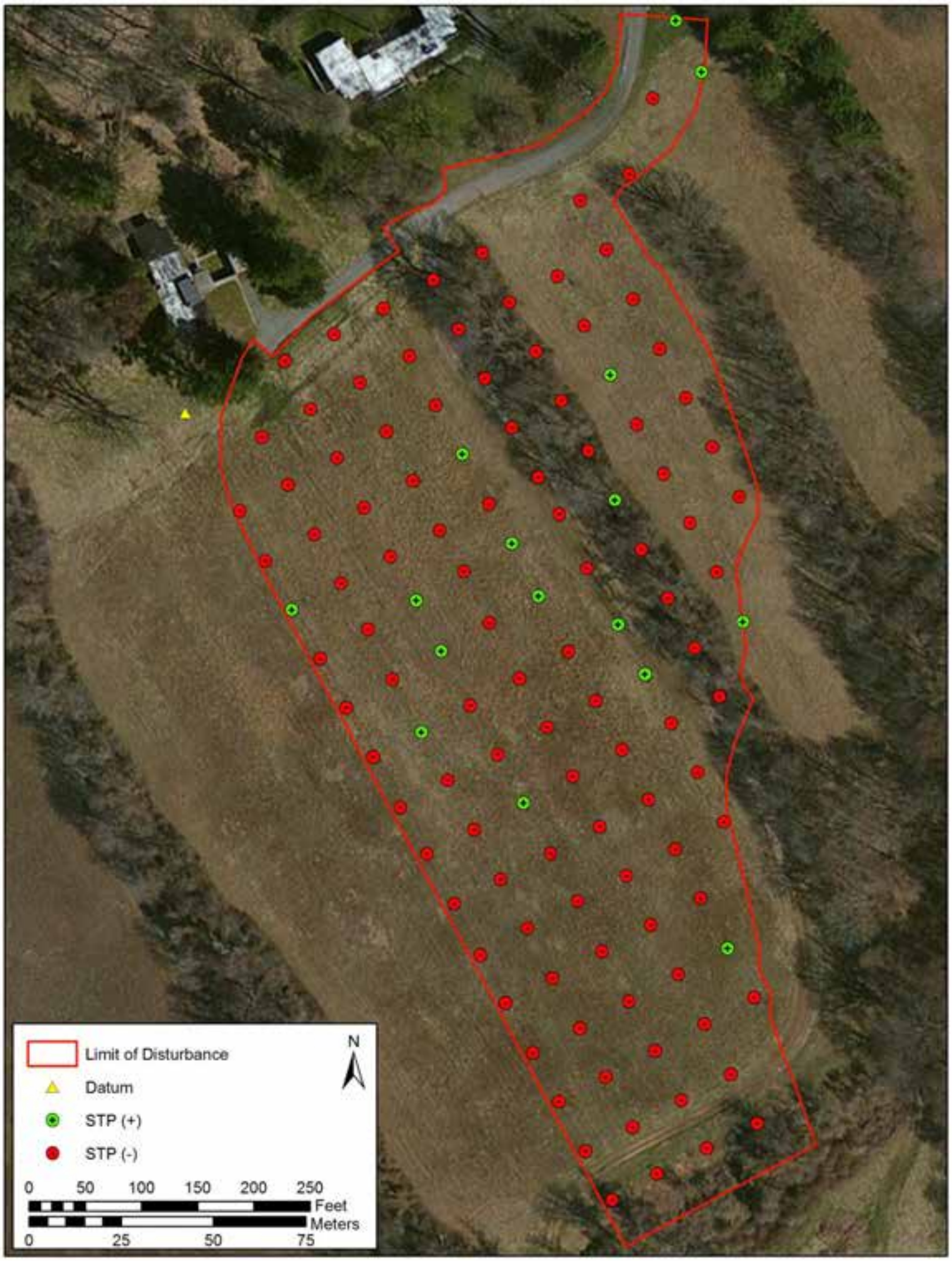

Figure 4.1: Plan of the Locations of Shovel Test Pits within the IAS Faculty Housing Project Area.

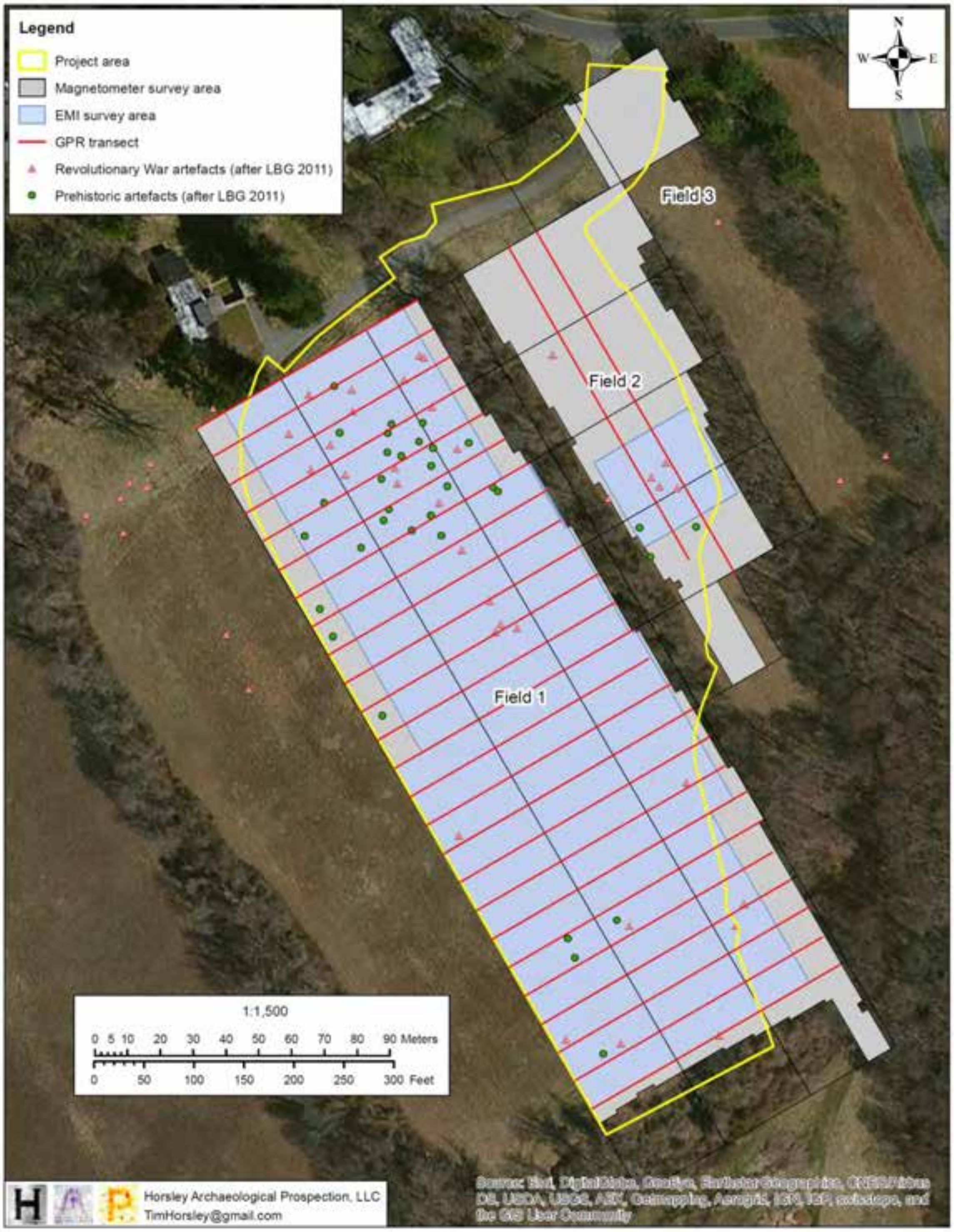

Figure 4.2: Plan of Geophysical Surveys Carried Out at the IAS Faculty Housing Project Area (from Appendix B: Figure 1).

The electromagnetic induction survey (EMI) was undertaken using a *Geonics EM38-MK2*. Since this technique was used to target smaller areas, a total area of 1.88 ha (4.65 acres) was surveyed. Electromagnetic methods include techniques ranging from GPR to metal detectors. Unlike magnetometers, these are active instruments, in that they measure variations in a signal generated by the equipment itself. Electromagnetic induction (EMI) instruments induce electrical current flow in conducting materials, and how easily current flows in a soil or sediment – its electrical conductivity – is related to factors including moisture content, material type, and compaction. In this way, conductivity contrasts can indicate the presence of buried pits, ditches, floors and foundations, as well as natural variations in soil moisture that may be due to pedological, geological, or topographic changes.

Since metal is a good electrical conductor, buried metal objects can produce distinctive conductivity anomalies that reveal their location. The *Geonics* EM38 electromagnetic induction meter employed here allows both soil conductivity and magnetic data to be collected simultaneously. Differences between the two data sets permit a distinction between ferrous and non-ferrous metal objects to be made. In addition, it is also possible to obtain information on the magnetic susceptibility of subsurface soils using EMI. While the results can be less detailed than seen a magnetometer survey, differences between the two data sets can be informative.

GPR is a relatively new addition to the geophysical archeologist's toolkit, being greatly enhanced by dedicated computer software for processing and display, as well as a better understanding of the types of environments where this method can be applied successfully. In contrast to other methods, GPR has the potential to provide detailed information on the depth of subsurface remains by recording energy reflections from sub-horizontal features (such as cultural layers, soil horizons); vertical features (e.g. trenches, foundations); and discrete bodies (such as rocks and boulders). Where conditions allow different features to be resolved it can be possible to identify vertical relationships between them. Since the energy reflections occur where there is a change in the velocity of the emitted GPR energy, such as between different materials, soil textures, or water content, it may not be possible to detect features where there is a gradual transition or no contrast from one material to another.

One of the most useful aspect of this method for archeological investigations is the ability to produce so-called *amplitude time-slices* – horizontal plans that correspond to different depths below the ground surface that more closely resemble archeological plans. When used in combination with the individual radar profiles, interpretations can be produced for different depth ranges. Data collection with this method is somewhat slower than magnetometry, but adequate data processing and analysis takes significantly longer. It is therefore usual to target specific areas of interest with GPR rather than conduct a total area survey.

The GPR test was conducted using a *GSSI SIR-3000* ground-penetrating radar system. Individual GPR profiles were collected in the larger western field along transects oriented approximately SW-NE (i.e. across the field), spaced 10m apart. Along these transects, measurements were taken at 0.65 foot (0.2 m) intervals, triggered using a survey wheel integrated into the cart used to collect the data. Two additional GPR profiles were collected in the smaller eastern field, oriented roughly NW-SE and separated by approximately 33 feet (10 meters).

4.6 Test Unit Excavation

A total of three test units were excavated to locate and assess anomalies identified during the geophysical survey of the project area (Figure 4.3). Discussion with geophysicist Dr. Tim Horsley yielded a list of anomalies prioritized according to their likelihood to represent historic or pre-contact

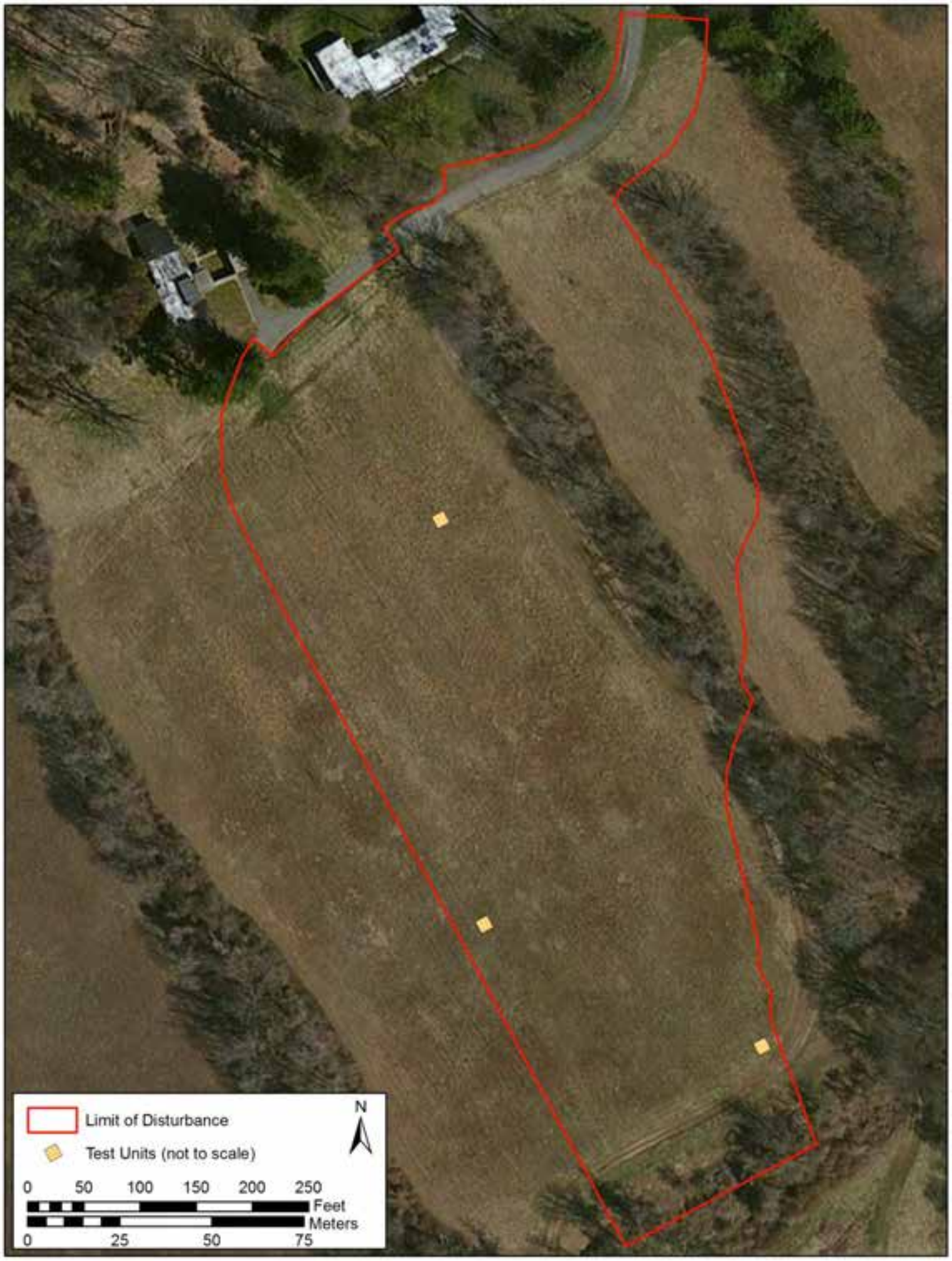

Figure 4.3: Plan of the Locations of Test Units within the IAS Faculty Housing Project Area.

Native American cultural features and/or deposits. Subsurface cultural features intruding into the subsoil are presumed to be unrelated to the Battle of Princeton, a brief-lived event that principally resulted in a surface assemblage rather than intrusive features that would be detectable as anomalies in the deeper soils at the site. The exception to this would be burial features for soldiers killed during the battle, but geophysical survey did not locate any anomalies identified as potential interments.

Test units were placed by first using GIS to impose the site grid established at the outset of fieldwork over interpretive plans of geophysical survey results prepared by Dr. Horsley. This yielded precise grid coordinates for corners of a number of alternative test units, prioritized as above. In the field, a laser transit and total station was used to stake out test units by projecting these known coordinate locations onto the ground. Each of the test units measured 3-x-3 foot and was excavated according to natural stratigraphy, reaching at least 0.6 feet into culturally sterile B Horizon soils. Excavated soils were sifted through one-quarter-inch mesh hardware cloth to recover any cultural artifacts; artifacts were collected in polyvinyl bags labeled with provenience information including the project name, test unit grid coordinates or other designation, stratigraphic level, and other pertinent information.

4.7 Metal Detection Surveys

Metal detecting was carried out in the IAS project area following a review of best practices and under the advice of recognized experts in the application of metal detection survey (MDS) in military sites archeology, including Christopher Espenshade of Commonwealth Cultural Resources Group, Dr. Matthew Reeves of the Montpelier Foundation, Dr. Douglas D. Scott, formerly of the National Park Service, and Daniel Sivilich of BRAVO.

The project area was prepared for MDS by plowing to break up accumulated sod and turn over soils that had been metal detected previously, and disking to smooth furrows created during plowing and allow better exposure of the ground surface for metal detecting. Plowing and disking was completed for the first metal detection survey on November 11, 2014, with the tractor moving east-west along the site grid, the short distance across the two fields comprising the project area. The first MDS was completed from November 12 to 18, 2014. Subsequently the project area was plowed and disked a second time with the tractor moving north-south along the site grid with the long axis of the two fields in the opposite orientation to the initial plowing and disking. This work was completed on December 22, 2014, and the subsequent MDS was carried out from January 12 to 16, 2015.

For each MDS, the survey area was subdivided into 100 x 100 feet blocks, similar to how the fields had been subdivided by Hunter Research during their fieldwork in 2003 (Grzybowski, Bowers and Beadenkopf 2007:64-66). This 100-foot grid is aligned with the eastern edge of the 200-foot buffer on Princeton Battlefield Park. Each 100-foot survey block was metal detected with transects running in two perpendicular directions, moving north-south with the site grid during the first survey in November 2014, and east-west with the site grid during the second survey in January 2015. To ensure 100 percent coverage, surveying tapes were aligned with opposite sides of each block, and mason's twine was stretched between the tapes at ten-foot intervals to define four, five-foot-wide transects. Metal detector operators walked within transects so defined, sweeping the detectors over an approximately six-foot arc to achieve some overlap with adjacent transects, providing complete coverage of the survey area.

Experienced metal detector operators utilized a White's Sierra Madre and a Tesoro Tejón, both with factory standard detector coils. Both detectors were used in "all metal" mode and were ground-balanced at the site at the beginning of each day of metal detecting. Both instruments can detect metal artifacts within approximately one foot from the ground surface, provided that little vegetation is present. Targets identified during MDS were marked with a non-metallic pin flag, and excavated with hand tools with assistance from a hand-held pinpointer. All excavated metal artifacts were identified in the field, recorded with a bag number in an inventory and with a general identification of the artifact, mapped, and collected. Locations of all collected artifacts were recorded with a laser transit using a total station. Artifacts are collected in polyvinyl bags marked with complete provenience information.

Special treatment was given to lead shot of any caliber, whether or not it appeared to have been fired and deformed from impact. In the interest of future analysis for traces of human blood or tissue, these finds were handled as little as possible and transferred into a polyvinyl bag with a clean trowel or another tool. They were not washed or removed from their field bags during cataloging. Analysis of these artifacts, including photographs for publication, will follow testing for blood residue.

4.8 Laboratory Methods

The general methodology for the processing of archeological material includes the cleaning, stabilization and cataloging of the artifact assemblage and associated records. In general, stable artifacts, such as ceramics and glass, were mechanically cleaned with water and dried. More friable artifacts, such as corroded iron but excluding potential military munitions, were mechanically cleaned with a dry brush to expose diagnostic attributes. Artifacts were initially sorted into general categories based on material type and inventoried in a Microsoft Excel database based on relevant diagnostic attributes.

Lead balls and iron grape shot recovered during fieldwork were minimally handled without direct skin contact and were not washed or handled in the laboratory, in order to preserve the possibility of blood residue analysis without contamination. Lead balls were weighed and measured with calipers to determine their diameter where possible, and these data were entered into the artifact catalog, acknowledging that these measurements may change slightly when the artifacts are cleaned following anticipated blood residue analysis.

Once a catalog was completed, artifacts were bagged in perforated, 4-mil polypropylene bags labeled with provenience and project information and boxed in acid-free containers for long-term storage.

4.9 Specialized Analyses

Human protein may be identified on expended munitions that hit an individual during the conflict, and may provide data regarding the intensity of the battle within the study area. Protein residue analysis is an analytical technique used to identify the presence of proteins that remain on artifacts as a result of their use. Proteins are present in plant tissues and in all body fluids and tissues, including blood. This analysis has been applied most commonly to Native American tools, but it also has been used successfully on a variety of prehistoric, historic, or even modern materials recovered archeologically.

Samples are tested using an immunologically-based technique referred to as counter immunoelectrophoresis (CIEP). The analytical technique involves the detection of a reaction between an antigen and antibody. For archeological purposes, an antigen is the unknown protein or proteins adhering to an artifact after its use. Blood is composed of many different proteins. In short, antigens are removed from an artifact or soil sample using a Tris hydrochloride (buffer), sodium chloride, and Triton X-100 (detergent) solution to break the hydrogen bonds holding the proteins to the artifact surface. Samples are placed in an ultrasonic bath; studies have shown that use of physical disruptors (sound waves) will result in recovery of more residual protein than soaking the artifact in solution. Use of both chemical and physical disruptors, therefore, yields the best recovery of proteins. Soil controls are also tested in order to control for false positive results. The CIEP analysis is performed using agarose gel as the medium. Two wells are punched in the gel. The protein extract is placed in the cathodic well and the antiserum is placed in the anodic well. The sample is electrophoresed in Barbital buffer (pH 8.6) for 45 minutes at a voltage of 130v to drive the antigens and antibodies towards each other. Positive reactions appear as a line of precipitation between the two wells.

In order to increase the opportunity for success, munitions were handled as little as possible, using non-latex gloves, and were stored in their original plastic bags. These artifacts were set aside during artifact processing, with no washing or brushing, in order to leave any soil on the artifact. Samples will be submitted to PaleoResearch Institute of Golden, Colorado for analysis. Following the analysis by the PaleoResearch Institute, the artifacts may be handled, and at that time will be subjected to a more complete cataloging and the analysis of specific features of the artifacts that may enhance the interpretation of the military action within the study area.

According to Linda Scott Cummings of PaleoResearch Institute, curated artifacts are also possible candidates for protein residue analysis, and artifacts that have been washed with plain water can also provide successful results (personal communication, 2015); thus, the samples submitted for analysis will include munitions collected from prior surveys in order to increase the potential for positive results (Table 4.1).

Table 4.1: Anticipated List of Revolutionary War Artifacts from Site 28ME363 for Protein Residue Analysis.

Artifact Type	Quantity in Combined Collection, 2003-2015
Impacted Lead Balls	12
Unimpacted Lead Balls	12
Grape Shot	19
Bayonet Fragment	1

4.10 Geographic Information Systems – Data Integration

Spatial data resulting from fieldwork, including the staked boundaries of the project area and historic preservation buffer, datum points fixing the site grid in space, locations of STP and test unit excavations, and all metal detector targets mapped during Ottery Group fieldwork have been incorporated into a GIS database for analysis, using ArcGIS 10.2.

Fieldwork conducted by Hunter Research and LBG utilized a total station and data recorder to map all metal detecting finds and subsurface testing. Hunter Research submitted this data digitally to IAS with submission of their *Compiled Historical and Archeological Data* (Hunter Research 2004), and this data was delivered to The Ottery Group, whereupon it was incorporated into the GIS for the current project. LBG was also contacted regarding spatial data associated with the artifact catalog from fieldwork conducted between 2004 and 2012, and LBG transmitted this data, allowing the GIS dataset compiled by The Ottery Group to be further increased. As a result, data representing the spatial distribution of all finds from systematic surveys of the IAS faculty housing project area, and particularly those artifacts that have been positively or potentially associated with the Battle of Princeton are consolidated within the GIS for the current project.

GIS was a significant element of the Battle of Princeton Mapping Project (Selig, Harris and Catts 2010); The Ottery Group requested permission from the ABPP to access the GIS produced by JMA via email on July 15, and again on September 14, 2014. On September 16, 2014 the ABPP replied that the GIS was not publicly available, stating that the data was protected under ARPA. Thus, the GIS portion of the mapping project by JMA does not contribute to the GIS implemented for the current project.

4.11 *Archeological Monitoring*

Archeological monitoring will take place during all ground-disturbing activities associated with construction. Monitoring, by itself, is not an effective mechanism for artifact recovery, and is particularly ineffective in the context of battlefield assemblages, in which mapping of individual artifacts at or near the location of recovery is of critical importance. The purpose of monitoring is to provide a mechanism for assessment and mitigation of unanticipated discoveries during construction. The archeological monitoring, thus, will be effective in alleviating any concern over the potential for the construction to encounter human remains associated with the interment of soldiers following the 1777 battle.

While a mass grave containing the remains of both British and American soldiers killed in the Battle of Princeton has been suggested for the general project area by JMA (Selig, Harris and Katts 2010:90), the location is not known. No evidence of such interments was identified during geophysical testing, and there is little anticipation that human remains will be encountered in the course of construction.

4.12 *Management of Archeological Collections*

Artifact collections made during the current project, and also the wider collection resulting from systematic fieldwork by Hunter Research and LBG will be prepared for permanent curation according to the guidelines promulgated by the New Jersey State Museum (NJSM 2005).

The combined collections made by Hunter Research and LBG are currently held by LBG. Additional artifacts recovered from IAS property by Deep Search/BRAVO and Dr. Keith Bonin may be on display at Princeton Battlefield State Park in Princeton, and Washington Crossing State Park in Titusville, or they may be in personal possession of these entities. While basic descriptive data and tentative identifications are available for all artifacts contained by this wider collection (Hunter Research, LBG, Deep Search/BRAVO, Bonin), some recovered systematically during professional archeological surveys, some not, it would be desirable to catalog the entire assemblage in a consistent manner, and to reanalyze portions of the collection for positive identifications of artifacts associated with the Battle of Princeton.

5.0 Preliminary Results

5.1 Subsurface Investigation

5.1.1 STP Stratigraphy

As previously stated, a total of 122 STPs were excavated across the project area (see Figure 4.1 above). Soil profiles recorded for each of these were essentially similar throughout the project area (Figure 5.1). With few exceptions, the STPs evidenced two distinct soil strata consisting of an Ap horizon directly overlying a culturally sterile B horizon. The Ap horizon was generally characterized as consisting of dark yellowish brown (10YR3/4) silty loam extending to an average depth of 0.9 feet to 1.6 feet below current ground surface. The B horizon encountered throughout the project area was generally described as consisting of yellowish brown (10YR5/6) or dark brown (7.5YR3/4) silty loam, with a notable amount of gravel in some portions of the project area. B Horizon soils extended to an average base of excavation of 1.5 feet to 2.0 feet below current ground surface.

Several STPs excavated within the project area (N2050 E2500, N200 E2150, N2000 E2100) evidenced soil strata that varied slightly from the soil profiles detailed above. In these instances, the STPs were located in relative close proximity to Stonehouse Drive and contained a fill layer, likely associated with road construction, overlying the Ap Horizon and B Horizon soils. Fill soils recorded in these STPs were described as consisting of brown (7.5YR4/4) and dark yellowish brown (10YR3/4) silty loam with noticeable amounts of gravel.

5.1.2 Artifacts Recovered from STPs

Sixteen of the 122 STPs excavated in the course of this investigation contained historic period artifacts (Table 5.1). The STPs that contained historic period artifacts were generally clustered in the large field in relatively close proximity to a 20th century farm road or were located in relative close proximity to the intersection of Stonehouse Drive and Maxwell Drive, adjacent to a demolished 20th century dwelling. Artifacts recovered from STPs excavated throughout the project area are generally associated with field scatter context. Structural (n=16), Domestic (n=14), Fuel (n=11), and Indefinite Group (n=5) artifacts are accounted for within this assemblage. Structural Group and Domestic Group artifacts account for the largest percentage of the 46 artifacts recovered from these STPs. Structural Group artifacts generally include artifacts associated with buildings and outbuildings and largely consist of nails (n=5), window glass (n=6), fragments of brick (n=4), and ceramic tile (n=1). Domestic Group Artifacts accounted for within this assemblage include a single fragment of bottle/vessel glass (n=1), sherds of whiteware (n=11), a single sherd of porcelain, and a single sherd of coarse earthenware. Fuel Group artifacts consist solely of coal (n=9) and coal slag (n=2). Indefinite group artifacts accounted for within this assemblage include unidentified container glass (n=4) and a single fragment of unidentified ferrous alloy metal. Diagnostic artifacts recovered from STPs excavated in the course of this investigation largely date to the 20th century (Table 5.1); no Revolutionary War-era artifacts were recovered from STPs excavated within the project area.

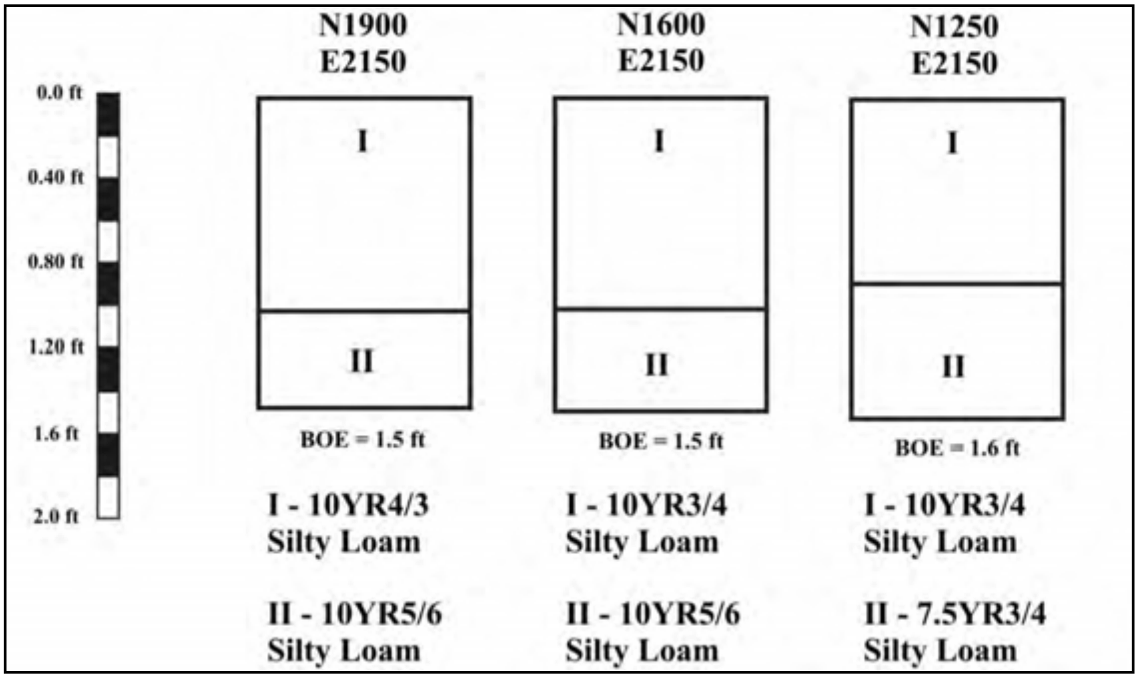

Figure 5.1: Representative STP Profiles in the IAS Faculty Housing Project Area.

Table 5.1: Artifacts Recovered from Shovel Test Pit Survey.

Artifact	Quantity (=n)	Weight (g)
Domestic		
Coarse Earthenware, Hollowware	1	
Porcelain, Hollowware	1	
Whiteware, Hollowware	8	
Whiteware, Unidentified	3	
Glass Container, Bottle	1	
Fuel		
Coal	9	40.34
Coal Slag	2	30.95
Indefinite		
Ferrous Alloy, Unidentified	1	
Glass, Container, Bottle	4	
Structural		
Brick	4	61.54
Ceramic Tile	1	
Window Glass	6	
Nail, Unidentified	1	
Nail, Wire	4	
Total	**46**	**132.83 (g)**

5.1.3 Test Units

Three test units were excavated to verify anomalies identified in the geophysical survey of the project area. Each of the test units measured 3-x-3 foot and was excavated 0.6 feet into culturally sterile B Horizon soils. A single modern cultural feature, consisting of an iron fence post and associated excavation trench/auger hole, was identified in Test Unit 1. With the exception of the modern fence post, corresponding to the anomaly described in Section 4.1.10 of the geophysical survey report (Appendix B), no cultural features or artifacts were recovered for either of the three test units. Soil strata encountered in each of the test units is described in further detail below.

Test Unit 1

Test Unit 1 evidenced two soil strata, consisting of a plowzone directly overlying culturally sterile B Horizon soil, and contained a modern 20th century metal-fencepost and associated excavation trench/auger hole, recorded as Feature 1 (Figures 5.2 and 5.3). The initial soil stratum recorded in Test Unit 1 was recorded as Stratum I and consisted of dark brown (10YR3/2) silty loam plowzone (Ap Horizon). Stratum I extended to an average depth of 1.3 feet below current ground surface and directly overlay B Horizon soil recorded as Stratum II. Also encountered at this depth was Feature 1, a modern 20th century metal-fencepost and associated excavation trench/auger hole. Feature 1 was located in the western half of the unit and initially measured 2.0 feet E/W by 3.0 feet N/S. Feature 1 was directly cut into B Horizon soil and extended to an average depth of 1.8 feet below current ground surface. The base of Feature 1 evidenced a circular auger-drilled posthole with a flat bottom. With the exception of a 20th century iron fence post, no artifacts were recovered from Feature 1. The basal soil layer excavated in Test Unit 1 was recorded as Stratum II and was described as consisting of dark yellowish brown (10YR4/6) silty loam. Stratum II extended to a base of excavation of 2.4 feet below current ground surface. With the exception of the 20th century iron fence post recovered from Feature 1, no cultural artifacts were recovered from Test Unit 1.

Test Unit 2

Test Unit 2 evidenced two soil strata, consisting of a plowzone directly overlying gravely culturally sterile B Horizon soil, and evidenced no cultural features (Figure 5.4). The initial soil stratum recorded in Test Unit 2 was recorded as Stratum I and consisted of dark brown (10YR3/2) silty loam plowzone (Ap Horizon). Stratum I extended to an average depth of 1.25 feet below current ground surface and directly overlay gravelly B Horizon soil recorded as Stratum II. Stratum II was described as consisting of strong brown (7.5YR5/8) silty clay loam with a noticeable amount of gravel, and extended to an average base of excavation of 1.85 feet below current ground surface. No cultural artifacts were recovered from Test Unit 2. In addition, no cultural features were observed in Test Unit 2, likely indicating that the anomaly identified in the Geophysical survey of this portion of the project area is geological in nature.

Test Unit 3

Test Unit 3 evidenced two soil strata, consisting of a plowzone directly overlying culturally sterile B Horizon soil, and no cultural features (Figure 5.5). The initial soil stratum recorded in Test Unit 3 was recorded as Stratum I and consisted of dark yellowish brown (10YR3/2) silty loam plowzone (Ap Horizon). Stratum I extended to an average depth of 1.25 feet below current ground surface and directly overlay gravelly B Horizon soil recorded as Stratum II. Stratum II was described as consisting

Figure 5.2: Test Unit 1, North Wall Profile.

Figure 5.3: Test Unit 1, View of Feature 1 Facing North.

Figure 5.4: Test Unit 2, North Wall Profile.

Figure 5.5: Test Unit 3, North Wall Profile.

of dark brown (7.5YR3/4) silty clay loam with a noticeable amount of gravel, and extended to an average base of excavation of 1.85 feet below current ground surface. No cultural artifacts were recovered from Test Unit 3. In addition, no cultural features were observed in Test Unit 3, likely indicating that the anomaly identified in the Geophysical survey of this portion of the project area is geological in nature.

5.2 Geophysical Assessment

Horsley Archeological Prospection, LLC, (HAP), conducted geophysical surveys of the project area from July 14 to 21, 2014, concurrently with the STP survey conducted by The Ottery Group. A combination of magnetometry, electromagnetic induction (EMI), and ground-penetrating radar (GPR) was employed to locate and map anomalies potentially indicating buried features or archeological resources present within the project area. The geophysical results indicate a number of anomalies that are representative of subsurface features, however, it is clear that many of these are either natural in origin, or result from modern activities and disturbances. For instance, a majority of the anomalies identified during magnetometry indicate iron and other ferrous objects in the soil, sometimes occurring within identifiable concentrations (Appendix B:8-12). These artifacts were sampled during MDS subsequent to the completion of geophysical survey, and with the few exceptions indicated in this report they represent refuse associated with agricultural and residential land uses during the 20th century. Based on the results of geophysical survey, a small number of anomalies were investigated with test unit excavations (Section 5.1.3 above). These identified no buried historic archeological resources.

An integrated approach was employed in this geophysical assessment, beginning with high-resolution magnetometry over the full project area where modern interference did not preclude this method. This identified areas where additional electromagnetic induction measurements could be taken. While both techniques are more commonly used to locate and map buried archeological features, they are also very effective at detecting near-surface metallic objects. They were therefore chosen for use in this investigation to map the distribution of metal artifacts and identify any buried archeological features intact below the plow zone. The results of these surveys are summarized below. The full geophysical report is presented in Appendix B of this report.

The geophysical data was used to guide the placement of test units, and for comparison with data on soil stratigraphy that resulted from STP survey carried out by The Ottery Group.

5.2.1 Magnetometry

As is commonly seen in magnetometer data, the results reveal anomalies attributable to both natural and cultural surface and subsurface features. It was hoped that the soils at the site would be sufficiently deep to reduce any geological responses; while this is the case for much of the northern portion of the survey, the southern end of the larger western field is characterized by relatively strong positive and negative anomalies due to naturally occurring magnetic variations in the underlying Stockton Formation. These bipolar responses are mostly within ±8nT in strength, although in a few localized instances they measure in excess of ±20nT (Figure 5.6). This area mostly coincides with the slight rise in the field, strengthening the interpretation that these responses are natural in origin.

The magnetometer results identified many near-surface iron objects. Ferrous anomalies are commonly detected on agricultural land as a background scatter, so these results are not surprising. If anything, the number of such responses is a little lower than average, perhaps due to 'cleaning' of the site as a result of the many metal detector surveys. Two concentrations of metallic debris were

Figure 5.6: Processed Magnetometer Data Depicting Strong Anomalies Associated with Contemporary Road Features, and Geological Conditions in the Southern Portion of the Project Area (Appendix B: Figure 2).

identified: one lies a third of the way down the western field, and a second just south of the modern road in the smaller eastern field. No intact structural remains are evident in either area, but whether these represent occupation areas or dumps of historic material is unclear from the geophysical data alone. Metal detection survey carried out following the completion of the geophysical survey determined that these are principally composed of metal artifacts associated with 20th-century agricultural and residential land uses, and are not related to the Revolutionary War (Section 5.3 below). These two concentrations were not subjected to further archeological testing.

5.2.2 Electromagnetic Induction (EMI)

Following the magnetometer survey, areas were selected for resurvey using the EMI instrument. The primary reason for employing this method was for its ability to detect and discriminate between ferrous and non-ferrous metallic objects, although the data also contain information on subsurface features, some of which can in some instances be cultural. Data obtained from EMI survey (Figure 5.7) generally corresponds to data obtained via magnetometry, in the types and distribution of anomalies. Specific corresponding anomalies identified in each survey include the gravel track/farm road, effectively bisecting the project area, and high levels of geological anomalies located along the southern end of the western field.

5.2.3 Ground-penetrating radar (GPR)

A number of GPR traverses were recorded to test this technique in this environment, and to sample the project area to confirm the interpretations of the magnetometer and EMI data. The results reveal a few isolated and groups of reflections that are most likely rocks weathered from the bedrock, as well as disturbances near Stone House Drive can be associated with modern utilities.

5.3 Metal Detection Surveys

Metal detection and surface collection carried out by The Ottery Group in November 2014 and January 2015 resulted in the recovery of 617 artifacts, the preponderance of which are structural materials (n=275) such as nails (n=175), and smaller quantities of bolts, hinges, wires, screws, pipe material, and so forth. The Indefinite category is the next most common at 19.1 percent of the overall assemblage, followed by Domestic artifacts at 12.2 percent. The Indefinite category overlaps with Structural artifacts, including a mix of metal hardware, but some of this is probably machinery, automobile parts, or pieces of broken farm machinery, rather than construction material. The Domestic category includes all of the historic and modern ceramics, glass container, cans, bottle and can closures, and related artifacts. The overall assemblage from metal detection and surface collection is reported in Table 5.2 below.

Two metal detection surveys were carried out by The Ottery Group, and the volume and distribution of artifacts recovered are similar, with a somewhat lower number of artifacts recovered during the second survey. Table 5.3 presents a comparison of the number of targets recovered during the first and second surveys. Survey in November 2014 resulted in collection of 335 artifacts from metal detection and 27 artifacts from surface collection. The January 2015 survey yielded 233 artifacts from metal detection and 22 artifacts from surface collection. Importantly, all Revolutionary War munitions recovered by The Ottery Group came from the November 2014 metal detection survey. Five lead balls and five pieces of grape shot were recovered during that survey, and no Revolutionary War artifacts have been identified in the assemblage from the January 2015 survey at this time.

Figure 5.7: Processed EM In-Phase Data Showing Similar Results to Magnetometry Survey (Appendix B: Figure 4).

Table 5.2: Artifacts Recovered by The Ottery Group During Metal Detection Survey and Surface Collection, by Functional Category.

Group	Quantity (=n)	Percentage
Activities	21	3.4
Ammunition, Modern	2	0.4
Ammunition, Revolutionary War	10	1.5
By-Product	9	1.5
Domestic	75	12.2
Electrical	12	1.9
Faunal	1	0.2
Floral	1	0.2
Fuel	58	9.4
Indefinite	121	19.6
Modern	3	0.5
Natural	1	0.2
Personal	13	2.1
Plumbing	12	1.9
Prehistoric	3	0.5
Structural	275	44.6
Total	**617**	**100.0**

Table 5.3: Comparison of Finds from First and Second Ottery Group Metal Detector Survey.

	November 2014		January 2015		Total
	Quantity (=n)	Percent of Grand Total	Quantity (=n)	Percent of Grand Total	
MDS Targets Recovered[1]	335	59.0	233	41.0	**568**
Targets Recovered Per Acre[2]	47.38/ac	-	32.96/ac	-	**80.34/ac**
Artifacts from Surface Collection	27	55.1	22	44.9	**49**
Total	**362**	**58.7**	**255**	**41.3**	**617**

[1] The Ottery Group recovered 10 munitions during the November 2014 metal detection survey, consisting of five lead balls and five grape shot. No additional munitions were recovered during the second metal detection survey in January 2015.
[2]Area of The Ottery Group Metal Detector Survey is 7.07 acres.

Figures 5.8 and 5.9 compare the distribution of artifacts recovered during the two metal detection surveys, and also show the locations of all munitions recovered during the metal detection survey conducted by The Ottery Group. Excluding Revolutionary War munitions, the distribution of metal artifacts is generally consistent for the two surveys, with clusters of material along Stone House Drive and in the approximate center of the project area, west of the hedgerow separating the western and eastern fields.

5.3.1 Comparison of Investigation Results and Efficacy of MDS

Comparison of the quantities of artifacts recovered by professional firms investigating the IAS faculty housing project area is informative in that it permits assessment of the efficacy of the surveys. Table 5.4 enumerates all finds from Berger, Hunter, and The Ottery Group, by method of recovery. Table 5.5 compares the rate per acre at which metal detecting targets were recovered during each period of fieldwork. These generally show a favorable comparison and equivalency among the respective investigative efforts. Published artifact data resulting from MDS of Princeton Battlefield State Park by Deep Search/BRAVO, and the available data on informal surveys by Bonin are not included in the data reported in this section of the report.

Table 5.4: Enumeration of All Finds from Hunter, Berger, and Ottery Group Surveys, 2003 to 2015.

Method[1]	Berger	Hunter	Ottery	Total
MDS[2]	357	295	568	**1220**
STP	61	2	46	**109**
Surface	28	107	49	**184**
TU	8	0	0	**8**
Total	**454**	**395**	**663**	**1512**

[1]All catalogued finds assigned to metal detection survey (MDS), shovel test pit survey (STP), Surface Collection, or Test Unit excavation (TU). Surface finds include non-metallic artifacts recovered during metal detection survey, either on the surface or located incidentally while excavating to identify a metal detecting target.
[2]This category includes metal and composite artifacts only.

Table 5.5: Metal Detecting Targets Recovered Per Acre, from 2003 to 2015.

	Total Metal Detecting Targets Recovered	Acreage Subjected to MDS	Targets Recovered Per Acre
Berger	357	4.79	74.5
Hunter	295	9.84	30.0
Ottery	568	7.07	80.3

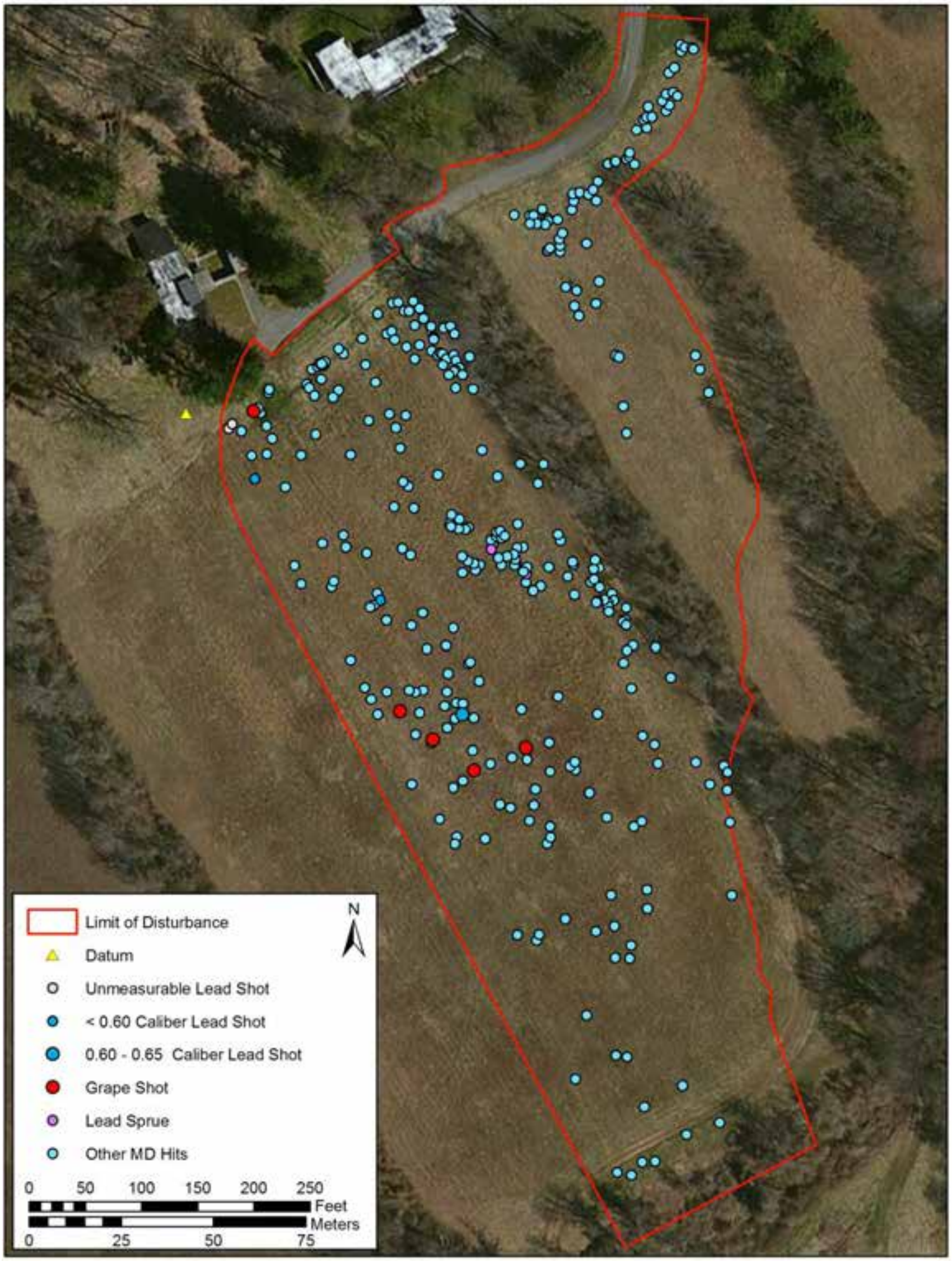

Figure 5.8: Plan of Artifacts Recovered During November 2014 Metal Detecting and Surface Collection Surveys, with Positions of Revolutionary War Munitions.

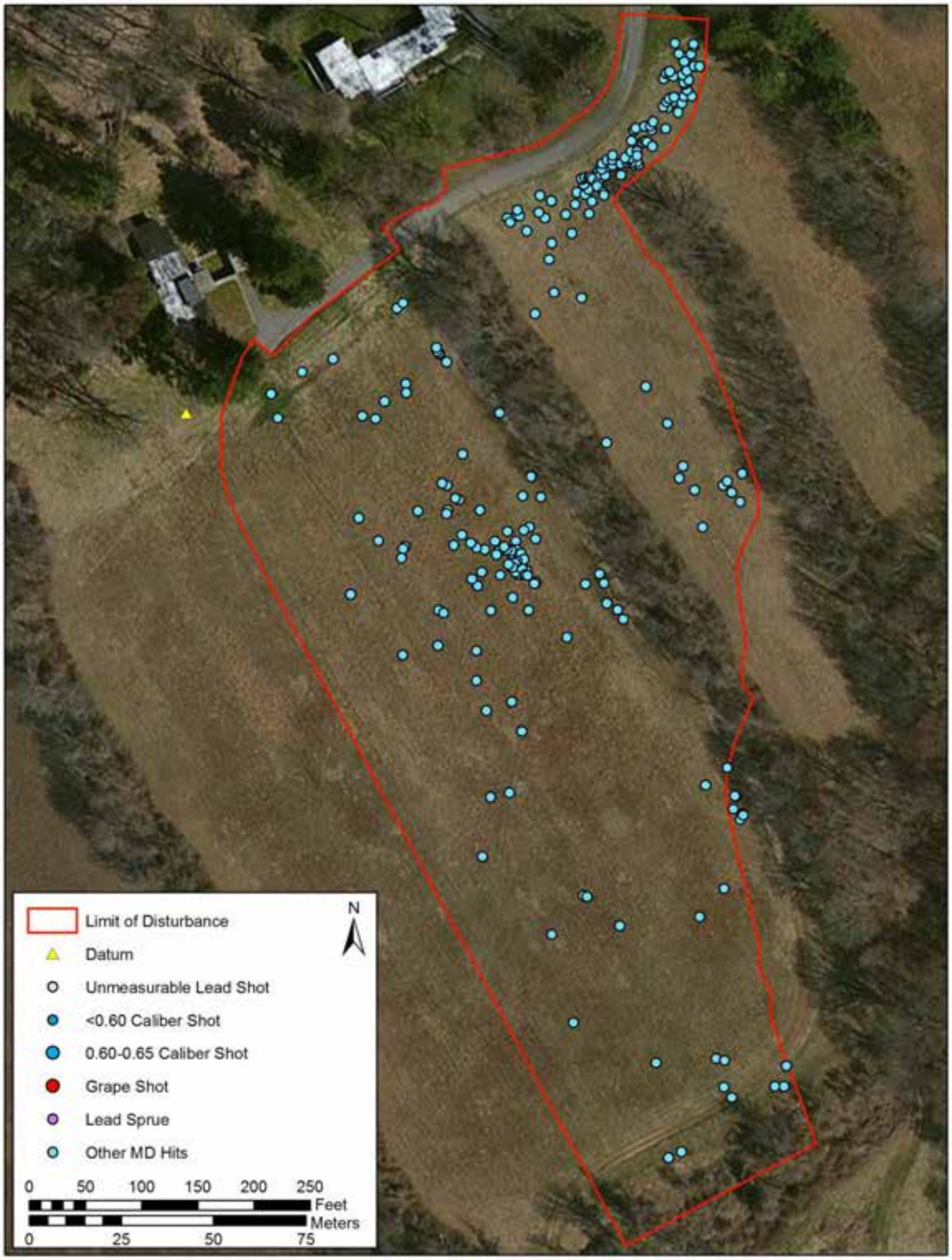

Figure 5.9: Plan of Artifacts Recovered During January 2015 Metal Detecting and Surface Collection Surveys.

The discrepancy in the rate of recovery between the 2003 MDS carried out by Hunter Research and subsequent surveys by Berger and The Ottery Group, described by Table 5.5 above, may result in part from selective recovery of certain materials. Field methodology reported by Hunter Research indicates that "[m]etal objects that were clearly modern (e.g. soda can tabs) were not recorded, but were gathered up and discarded. Some discrimination of metal detector "hits" was possible with the instrumentation used, but ground-truthing through shovel testing was necessary in most cases"(Hunter Research 2004:2.A. Field Methodology). Thus BRAVO metal detector operators working with Hunter Research during their 2003 MDS observed a tradition among metal detectorists, to remove intrusive modern materials from the field as one would remove litter.

Metal detectorists with long experience can often distinguish the type of metal in a target prior to locating it; the devices themselves also have this capability of discriminating what metal material has been discovered remotely, though many metal detectorists learn to discriminate based upon feedback from the device while working in all-metal mode. This skill can be an asset, for instance readings from heavy inclusions of coal in some historic deposits can overwhelm other targets and confound a survey entirely. Among avocational collectors this skill at interpreting feedback is used to avoid digging up low-value targets, such as nails and other iron objects. All surveys of Maxwell's Field recovered significant amounts of ferrous metal, often categorized by Berger simply as "metal." Because aluminum presents such a strong signal, it is doubtful that Hunter Research did not excavate these targets for identification, but BRAVO detectorists clearly did not collect aluminum objects, and they may have avoided recovery of coal and slag altogether. Table 5.6 categorizes all artifacts recovered during metal detecting in Maxwell's Field by material, and it shows that metal detector operators with Berger and The Ottery Group recorded numerous pieces of aluminum, while BRAVO metal detectorists working with Hunter Research recorded very little aluminum. The Ottery Group also located and recovered 58 pieces of coal, and six pieces of slag as well, while MDS by Hunter Research resulted in only two pieces of coal being collected and cataloged. Berger collected no coal from any of their metal detecting. These decisions about what to collect are reflected in rates of recovery described in Table 5.5, which in this light are ultimately very similar.

Finally, Table 5.7 compares munitions recovered during all metal detection surveys between 2003-2015, by Berger, Hunter, and The Ottery Group. These data exclude all Revolutionary War artifacts apart from munitions – lead balls and grape shot – as the artifact assemblages from the Berger and Ottery surveys have not yet been analyzed and are not strictly comparable with the assemblage catalogued by Hunter. The rate of recovery for munitions is variable across different surveys. Bonin identified a number of lead balls and grape shot within the area surveyed by Berger, and Berger recovered no additional munitions. Hunter Research and The Ottery Group examined survey areas that overlap. The entire survey area examined by The Ottery Group falls within the larger parcel surveyed by Hunter with assistance from BRAVO in 2003. In effect, the second metal detector survey conducted by The Ottery Group in January 2015 is the third or fourth systematic survey of the 7.07-ac parcel project area. While The Ottery Group recovered a greater number of artifacts per acre overall than did Hunter, there was a 22 percent decrease (approximate) in the rate of recovery per acre during the second Ottery Group survey, from 335 targets recovered in November 2014 to 233 recovered in January 2015. More importantly, The Ottery Group recovered ten artifacts representing munitions in November 2014 including five lead balls and five grape shot, and only one fragment of lead with no clear identification during the January 2015 survey, which is not tallied as a munition here, pending analysis.

Table 5.6: Enumeration of Metal Detecting Targets Recovered from All Surveys, 2003 to 2015, by Material (Excludes Surface Collections).

Material	Berger	Hunter	Ottery	Total
Aluminum	26	1	36	**63**
Cast Iron	-	-	11	**11**
Chrome	-	-	1	**1**
Coal	1	2	58	**60**
Composite	-	2	19	**21**
Composite Material	1	-	-	**1**
Copper	3	-	-	**3**
Copper Alloy	12	34	35	**81**
Ferrous Metal	1	221	371	**593**
Ferrous Metal, Composite	-	1	-	**1**
Lead	1	23	11	**35**
Lead Alloy	1	-	-	**1**
"Metal"	305	-	-	**305**
Metal/Plastic	2	-	-	**2**
Metal/Wood	1	-	-	**1**
Pewter	-	2	1	**3**
Plastic	-	-	1	**1**
Porcelain	-	-	8	**8**
Rubber	-	1	-	**1**
Shell	-	-	1	**1**
Silver	-	1	-	**1**
Slag	1	-	6	**7**
Stainless Steel	-	-	1	**1**
Steel	2	-	8	**10**
White Metal	-	6	-	**6**
(Blank)	-	1	-	**1**
Total	**357**	**295**	**568**	**1220**

Table 5.7: Comparison of Recovery of Munitions for All MDS from 2003 to 2015.

	Lead Balls	Grape Shot	Total Munitions Recovered	Acreage	Munitions Recovered Per Acre
Berger[1]	0	0	0	4.79	0.0
Hunter	18	14	32	9.84	3.3
Ottery	5	5	10	7.07	1.4
[1]The area subjected to MDS by LBG was surveyed previously by Bonin, who collected nine lead balls from the northwestern portion of the LBG metal detecting area.					

6.0 Synthesis of Archeological Data

6.1 Distribution of Revolutionary War Artifacts

The distribution of Revolutionary War artifacts across all surveys of the IAS faculty housing project area and other portions of Maxwell's Field form a consistent pattern (Figure 6.1). Two clusters of grape shot are present in the northwestern and the central portions of the project area. Widely-dispersed grape shot occurs in the southern part of the 7.07-acre project area.

Lead balls and other military artifacts cluster in the northern end of the project area. The significance of this requires closer analysis of the artifacts, particularly a reckoning of caliber of munitions, and the arms brought to bear by British and American forces during the battle.

6.2 Size Categories for Lead Projectiles

One problem for the analysis of musket balls and other lead projectiles recovered from Maxwell's Field lies in the probable diversity of firearms utilized in the battle. Diameter measurements of projectiles are expressed in inches, and the term caliber is used to describe bore diameters of firearms. The widely-used size categories presented by Sivilich (1996, 2007) sort projectiles into diameters of 0.68-0.70 inches for British Brown Bess muskets, and 0.60-0.65 inches for French Charleville muskets utilized by Continental troops starting in the spring of 1777, acknowledging that projectiles of this size could also be fired from British fusils, Dragoon carbines, and so forth. In practice this has meant measuring an assemblage of projectiles recovered from a battlefield or encampment and using these two size categories to discern distributions of musket balls dropped or fired by British or American soldiers, without necessarily acknowledging ambiguity about actual armaments of soldiers taking part in the battle.

For example, Sivilich (1996) presents the results of fieldwork initiated as recreational metal detecting at a Monmouth County Park in Middletown, New Jersey by the Deep Search Metal Detecting Club in 1992. Sivilich explicitly describes metal detecting at Monmouth County Park as being patterned after the work of Scott, et al. (1989) at Custer Battlefield National Monument. Finds included 52 musket balls, and all but a very small number were unfired and measured between 0.68-0.70 inches diameter, indicating to the author that the site was associated with British forces encamped briefly after the Battle of Monmouth in June 1778 (Sivilich 1996). This example of munitions recovered from a British encampment does not really challenge the technique of inferring British positions by measuring musket ball diameters.

The combined assemblage of lead projectiles with measurable ball diameters from systematic metal detection surveys of the IAS faculty housing project area, consisting only of those recovered by BRAVO working in conjunction with Hunter Research in 2003, and the finds resulting from the current study in 2014-2015, consists of 19 projectiles. These cannot be easily sorted into two size categories. Figures 6.2-6.3 present scatter plots showing measurable/calculable ball diameters plotted against the weight in grams of each ball. Diameters of lead balls range from 0.30-0.69 inches. These can be grouped into seven size categories based on apparent plateaus or clusters in the scatter distribution, but this grouping is somewhat arbitrary and should be informed by an understanding of what small arms, and therefore what weapon calibers were present at the battle (Table 6.1). Throughout this report, lead balls are categorized in a manner resembling that employed by previous studies by Sivilich (2007) and Hunter Research (2004), with sizes of .30 inches (buckshot); <.60 inches; .60-.65 inches; and 0.65-0.70 inches in diameter.

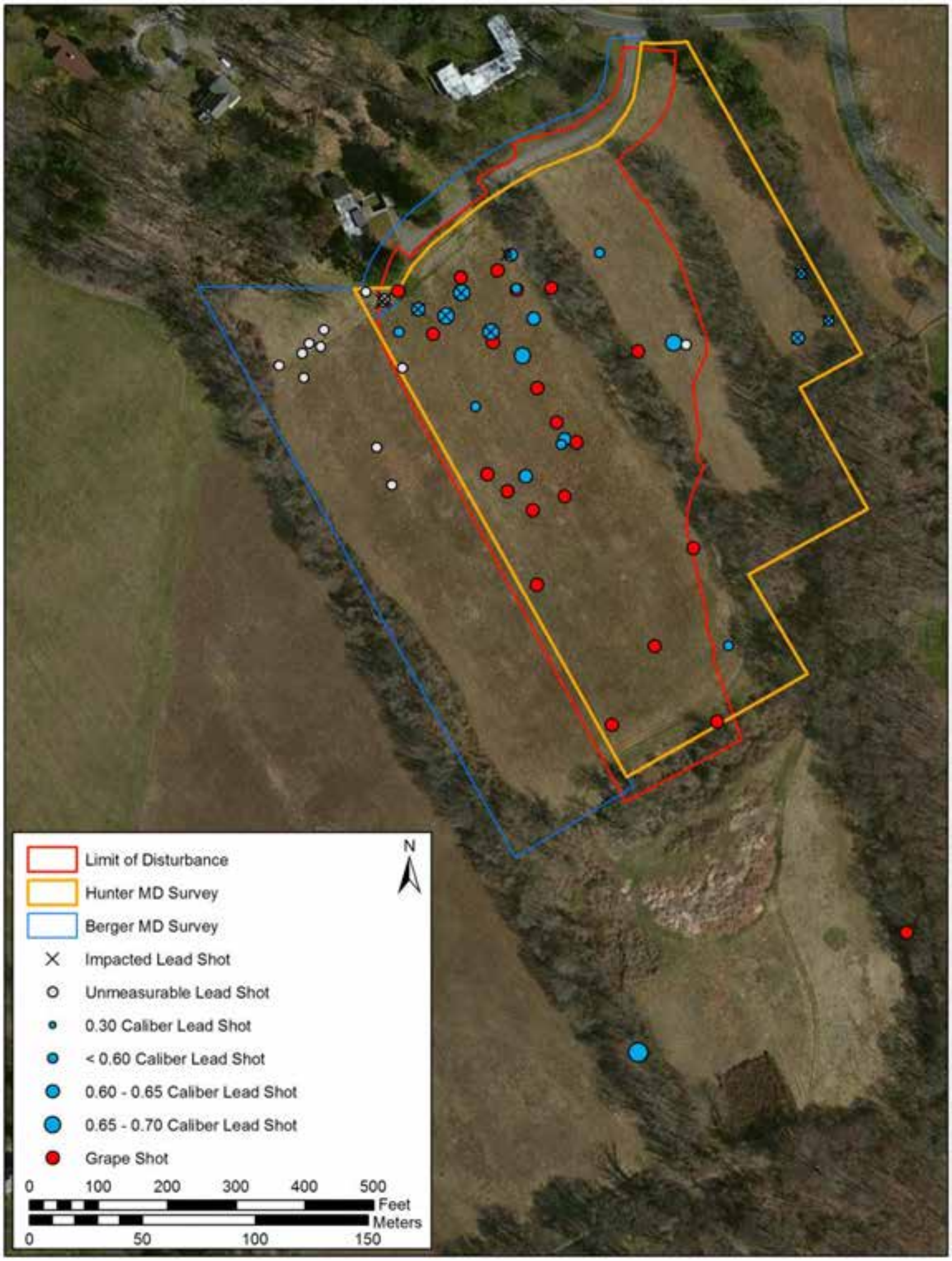

Figure 6.1: Distribution of Ball Diameters from All Measurable Lead Projectiles Recovered at Maxwell's Field from 1989 to 2015.

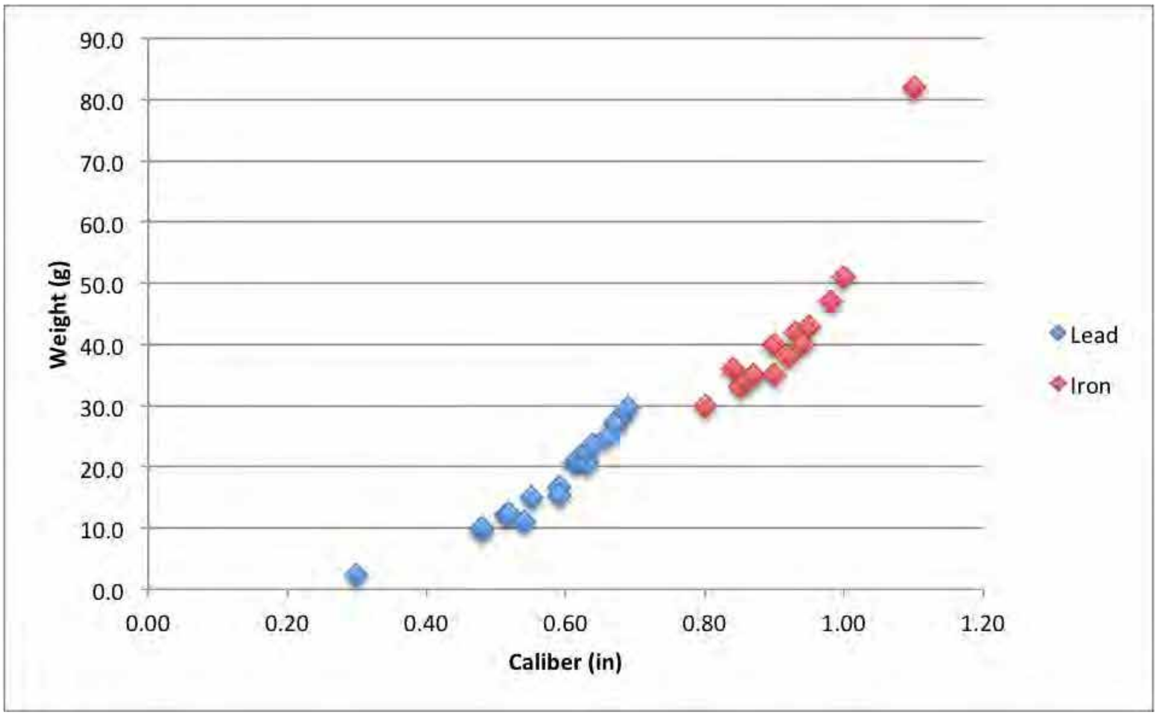

Figure 6.2: Scatterplot of Ball Diameters from All Measurable Projectiles Recovered at Maxwell's Field from 2003 to 2015, Including Lead Balls and Grape Shot.

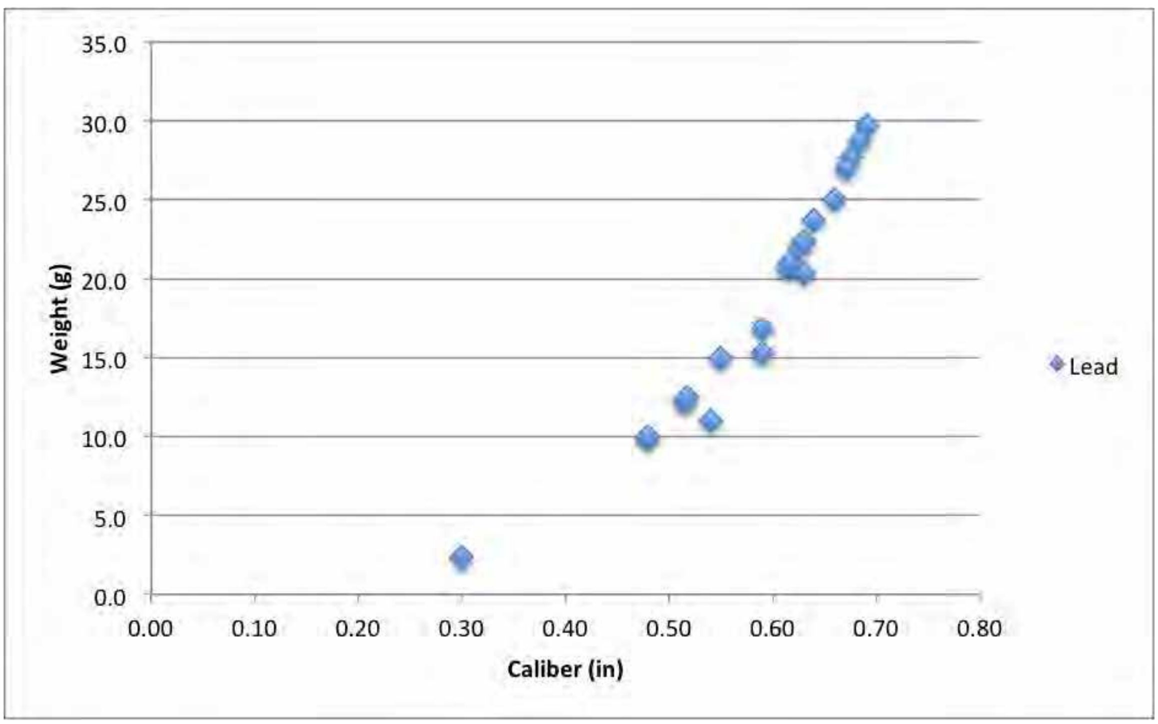

Figure 6.3: Scatterplot of Ball Diameters from All Measurable Lead Projectiles Recovered at Maxwell's Field from 2003 to 2015.

Table 6.1: Quantification of Lead Balls Recovered by Berger, Hunter, and The Ottery Group, 2003 to 2015, by Size Category.

Ball Diameter	Quantity (=n)	Percentage
0.30	1	5.3
0.479-0.48	2	10.5
0.514-0.518	2	10.5
0.54-0.55	2	10.5
0.59	2	10.5
0.613-0.64	6	31.5
0.66-0.69	4	21.1
Total	**19**	**100**

The smallest of these munitions is catalogued by Hunter Research as buckshot, but the diameter was calculated from the weight of the projectile indicating deformity of the ball. This likely prevents positive identification as a historic or modern munition; in any event, modern 00-size buckshot, with a diameter of 0.33 inches, is considered by Sivilich to be indistinguishable from the small shot used in the buck-and-ball load by American soldiers, in which a musket was loaded with a musket ball as well as two or more pieces of smaller shot for greater effectiveness (personal communication, Daniel Sivilich to Matthew Palus, 11/07/2014).

6.3 Discussion

The distribution of ball diameters in the scatterplots above (Figures 6.2 and 6.3) can be divided into any number of categories, but it should reflect the arms that were potentially present at the Battle of Princeton. The distribution of fired and dropped projectiles, combined with the distribution of grape shot across the project area, may reflect patterns that can be used to make inferences about the battle taking place on and around Maxwell Field.

Milner's *Battle of Princeton Mapping Project* (Selig, Harris and Catts 2010) offers the most comprehensive survey of published and unpublished sources available bearing on the order of battle and the composition of British and American forces involved in the Battle of Princeton, specifically the opening engagement between Mawhood's forces and American infantry under the command of Mercer and Cadwalader. However, the JMA study principally addresses field guns potentially available to American forces, as these proved crucial to breaking the charge of Mawhood's light dragoons (2010:42, 67). Small arms are not discussed apart from the capabilities of American riflemen. The opening of the battle pitted the 17th Regiment of Foot, armed with Brown Bess Muskets (.75 caliber) or light infantry fusils (.65 caliber), and mounted and dismounted 16th Light Dragoons who were likely armed with carbine pattern muskets, against Mercer's Continental troops, and militia under Cadwalader who probably carried mixed arms.

In an analysis of lead balls associated with the British post at Gloucester Point, Virginia during the Siege of Yorktown in 1781, Torp et al. (2010:142) identify some of the issues related to using lead ball caliber to discern the weapons represented. The American soldiers were likely equipped with French Charleville muskets in that context, however, the weapons used by the American troops at the Battle of Princeton, prior to direct French involvement, is less clear.

The caliber of a lead ball was usually cast .05-.10 inch less than the caliber of the smoothbore musket (Neumann 1967:14). The majority of the large lead balls would be characteristic for use with the British Brown Bess musket and other British weapons, generally in the .75 to .80 caliber range (Neumann 1967: 40), however, Americans may have used some of these weapons during the Battle of Princeton. It should also be noted that the Dutch-German muskets were of the same large caliber

(Neumann 1967:44). The French Charleville (.69 caliber) muskets would have used a smaller caliber ball (Neumann 1967:42) than British muskets in use, which would allow for the differentiation of munitions on the battlefield, though it should be noted that these caliber balls may also represent British pistols. The Americans also used Dutch muskets and their own copies of the Brown Bess style both with the larger caliber (Neumann 1967:46). Thus, despite the fact that British and American lead balls have been differentiated on the battlefield according to size (see, for example, Sivilich 2004) these studies generally have the benefit of using dropped balls versus fired balls as a controlled variable to define the universe of ball calibers in use by combatants. Although the analysis of munitions is not complete due to the need to limit handling of the artifacts until protein residue analysis is completed, the distribution of dropped munitions in the project area does not appear to include sufficient evidence to firmly establish the placement of soldiers on the landscape. The firing lines may extend beyond the project area boundaries, but the observed distribution may also be indicative of a quickly-moving action. In either event, additional archival study to better document the range of weapons in use by the combatants, as well as the completion of the attribute analysis for munitions, before significant interpretation of the action within the project area can be made.

6.4 Conclusions

The results of the investigation appear to be largely consistent with prior investigations, with some exceptions. One issue is inconsistency in the quantities of Revolutionary War munitions recovered during systematic metal detection surveys that are otherwise equivalent (following comparisons made at the end of the preceding chapter). One explanation is simply the distribution of Revolutionary War munitions and other artifacts associated with the Battle of Princeton within Maxwell's Field. The expectation that each round of metal detecting should result in recovery in a similar return for the effort, in terms of historical munitions and other military artifacts, is premised in the notion that the land itself contains an even and regular distribution of these artifacts. Given equal competency and instrumentation, the differential recovery of munitions with each survey points towards an irregular distribution of such artifacts, which thus far is consistent with narrative accounts of the Battle of Princeton.

Beyond this, the results would indicate that a sufficient sample of the Maxwell's Field portion of the Princeton Battlefield has been collected. Additional metal detection survey is likely to result in the recovery of additional artifacts; some portion of the resulting collections may be relevant to the Revolutionary War battle; however, the general distribution of artifacts over the project area is not likely to change in a significant manner.

Archeological fieldwork has never been focused on one-hundred percent artifact recovery; it would be unreasonably expensive and time-consuming given the diminishing returns to interpretation to either excavate 100 percent of the project area or complete multiple additional iterations of metal detecting of the same area. Archeological interpretation is based on the collection and analysis of samples. The three surveys, and the data that are available regarding the additional collections associated with the project area would indicate that additional survey is likely to recover the same broad types of artifacts in similar clusters to what is currently known. Additional survey is not likely to yield new data. Therefore, the artifacts collected to date are considered to represent a sufficient and representative sample of the material remains within the project area.

7.0 Summary of Project Status

7.1 Comparison of Cumulative Results with the ABPP Framework

The current study expands available archeological data pertaining to the Battle of Princeton, and complements the results of previous studies. A sample consisting of at least 51 Revolutionary War artifacts have been recovered from the IAS faculty housing project area. These data provide a platform to carry out problem-oriented research that combines the series of hypotheses about the chronology and spatial associations of the battle presented in JMA's *Battle of Princeton Mapping Project* (Selig, Harris and Catts 2010) with representative archeological data. The cumulative archeological data contributes to the analysis of the Princeton Battlefield synthesized by the JMA study.

Milner's study does not engage archeological data in a substantive way, largely due to the lack of data for the entirety of the battlefield. It should however be seen as a resource that complements and enhances archeological investigation of the battle. Additional research may improve the ability to distinguish British and American munitions, and may identify other militaria within the collection. Further analysis of the assemblage of militaria recovered from Site 28ME363 is necessary and can contribute to the narrative presented in the JMA study. Preparation for permanent curation of the complete assemblage from all investigations between 2003 and 2015 provides that opportunity. Systematic, professional investigations of a wider portion of the Princeton Battlefield, however, remains both lacking and necessary.

7.2 Blood Protein Residue Analysis

The July 14, 2014 press release from PBS included a recommendation from battlefield archeologist Douglas Scott that all lead balls be analyzed by a qualified and independent laboratory for the presence of human protein, or blood residue. A laboratory to perform this analysis has been identified, as discussed in Chapter 4. The Ottery Group is advised that protein residue may be recovered even from munitions that have been washed according to conventional laboratory practice in archeology. For this reason, a sample of munitions, including lead balls and iron grape shot from prior investigations will be subjected to protein residue analysis. The presence of human protein or blood residue on munitions may be reflective the intensity of battle. The samples for protein residue analysis will be submitted following transfer of the artifact collections currently in the possession of LBG to The Ottery Group.

Protein residue analysis must precede the attribute analysis of the complete assemblage of Revolutionary War munitions from the project area. Special treatment was given to recovered munitions, whether or not it appeared to have been fired and deformed from impact. In the interest of future analysis for traces of human blood or tissue, these finds were handled as little as possible and transferred into a polyvinyl bag with a clean trowel or another tool. They were not washed or removed from their field bags during cataloging. Analysis of these artifacts, including photographs for publication, will follow testing for protein residue. Once this testing is completed and the artifacts are returned to The Ottery Group, analysis of munitions will proceed.

7.3 Munitions Analysis

Analysis of munitions recovered by The Ottery Group in 2014-2015 has been minimal in order to avoid handling of these artifacts prior to completion of blood residue analysis. The entire assemblage collected between 2003 and 2015 must be prepared for permanent curation, which creates the opportunity to examine and analyze the entirety of Revolutionary War artifacts in the collection. This analysis may identify and consistently record attributes of artifacts within the collection that are appropriate for battlefield interpretation, such as severely deformed and fragmentary lead balls, as well as other artifacts such as metal components of soldiers dress or uniforms (buckles, buttons, frogs, hooks, etc.), weapon parts, and other materiel. Analysis of munitions will entail determining to the greatest possible extent what arms and provisions equipped each unit participating in the early stages of the Battle of Princeton.

Analysis of the combined assemblage may clarify the narrative of the Battle of Princeton, specifically the spatial associations of Revolutionary War artifacts with elements presented in the KOCOA analysis developed by JMA. Munitions analysis can more clearly identify troop positions during the progression of a portion of the two-hour battle. To this end, it is recognized that the study area for the IAS faculty housing project is spatially constrained and this imposes a limitation on what this analysis can achieve.

7.4 Permanent Curation

Upon the completion of analysis and preparation of a consolidated catalog for the entire collection, the artifacts will be prepared for permanent curation in accordance with the curation guidelines of the NJSM (2005). At this time it is anticipated that the collection will be permanently curated at the NJSM, however consultation may identify appropriate alternative repositories.

7.5 Final Report

A final report will be prepared by The Ottery Group that addresses the outcome of archeological monitoring, and also presents results following the completion of ongoing aspects of this study. It is anticipated that the review of the interim report by professionals, regulatory agencies, and the interested public will enhance the contribution of the final report to the knowledge of the Battle of Princeton.

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APPENDIX A:
Artifact Catalog

The Ottery Group

Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Ottery	STP	1			2		8.01	coal						fuel		
Ottery	STP	2			1		4.10	brick		fragment				structural		
Ottery	STP	3			1			glass	container	body	bottle	colorless	colorless	indefinite		
Ottery	STP	3			1			glass		fragment	window	aqua	aqua	structural		
Ottery	STP	4			1			ceramic	whiteware	footring and base	unid		undecorated	domestic		
Ottery	STP	5			6		26.91	coal						fuel		
Ottery	STP	5			1		14.27	slag						indefinite		
Ottery	STP	5			1			glass	container	finish	bottle	amethyst	amethyst; possible blog finish	domestic		solarized
Ottery	STP	5			1			ceramic	porcelain	handle	hollowware		undecorated	domestic		
Ottery	STP	5			1			ferrous alloy		fragment	unid		curved, with rounded end	indefinite		pipe-like, possible plumbing part
Ottery	STP	5			1			ceramic	whiteware	body	unid		undecorated	domestic		
Ottery	STP	5			3			glass		fragment	window	aqua	aqua	structural		
Ottery	STP	6			1			glass		fragment	window	aqua	aqua	structural		
Ottery	STP	7			1		5.42	coal						fuel		
Ottery	STP	8			1			ceramic	coarse earthenware	body	hollowware	red	red-bodied; unglazed	domestic		
Ottery	STP	9			1		5.82	brick		fragment				structural		
Ottery	STP	10			1		14.07	brick		fragment				structural		
Ottery	STP	10			1			glass		fragment	window	aqua	aqua	structural		
Ottery	STP	11			1		37.55	brick		fragment				structural		
Ottery	STP	12			1			nail	unidentified					structural		
Ottery	STP	12			2			nail	wire	head and shank			galvinized	structural		
Ottery	STP	12			2			nail	wire	shank			galvinized	structural		
Ottery	STP	12			1			glass	container	body	bottle	colorless	colorless	indefinite		
Ottery	STP	12			5			ceramic	whiteware	body	hollowware	blue	blue painted int/ext	domestic		same vessel as 12.2
Ottery	STP	12			3			ceramic	whiteware	body	hollowware	blue	blue painted int/ext	domestic		burned; same vessel as 12.1
Ottery	STP	12			1			ceramic		fragment	tile	white	white ext.	structural		
Ottery	STP	13			1			glass	container	body	bottle	olive green	olive green	indefinite		

The Ottery Group

Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Ottery	STP	14			1			ceramic	whiteware	body	unid		undecorated	domestic		
Ottery	STP	15			1			glass	container	body	bottle	aqua	aqua	indefinite		embossed "…? g…"
Ottery	STP	16			1		16.68	slag						indefinite		
Ottery	MDS	17			1		24.68	Lead			Musket Ball		Flattened	Ammunition		Immeasurable
Ottery	MDS	18			1		27.34	Lead			Musket Ball		Deformed	Ammunition		Immeasurable
Ottery	MDS	19			1			Copper Alloy			Unidentified		Possible ornament or button	Indefinite		Molded lines
Ottery	MDS	20			1		22.26	Coal						Fuel		
Ottery	MDS	21			1	0.59	16.83	Lead			Pistol Ball			Ammunition		.59 caliber
Ottery	Surface	22			1			Rhyolite			Debitage		Chunk	Prehistoric		
Ottery	Surface	23			1			Wood			Tree root			Floral		
Ottery	MDS	24			1			Iron			Unidentified		Corroded	Indefinite		
Ottery	MDS	25			1	0.22	1.51	Lead			Bullet			Non-historic		.22 caliber
Ottery	MDS	26			1			Iron			Unidentified		Corroded	Indefinite		Possible nail
Ottery	MDS	27			4			Aluminum			Cap liner		Deteriorated	Domestic		Within 20th c. glass container
Ottery	Surface	28			1			Glass			Container	colorless	Thick, colorless	Domestic		20th c.
Ottery	MDS	29			1		56.25	Iron			Grapeshot		Corroded	Ammunition		
Ottery	MDS	30			1			Iron			Scraper blade			Activities		Modern
Ottery	MDS	31			1			Copper Alloy			Cable			Domestic		Modern
Ottery	MDS	32			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	33			1			Composite			Phone jack		Wall-mounted for 4-prong plugs	Electrical		20th c.
Ottery	MDS	34			1		7.49	Coal						Fuel		
Ottery	MDS	35			1			Iron			Unidentified		Corroded	Indefinite		Possible bolt
Ottery	MDS	36			1			Composite			Paint Brush		Handle broken off	Activities		"Purdy" etched on both sides
Ottery	MDS	37			1		29.35	Coal						Fuel		
Ottery	MDS	38			1		9.46	Coal						Fuel		
Ottery	MDS	39			1			Lead		Frag	Unidentified		Square fragment	Indefinite		

The Ottery Group

Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Ottery	Surface	40			1			Ceramic			Tile	red	Construction tile, red	Structural		
Ottery	MDS	41			1			Iron			Strap		Corroded	Structural		
Ottery	MDS	42			1			Composite			Unidentified		Iron bar attached to possible ceramic wheel	Indefinite		Possible toy
Ottery	MDS	43			2			Iron			Strap		Corroded	Structural		
Ottery	MDS	44			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	45			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	46			1			Iron		Shank frag	Bolt		Shank fragment	Structural		
Ottery	MDS	47			1			Iron			Unidentified		Corroded	Indefinite		
Ottery	MDS	48			1		17.05	Coal						Fuel		
Ottery	MDS	49			1		23.76	Coal						Fuel		
Ottery	MDS	50			1			Iron			Bolt			Structural		
Ottery	MDS	51			1			Iron			Bolt			Structural		
Ottery	MDS	52			1		10.85	Coal						Fuel		
Ottery	MDS	53			1			Iron			Nail		Wire	Structural		
Ottery	Surface	54			1			Glass			Container	Colorless	Colorless	Domestic		Surface find
Ottery	MDS	55			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	56			1			Iron			Sheet metal			Structural		
Ottery	Surface	57			1	0.866		Carbon			Rod		22 mm diameter	Indefinite		
Ottery	MDS	58			1			Composite		handle	Folding knife		Wood and iron handle	Personal		
Ottery	MDS	59			1			Aluminum			Can		Amp energy drink	Domestic		Modern
Ottery	MDS	60			1			Chrome			Pin			Structural		Broken off disc assembly during plowing
Ottery	MDS	61			1			Iron			Bolt			Structural		
Ottery	MDS	62			1			Iron			Nail		Machine cut	Structural		
Ottery	MDS	63			1			Iron			Rim spike			Structural		
Ottery	MDS	64			1			Iron			Bolt			Structural		

Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Ottery	MDS	65			1			Iron			Strip		Very thin	Indefinite		
Ottery	MDS	66			1			Slag					Iron	By-Product		
Ottery	MDS	67			1			Iron			Sheet metal			Structural		
Ottery	MDS	68			1			Iron			Sheet metal		Drilled hole	Structural		
Ottery	MDS	69			1			Iron			Sheet metal		Folded	Structural		
Ottery	MDS	70			1			Copper Alloy			Gear		Possible clock piece	Indefinite		
Ottery	MDS	71			1			Iron			Metal plate		Multiple drilled holes	Indefinite		Possible machine part
Ottery	MDS	72			1			Aluminum			Can		Arizona sweet tea	Domestic		
Ottery	MDS	73			1			Iron			Unidentified		Corroded	Indefinite		
Ottery	MDS	74			1			Iron			Strip		Very thin	Indefinite		
Ottery	MDS	75			1			Composite			Utility tape		Plastic and aluminum	Activities		
Ottery	MDS	76			1	0.787		Iron			Nut		2 cm diameter	Structural		
Ottery	MDS	77			1			Aluminum			Can		Amp energy drink	Domestic		
Ottery	MDS	78			1			Iron			Strip		Very thin	Indefinite		
Ottery	MDS	79			1			Aluminum			Can		Red Bull energy drink	Domestic		
Ottery	MDS	80			1			Iron			Fence staple			Structural		
Ottery	MDS	81			1			Copper Alloy			Wire			Structural		
Ottery	MDS	82			1			Composite			Electrical connection cable		Etched "GAF-360-11Q"	Electrical		
Ottery	MDS	83			1			Iron			Nut and bolt			Structural		
Ottery	MDS	84			1			Steel			Electrical plate		"Verizon" on back	Electrical		
Ottery	MDS	85			1	3.268		Iron			Ring		8.3 cm diameter	Indefinite		Possible jar liner
Ottery	MDS	86			1			Steel			Mesh			Indefinite		
Ottery	MDS	87			1			Iron			Bolt		Large	Structural		
Ottery	MDS	88			1			Aluminum			Can		Unidentified type	Domestic		
Ottery	MDS	89			1	0.591		Iron			Nut		1.5 cm diameter	Structural		

The Ottery Group

Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Ottery	MDS	90			1			Iron			Unidentified		Corroded	Indefinite		
Ottery	MDS	91			1			Iron			Unidentified		Corroded	Indefinite		
Ottery	Surface	92			1			Ceramic			Bathroom tile	White	White glaze	Structural		
Ottery	MDS	92			1			Iron			Horseshoe			Activities		
Ottery	MDS	93			1			Iron			Spike			Structural		
Ottery	MDS	94			1			Iron			Unidentified		Possible furniture hardware	Indefinite		
Ottery	MDS	95			1			Iron			Strip		Bent	Indefinite		
Ottery	MDS	96			1			Copper Alloy			Shotgun shell		12 gauge	Non-historic		"Manchester"
Ottery	MDS	97			1			Iron			Unidentified		Corroded, chunk	Indefinite		
Ottery	MDS	98			1			Iron			Nail		Hand wrought	Structural		
Ottery	MDS	99			1			Iron			Unidentified		Corroded, flat	Indefinite		
Ottery	MDS	100			1		23.76	Coal						Fuel		
Ottery	MDS	101			1			Iron			Bolt		Large	Structural		
Ottery	Surface	102			1			Whiteware		Base fragment	Flatware		Base frag, undecorated	Domestic		
Ottery	MDS	103			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	104			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	105			1			Iron			Nail		Hand wrought	Structural		
Ottery	MDS	106			1			Copper Alloy			Thimble			Activities		
Ottery	MDS	107			1			Iron			Spike		Hand wrought	Structural		Head frag
Ottery	MDS	108			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	109			1			Iron			Spike		Machine cut	Structural		Shank frag
Ottery	MDS	110			1			Composite			Unidentified		Iron and Copper alloy frag	Indefinite		
Ottery	MDS	111			1			Iron			Spike		Machine cut	Structural		
Ottery	MDS	112			1			Iron			Unidentified		Nut, bolt, and unid iron frag	Structural		
Ottery	MDS	113			1			Iron			Nail		Hand wrought	Structural		
Ottery	MDS	114			1			Iron			Spike		Hand wrought	Structural		

The Ottery Group

Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Ottery	MDS	115			1			Iron			Spike		Unidentified type	Structural		Head frag
Ottery	MDS	116			1			Iron			Nail		Hand wrought	Structural		Shank frag
Ottery	MDS	117			1			Iron			Nail		Machine cut	Structural		Shank frag
Ottery	MDS	118			1			Iron			Nail		Machine cut	Structural		Shank frag
Ottery	MDS	119			1			Iron			Nail		Wire	Structural		
Ottery	MDS	120			1			Iron			Nail		Hand wrought	Structural		
Ottery	MDS	121			1	0.63	20.39	Lead			Musket Ball		Flattened on one end	Ammunition		.63 caliber
Ottery	MDS	122			1		11.25	Coal						Fuel		
Ottery	MDS	123			1			Iron		Frag	Chain Link		Frag	Indefinite		
Ottery	MDS	124			2			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	125			1			Lead			Sprue			By-Product		
Ottery	MDS	126			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	127			1			Steel			Can			Domestic		
Ottery	MDS	128			1			Iron		Whole	Wrench		Whole	Activities		
Ottery	MDS	129			1			Iron			Nail		Unidentified type	Structural		
Ottery	Surface	130			1			Glass			Insulator	Aqua	Aqua	Electrical		
Ottery	MDS	131			1			Iron			Unidentified		Thick, flat	Indefinite		
Ottery	MDS	132			1			Iron			Bolt			Structural		
Ottery	MDS	133			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	134			1			Iron		Frag	Pipe		Frag	Plumbing		
Ottery	MDS	135			1			Slag						By-Product		
Ottery	MDS	136			1			Aluminum			Bracket		White coating	Structural		
Ottery	MDS	137			1			Iron			Nail		Wire	Structural		
Ottery	MDS	138			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	139			1			Steel			Nut		Red coating	Structural		
Ottery	MDS	140			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	141			1			Copper Alloy			Sheet metal			Indefinite		
Ottery	MDS	142			1			Iron			Nail		Unidentified type	Structural		

The Ottery Group

Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Ottery	MDS	143			1			Iron			Nut		Very large	Structural		
Ottery	MDS	144			1			Iron			Unidentified		Possible iron bar	Indefinite		
Ottery	MDS	145			1			Iron			Bolt and Hinge		Attached	Structural		
Ottery	MDS	146			1			Copper Alloy			Unidentified		4 drilled holes	Indefinite		Possible cap or shell casing?
Ottery	MDS	147			1			Iron			Natural			Indefinite		Non-material culture
Ottery	MDS	148			1			Iron			Hardware		Corroded	Structural		Possible hinge
Ottery	MDS	149			1			Lead		Frag	Chain Link		Frag	Indefinite		
Ottery	MDS	150			1			Iron			Spike		Wire	Structural		
Ottery	MDS	151			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	152			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	153			1		13.72	Coal						Fuel		
Ottery	MDS	154			1			Iron			Nail		Hand wrought	Structural		
Ottery	MDS	155			1			Iron			Nail		Machine cut	Structural		
Ottery	MDS	156			1			Iron			Nut		Square-shaped	Structural		
Ottery	MDS	157			1			Iron			Nut		Square-shaped	Structural		
Ottery	Surface	158			1		5.31	Mortar					Square fragment	Structural		
Ottery	MDS	159			1			Steel			Tab		Plated	Indefinite		"OPEN..." "PSEG/PR/?13759"
Ottery	MDS	160			1	0.59	15.27	Lead			Pistol Ball			Ammunition		.59 caliber
Ottery	MDS	161			1		24.47	Coal						Fuel		
Ottery	MDS	162			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	163			1			Iron			Nail		Hand wrought	Structural		
Ottery	MDS	164			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	165			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	166			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	167			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	168			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	169			1			Iron			Nail		Unidentified type	Structural		

The Ottery Group

Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Ottery	Surface	169			1			Ball Clay		Bowl frag	Tobacco Pipe		Bowl frag	Personal		
Ottery	Surface	170			1			Chert			Flake		Primary reduction	Prehistoric		
Ottery	MDS	171			1		15.04	Coal						Fuel		
Ottery	MDS	172			1		20.46	Coal						Fuel		
Ottery	MDS	173			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	174			1			Iron			Bolt		Square head	Structural		
Ottery	MDS	175			1			Iron			Metal plate		Multiple drilled holes, bent	Indefinite		Possible machine part
Ottery	MDS	176			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	177			1			Iron			Metal plate		Two screws drilled in	Indefinite		Possible machine part
Ottery	MDS	178			1			Iron			Nail		Wire	Structural		
Ottery	MDS	179			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	180			1			Iron			Tag		Plated	Indefinite		Front:"MADE IN MEXICO" Back: "BP16225"
Ottery	MDS	181			1			Iron			Metal plate		Multiple drilled holes, bent	Indefinite		Possible machine part
Ottery	MDS	182			1			Iron			Bolt			Structural		
Ottery	MDS	183			1			Aluminum			Can		Amp energy drink	Domestic		
Ottery	MDS	183			1		36.72	Coal						Fuel		
Ottery	MDS	184			1			Iron			Nail		Wire	Structural		
Ottery	MDS	185			1			Iron			Sheet metal		Possible drilled hole	Indefinite		
Ottery	MDS	186			1			Composite			Conduit			Electrical		
Ottery	Surface	186			1			Whiteware		Rim frag	Crock		Rim frag	Domestic		
Ottery	MDS	187			1			Stainless Steel			Cup			Domestic		
Ottery	MDS	188			1			Iron			Nail		Wire	Structural		
Ottery	MDS	189			1			Iron			Hardware		T-shaped	Indefinite		
Ottery	MDS	190			1			Iron			Nail		Wire	Structural		
Ottery	MDS	191			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	192			1			Iron			Bolt			Structural		
Ottery	MDS	193			1			Iron			Nail		Machine cut	Structural		

The Ottery Group

Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Ottery	MDS	194			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	195			1			Copper Alloy			Coin		Penny, corroded	Personal		
Ottery	MDS	196			1			Pewter		Rim frag	Hollowware		Rim frag	Domestic		
Ottery	MDS	197			1			Iron			Unidentified		Corroded chunk	Indefinite		
Ottery	MDS	198			1			Iron			Nail		Hand wrought	Structural		
Ottery	MDS	199			1		11.51	Coal						Fuel		
Ottery	MDS	200			1		22.02	Coal						Fuel		
Ottery	MDS	201			1			Copper Alloy			Bar		Possibly electrical	Indefinite		
Ottery	MDS	202			1			Iron			Nut		Square-shaped	Structural		
Ottery	MDS	203			1			Iron			Hardware		Machine prong	Indefinite		
Ottery	MDS	204			1		53.47	Coal						Fuel		
Ottery	Surface	205			1			Chert			Core			Prehistoric		
Ottery	MDS	206			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	207			1			Iron			Nail		Hand wrought	Structural		
Ottery	MDS	208			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	209			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	210			1			Composite			Screwdriver		Plastic and iron	Activities		Very large
Ottery	MDS	211			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	212			1		55.56	Iron			Grapeshot		Corroded	Ammunition		
Ottery	MDS	213			1		7.74	Coal						Fuel		
Ottery	MDS	214			1			Iron			Nail		Wire	Structural		
Ottery	MDS	215			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	216			1			Iron			Hardware		Tractor part	Activities		
Ottery	MDS	217			1			Copper Alloy		Frag	Buckle		Frag	Personal		
Ottery	MDS	218			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	219			1		45.57	Iron			Grapeshot		Corroded	Ammunition		
Ottery	MDS	220			1			Iron			Nail		Machine cut	Structural		
Ottery	MDS	221			1			Iron			Nail		Unidentified type	Structural		

The Ottery Group

Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Ottery	MDS	222			1			Iron			Unidentified		Flat	Indefinite		Possible sheet metal
Ottery	MDS	223			1			Iron		Head frag	Screwdriver		Head frag	Activities		
Ottery	MDS	224			1			Iron		Shank frag	Spike		Shank frag	Structural		
Ottery	MDS	225			1			Iron			Unidentified		Possible hardware	Indefinite		
Ottery	MDS	226			1			Iron			Unidentified		Flat	Indefinite		Possible sheet metal
Ottery	MDS	227			1			Copper Alloy			Button		Dome-shaped, cast with eye in place	Personal		Stamped "[UNI]TED"
Ottery	MDS	228			1		5.34	Coal						Fuel		
Ottery	MDS	229			1			Copper Alloy			Bathroom fixture		Chrome plated	Domestic		
Ottery	MDS	230			1			Iron			Valve		Corroded	Indefinite		
Ottery	MDS	231			1			Lead			Sprue			By-Product		
Ottery	MDS	232			1		15.42	Coal						Fuel		
Ottery	MDS	233			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	234			1			Copper Alloy			Pipe		Threaded	Plumbing		
Ottery	MDS	235			1			Cast Iron			Hardware		Stove or machine part	Indefinite		
Ottery	MDS	236			1			Copper Alloy			Pipe		Threaded	Plumbing		
Ottery	MDS	237			1			Iron			Nail		Hand wrought	Structural		
Ottery	MDS	237			1			Lead			Sprue			By-Product		
Ottery	MDS	238			1			Iron			Unidentified		Corroded, chunk	Indefinite		
Ottery	MDS	239			1			Iron			Nail		Machine cut	Structural		
Ottery	MDS	240			1			Copper Alloy			Wire			Indefinite		
Ottery	MDS	241			1			Iron			Nail		Hand wrought	Structural		
Ottery	MDS	242			1			Iron			Nail		Machine cut	Structural		
Ottery	MDS	243			1			Iron			Unidentified		Corroded, chunk	Indefinite		
Ottery	MDS	244			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	245			1			Iron		Frag	Horseshoe		Frag	Activities		
Ottery	MDS	246			1			Iron		Frag	Pipe		Frag	Plumbing		

The Ottery Group

Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Ottery	MDS	247			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	248			1			Iron			Nail		Machine cut	Structural		
Ottery	MDS	249			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	250			1			Iron			Nail		Hand wrought	Structural		
Ottery	MDS	251			1			Iron			Bolt		Square head	Structural		
Ottery	MDS	252			1			Cast Iron			Machine part		Possible farm equipment	Indefinite		
Ottery	MDS	253			1			Iron			Nail		Machine cut	Structural		
Ottery	MDS	254			1			Iron			Rod		Possible farm equipment	Indefinite		
Ottery	MDS	255			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	256			1		33.98	Coal						Fuel		
Ottery	MDS	257			1			Iron			Unidentified		Corroded, chunk	Indefinite		
Ottery	MDS	258			1			Aluminum		Frag	Foil		Frag	Domestic		
Ottery	MDS	259			1			Iron			Unidentified		Possible farm equipment	Indefinite		
Ottery	MDS	260			1			Iron			Collar		Possible farm equipment	Indefinite		
Ottery	MDS	261			1			Composite			Unidentified		Wire in cement	Structural		
Ottery	MDS	262			1			Iron			Wire			Structural		
Ottery	MDS	263			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	264			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	265			1		39.21	Coal						Fuel		
Ottery	MDS	266			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	267			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	268			1			Iron			Nail		Hand wrought	Structural		
Ottery	MDS	269			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	270			1			Iron			Unidentified		Flat	Indefinite		
Ottery	MDS	271			1			Iron			Nail		Unidentified type	Structural		

The Ottery Group

Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Ottery	MDS	272			1			Aluminum			Can		Mountain Dew soda	Domestic		
Ottery	MDS	273			1			Aluminum		Frag	Can		Frag	Domestic		
Ottery	MDS	274			1			Cast Iron			Machine part		Two drilled holes	Indefinite		Possible farm equipment
Ottery	MDS	275			1			Aluminum			Can		Amp energy drink	Domestic		
Ottery	MDS	276			1			Aluminum			Can		Pepsi soda	Domestic		
Ottery	MDS	277			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	278			1			Iron			Horseshoe			Activities		
Ottery	MDS	279			1			Copper Alloy			Coin		Nickel, 2004	Personal		Special edition, Lewis and Clark
Ottery	MDS	280			2			Iron			Nail		Unidentified type	Structural		
Ottery	Surface	281			1			Whiteware		Base	Unidentified		Base, undecorated	Domestic		
Ottery	MDS	282			1			Iron			Wire			Structural		
Ottery	MDS	283			1		1.14	Slag						By-Product		
Ottery	MDS	284			1			Aluminum			Foil			Domestic		
Ottery	MDS	285			1			Iron			Unidentified		Corroded, chunk	Indefinite		
Ottery	MDS	286			1			Iron		Frag	Horseshoe		Fragment	Activities		
Ottery	MDS	287			1		68.93	Slag						By-Product		
Ottery	MDS	288			1			Iron		Frag	Horseshoe		Fragment	Activities		
Ottery	MDS	289			1			Iron			Sheet metal			Indefinite		
Ottery	MDS	290			1			Iron			Nail		Wire	Structural		
Ottery	MDS	291			1			Composite			Carabiner		Plastic coated iron	Activities		
Ottery	MDS	292			1			Composite					Nail in mortar	Structural		
Ottery	MDS	293			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	294			2			Iron			Unidentified		Flat	Indefinite		Possible sheet metal
Ottery	MDS	295			1			Iron			Hardware		Possible farm equipment	Indefinite		
Ottery	MDS	296			1			Iron			Nail		Unidentified type	Structural		

The Ottery Group

Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Ottery	Surface	297			3			Whiteware			Plate		Base; Makers mark: "[JO]HN MADDOCK & SONS…"			Mends; late 19th c.
Ottery	MDS	298			1			Iron			Unidentified		Flat	Indefinite		Possible sheet metal
Ottery	MDS	299			1			Iron			Nail		Wire	Structural		
Ottery	MDS	300			1			Iron		Frag	Hinge		Fragment	Structural		
Ottery	MDS	301			1			Aluminum			Can		Arizona sweet tea	Domestic		
Ottery	MDS	302			1			Iron			Unidentified		Flat	Indefinite		Possible sheet metal
Ottery	MDS	303			1			Iron			Unidentified		Flat	Indefinite		Possible farm equipment
Ottery	MDS	304			1	1.260		Porcelain			Figurine		Torso and legs, 3.2cm	Personal		
Ottery	MDS	305			1			Iron			Screw			Structural		
Ottery	MDS	306			1			Iron			Screw			Structural		
Ottery	Surface	307			1			Whiteware			Teacup		Blue transfer print	Domestic		1820-1990
Ottery	MDS	308			1			Composite			Connector		Copper alloy connector with porcelain insulator	Electrical		
Ottery	MDS	308			1			Iron			Nail		Wire	Structural		
Ottery	MDS	309			1			Iron			Horseshoe			Activities		
Ottery	MDS	310			1			Iron			Horseshoe		Bent	Activities		
Ottery	MDS	311			1			Iron		Frag	Can		Fragment	Domestic		
Ottery	MDS	312			1			Iron		Frag	Pipe		Fragment	Plumbing		
Ottery	MDS	313			1			Iron			Barbed wire			Structural		
Ottery	MDS	314			1			Iron			Pipe			Plumbing		
Ottery	MDS	315			1			Cast Iron			Bar		Possible farm equipment	Indefinite		
Ottery	MDS	316			2			Copper Alloy			Hardware		Possible electrical cap	Indefinite		
Ottery	MDS	317			1			Iron			Hinge			Structural		
Ottery	MDS	318			1			Iron			Hinge			Structural		
Ottery	MDS	319			1			Iron			Nail		Unidentified type	Structural		

The Ottery Group

Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Ottery	MDS	320			1			Iron			Nail		Unidentified type	Structural		
Ottery	Surface	321			1			Glass		Body frag	Container		Cobalt blue body frag	Domestic		Embossed "…SI…"
Ottery	MDS	322			1			Composite			Insulated wire		Iron and rubber	Electrical		
Ottery	MDS	322			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	323			1			Porcelain		Frag	Insulator		Fragment	Electrical		
Ottery	MDS	324			1			Iron			Unidentified		Corroded, chunk	Indefinite		
Ottery	MDS	325			1			Iron			Nail		Machine cut	Structural		
Ottery	MDS	325			1			Iron			Nail		Wire	Structural		
Ottery	MDS	326			1			Aluminum		Top frag	Can		Top frag	Domestic		
Ottery	MDS	327			1			Iron			Pipe			Plumbing		
Ottery	MDS	328			1			Aluminum		Top frag	Can		Top frag	Domestic		
Ottery	MDS	329			1			Iron			Unidentified		Corroded, chunk	Indefinite		
Ottery	Surface	330			1			Glass		Body frag	Container	Colorless	Colorless, body frag	Domestic		
Ottery	MDS	330			1			Cast Iron			Unidentified		Stove or farm equipment part	Indefinite		
Ottery	Surface	331			1			Glass		Body frag	Bottle	Amber	Amber, body frag	Domestic		
Ottery	MDS	331			1			Cast Iron			Unidentified		Stove or farm equipment part	Indefinite		
Ottery	Surface	331			1			Whiteware			Unidentified		Undecorated, body frag	Domestic		
Ottery	MDS	331			1		0.92	Coal						Fuel		
Ottery	MDS	332			1			Iron			Farm equipment			Structural		
Ottery	MDS	333			1			Iron			Chain Link			Indefinite		
Ottery	Surface	334			1			Whiteware		Rim frag	Hollowware		Undecorated, rim frag	Domestic		
Ottery	MDS	334			1			Copper Alloy			Wire			Electrical		
Ottery	MDS	335			1			Iron			Nut		Square-shaped	Structural		
Ottery	MDS	336			1			Iron			Spike			Structural		
Ottery	MDS	337			1		25.06	Coal						Fuel		
Ottery	MDS	338			1			Iron			Nail		Unidentified type	Structural		

The Ottery Group

Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Ottery	MDS	339			1			Copper Alloy			Wire			Electrical		
Ottery	MDS	340			1			Aluminum		Body frag	Can		Body frag	Domestic		
Ottery	MDS	341			2		50.62	Coal						Fuel		
Ottery	MDS	342			1		22.95	Coal						Fuel		
Ottery	Surface	343			1			Whiteware			Hollowware		Blue annular painted	Domestic		1820-1920
Ottery	Surface	344			1			Glass		Base	Wine Bottle	Olive green	Olive green, base	Personal		
Ottery	MDS	345			1			Iron			Wire			Indefinite		Possible fencing
Ottery	MDS	346			1		69.59	Coal						Fuel		
Ottery	MDS	347			1			Iron			Wire			Indefinite		Possible fencing
Ottery	MDS	348			1		9.34	Coal						Fuel		
Ottery	MDS	349			1			Iron			Bar		Possible hinge	Indefinite		
Ottery	Surface	350			1			Ceramic			Bathroom tile		Buff glazed	Structural		
Ottery	MDS	350			1			Aluminum		Body frag	Can		Body frag	Domestic		
Ottery	MDS	351			1			Copper Alloy			Wire			Electrical		
Ottery	MDS	352			1			Iron			Hinge			Structural		
Ottery	MDS	353			1		12.19	Coal						Fuel		
Ottery	MDS	354			1			Copper alloy			Ring	green	Green painted	Indefinite		Possible machine part
Ottery	MDS	355			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	356			1			Iron			Bolt			Structural		
Ottery	MDS	357			1			Iron		Frag	Horseshoe		Fragment	Activities		
Ottery	MDS	358			1			Iron			Bolt			Structural		
Ottery	Surface	359			1			Whiteware			Flatware		Blue transfer-printed	Domestic		
Ottery	MDS	360			1			Copper alloy			Bolt and washer		Large	Structural		
Ottery	MDS	361			1			Composite			Twist tie	black	Black	Domestic		
Ottery	MDS	362			1			Aluminum		Frag	Can		Fragment	Domestic		
Ottery	MDS	363			1			Iron			Nut and bolt			Structural		
Ottery	MDS	364			1			Iron			Wire		Flat	Indefinite		
Ottery	MDS	365			1			Iron		Frag	Unidentified		Fragment	Indefinite		
Ottery	MDS	366			1			Cast iron			Unidentified		Flat	Indefinite		Possible machine part

The Ottery Group

Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Ottery	MDS	367			1			Copper alloy			Swiss Franc		20 rappen from the Swiss Confederation	Personal		Back: "20", Front: "Confœderatio Helve[tica]…"
Ottery	MDS	368			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	369			2			Iron			Nail		Hand wrought	Structural		Mends
Ottery	MDS	370			1		11.34	Coal						Fuel		
Ottery	MDS	371			1			Iron		Frag	Unidentified		Bolt or nail frag	Structural		
Ottery	MDS	372			1			Iron			Unidentified		Flat, possible hinge	Indefinite		
Ottery	MDS	373			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	374			1		22.68	Coal						Fuel		
Ottery	MDS	375			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	376			1			Iron			Nail		Unidentified type	Structural		
Ottery	Surface	377			1			Whiteware			Flatware	Light blue	Light blue painted	Domestic		Body frag
Ottery	MDS	378			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	379			1			Iron			Nail		Hand wrought	Structural		
Ottery	MDS	380			1		51.03	Coal						Fuel		
Ottery	MDS	381			1			Aluminum			Can		Amp energy drink	Domestic		
Ottery	MDS	382			1			Copper alloy			Tube		Possibly electrical	Indefinite		
Ottery	MDS	383			1			Copper alloy			Elbow pipe joint			Plumbing		
Ottery	Surface	384			1			Redware			Flower pot		Unglazed	Domestic		
Ottery	MDS	385			1			Iron			Spike		Unidentified type	Structural		
Ottery	MDS	386			1			Iron			Spike		Hand wrought	Structural		
Ottery	Surface	387			1			Whiteware		Rim	Flatware		Rim, undecorated	Domestic		
Ottery	MDS	388			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	389			1			Iron			Nail		Hand wrought	Structural		Shank frag
Ottery	MDS	390			1			Copper alloy			Furniture hardware		Plate w/ drilled holes	Domestic		
Ottery	Surface	391			1			Whiteware		Rim	Plate		Rim, Flow Blue	Domestic		

The Ottery Group

Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Ottery	MDS	392			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	393			1			Porcelain		Rim	Hollowware		Rim, undecorated	Domestic		
Ottery	MDS	394			1			Composite			Antennae spring		Automobile part	Modern		
Ottery	MDS	395			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	396			1			Iron			Unidentified		Flat	Indefinite		
Ottery	MDS	397			1			Iron		Frag	Unidentified		Small frag	Indefinite		
Ottery	MDS	398			1			Iron			Bolt		Square head	Structural		
Ottery	MDS	399			1			Iron			Elbow pipe joint			Plumbing		
Ottery	MDS	399			1		2.83	Coal						Fuel		
Ottery	Surface	399			1		5.67	Brick						Structural		
Ottery	Surface	400			1			Ceramic			Bathroom tile	white	White glaze	Structural		
Ottery	MDS	400			1			Porcelain			Unidentified		Prongs, broken	Indefinite		
Ottery	Surface	401			1			Glass			Jar		Milk glass	Domestic		
Ottery	MDS	402			1		45.6	Iron			Grape shot			Ammunition		
Ottery	Surface	402			1			Ceramic			Sewer pipe			Structural		
Ottery	Surface	403			1			Glass		base	Jar		Base, cosmetic	Personal		Ponds cold cream
Ottery	MDS	404			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	405			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	406			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	407			1			Aluminum			Bottle cap		"S" inside "Since/1872" "Trade Mark"	Domestic		Water bottle, Saratoga Spring Water
Ottery	MDS	408			1			Iron		Frag	Wire		Fragment	Indefinite		
Ottery	MDS	409			1			Iron		Frag	Wire		Fragment	Indefinite		
Ottery	MDS	410			1			Iron		Frag	Wire		Fragment	Indefinite		
Ottery	MDS	411			1			Iron		Frag	Wire		Fragment	Indefinite		
Ottery	MDS	412			1			Iron		Frag	Wire		Fragment	Indefinite		
Ottery	MDS	413			1			Iron		Frag	Wire		Fragment	Indefinite		

The Ottery Group

Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Ottery	MDS	414			1			Iron		Frag	Pipe		Large frag	Plumbing		
Ottery	MDS	415			1			Iron			Unidentified		Flat	Indefinite		
Ottery	MDS	416			1			Cast iron			Unidentified		Flat	Indefinite		Possible machine part
Ottery	Surface	417			1			Glass		Base	Wine bottle	olive green	Base, dark olive green	Domestic		
Ottery	MDS	418			1			Aluminum			Can		Pepsi can	Domestic		
Ottery	MDS	419			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	420			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	421			1			Aluminum			Can		Amp energy drink	Domestic		
Ottery	MDS	422			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	423			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	424			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	425			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	426			1			Iron			Bar		Possible horseshoe	Indefinite		
Ottery	MDS	427			1			Iron			Nail		Wire	Structural		
Ottery	MDS	428			1			Iron			Spring		Corroded	Structural		
Ottery	MDS	429			1			Iron			Nail		Wire	Structural		
Ottery	MDS	430			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	431			1			Iron			Plate		Drilled holes and bolts	Indefinite		Possible machine part
Ottery	MDS	432			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	433			1		50.1	Iron			Grape shot			Ammunition		
Ottery	MDS	434			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	435			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	436			1			Iron			Unidentified		Chunk	Indefinite		
Ottery	MDS	437			1			Iron			Nut		Square	Structural		
Ottery	MDS	438			1			Aluminum			Can		Coke	Domestic		

The Ottery Group

Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Ottery	MDS	439			1		25.51	Coal						Fuel		
Ottery	MDS	440			1			Aluminum			Can		Red Bull energy drink	Domestic		
Ottery	MDS	441			1			Porcelain			Hollowware		Profile, floral painted	Domestic		Paint rubbed off
Ottery	MDS	442			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	443			1			Iron			Strap		Flat, thin	Indefinite		
Ottery	MDS	443			1			Iron			Unidentified		Chunk	Indefinite		
Ottery	MDS	444			1			Iron			Unidentified		Folded	Indefinite		Possible machine part
Ottery	MDS	445			1			Iron			Iron concretion			Natural		
Ottery	MDS	446			1			Cast iron			Unidentified		Flat	Indefinite		Possible machine part
Ottery	MDS	447			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	448			1		51.03	Coal						Fuel		
Ottery	MDS	449			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	450			1			Aluminum			Can		Beer	Domestic		
Ottery	MDS	451			1			Steel			Bracket		Dog collar part	Activities		
Ottery	MDS	452			1			Composite			Laundry line		Coated metal wire	Domestic		
Ottery	MDS	453			1			Iron			Bar		Possible horseshoe	Indefinite		
Ottery	MDS	454			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	455			1			Copper alloy			Thimble			Activities		
Ottery	MDS	456			1		8.5	Coal						Fuel		
Ottery	MDS	457			1			Copper alloy			Hinge		Applied decoration	Indefinite		
Ottery	Surface	458			1		2.83	Concrete						Structural		
Ottery	MDS	459			1		8.5	Coal						Fuel		
Ottery	MDS	460			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	461			1			Composite			File		Steel plated iron	Activities		Machinist's triangular file
Ottery	MDS	462			1			Iron			Nail		Unidentified type	Structural		

The Ottery Group

Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Ottery	MDS	463			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	464			1			Iron			Nail		Unidentified type	Structural		Very corroded
Ottery	MDS	465			1			Iron			Nail		Hand wrought	Structural		
Ottery	Surface	466			1			Whiteware		Rim	Hollowware		Rim, undecorated	Domestic		
Ottery	MDS	467			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	468			1			Iron			Nut		Square	Structural		
Ottery	MDS	469			1			Iron			Bolt		Square head	Structural		
Ottery	MDS	470			1			Iron			Unidentified		Flat	Indefinite		
Ottery	MDS	471			1			Iron			Bolt		Square head	Structural		
Ottery	MDS	472			1			Steel			Wire			Structural		
Ottery	MDS	473			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	474			1			Iron			Wire			Structural		
Ottery	MDS	475			1			Cast iron		Frag	Unidentified		Ring frag	Indefinite		Possible machine part
Ottery	MDS	476			1			Iron			Nail		Unidentified type	Structural		
Ottery	Surface	477			1			Glass			Bottle		Coke, script "…la"	Domestic		
Ottery	MDS	477			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	478			1			Iron			Pipe			Plumbing		
Ottery	MDS	479			1			Plastic			Pencil sharpener			Modern		
Ottery	MDS	480			1		28.35	Coal						Fuel		
Ottery	MDS	481			1			Iron			Nail		Wire	Structural		
Ottery	MDS	482			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	483			1			Iron			Unidentified		Flat, bent	Indefinite		
Ottery	MDS	484			1		2.83	Coal						Fuel		
Ottery	MDS	485			1			Iron			Wire			Structural		
Ottery	MDS	486			1		14.17	Coal						Fuel		
Ottery	MDS	487			1			Iron			Wire			Structural		
Ottery	Surface	488			1		249.47	Asphalt						Structural		

The Ottery Group

Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Ottery	MDS	489			1			Iron			Bolt		Hexagonal head	Structural		
Ottery	Surface	489			1			Glass			Bottle	colorless	Colorless	Domestic		
Ottery	MDS	490			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	490			1		19.84	Coal						Fuel		
Ottery	MDS	491			1			Iron			Unidentified		Flat	Indefinite		
Ottery	MDS	492			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	493			1			Iron			Unidentified		Flat, folded	Indefinite		
Ottery	MDS	494			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	495			1			Iron			Unidentified		Flat, folded	Indefinite		Possible machine part
Ottery	MDS	496			1			Iron			Pipe			Plumbing		
Ottery	MDS	497			1		8.5	Coal						Fuel		
Ottery	MDS	498			1			Iron			Unidentified		Flat	Indefinite		Possible ring frag
Ottery	MDS	499			1			Iron			Wire			Structural		
Ottery	MDS	500			1			Aluminum			Pull tab			Domestic		
Ottery	MDS	501			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	502			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	503			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	504			1			Iron			Bar			Indefinite		
Ottery	MDS	504			1			Iron			Unidentified		Y-shaped	Indefinite		Possible machine part
Ottery	MDS	505			1			Porcelain			Fixture		Undecorated	Domestic		
Ottery	MDS	505			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	506			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	507			1			Iron			Nail		Wire	Structural		
Ottery	MDS	508			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	509			1		19.84	Coal						Fuel		
Ottery	MDS	510			1			Porcelain			Flatware		Blue transfer-printed	Domestic		

The Ottery Group

Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Ottery	MDS	511			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	512			1			Iron			Unidentified		Flat	Indefinite		Possible machine part
Ottery	MDS	513			1			Iron			Unidentified		Chunk	Indefinite		
Ottery	MDS	514			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	515			1			Iron			Pin		Two drilled holes	Structural		
Ottery	MDS	516			1			Aluminum			Foil		Food wrapper	Domestic		
Ottery	MDS	517			1		31.18	Coal						Fuel		
Ottery	MDS	518			1			Iron			Unidentified		Chunk	Indefinite		
Ottery	MDS	519			1			Iron			Bolt			Structural		
Ottery	MDS	520			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	521			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	522			1			Iron			Chain link			Structural		
Ottery	MDS	523			1			Iron			Chain link			Structural		
Ottery	MDS	524			1			Copper alloy			Pencil sharpener			Modern		
Ottery	MDS	525			1		11.34	Coal						Fuel		
Ottery	MDS	526			1		14.17	Coal						Fuel		
Ottery	MDS	527			1			Composite			Pocket knife		Wood handle, copper alloy blade	Personal		"BOYSCOUT"
Ottery	MDS	528			1			Iron			Unidentified		Chunk	Indefinite		
Ottery	MDS	529			1		14.17	Coal						Fuel		
Ottery	MDS	530			1			Iron			Wire			Structural		
Ottery	Surface	531			1			Glass			Bottle	colorless	Colorless	Domestic		Embossed "S"
Ottery	Surface	531			1			Whiteware		Rim	Hollowware		Rim, undecorated	Domestic		
Ottery	MDS	531			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	531			1			Shell			Oyster			Faunal		
Ottery	MDS	531			1			Porcelain		Body frag	Unidentified		Body frag, undecorated	Domestic		

The Ottery Group

Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Ottery	MDS	531			1			Steel			Unidentified		"Devil…/15/Toledo USA"	Electrical		
Ottery	Surface	531			1			Glass			Window			Structural		
Ottery	Surface	532			1			Stoneware			Bristol-Glazed	black/ white	Black interior, white exterior	Domestic		
Ottery	MDS	532			1			Copper alloy			Buckle		For a boot	Personal		
Ottery	MDS	533			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	534			1			Iron			Farm equipment		Nails included	Structural		
Ottery	MDS	535			1			Aluminum			Bottle cap			Domestic		
Ottery	MDS	536			1			Iron		Shank frag	Screw		Shank frag	Structural		
Ottery	MDS	537			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	538			1			Aluminum			Pull tab			Domestic		
Ottery	MDS	539			1			Iron			Wire			Structural		
Ottery	MDS	540			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	541			1			Iron			Spike			Structural		
Ottery	MDS	542			1		8.5	Coal						Fuel		
Ottery	MDS	543			1		0.41	Coal						Fuel		
Ottery	MDS	544			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	545			1			Iron			Nail		Wire	Structural		
Ottery	MDS	546			1			Iron			Wire			Structural		
Ottery	MDS	547			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	548			1			Iron			Nail		Wire	Structural		
Ottery	MDS	549			1			Iron			Wire			Structural		
Ottery	MDS	550			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	551			1			Iron			Nail		Wire	Structural		
Ottery	MDS	551			4		70.87	Coal						Fuel		
Ottery	MDS	551			1		14.17	Slag					Coal slag	By-Product		
Ottery	MDS	552			1			Iron			Hatchet		Blade only	Activities		
Ottery	MDS	553			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	554			1			Iron			Nail		Unidentified type	Structural		

The Ottery Group

Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Ottery	MDS	555			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	556			1		25.51	Coal						Fuel		
Ottery	MDS	557			1			Aluminum			Bottle seal		"K" inside circle	Domestic		
Ottery	MDS	558			1			Iron			Nail		Unidentified type	Structural		
Ottery	Surface	559			1			Whiteware			Hollowware	light blue	Light blue, engine turned	Domestic		Possible tea cup
Ottery	Surface	560			1			Glass		Finish frag	Jar	aqua	Aqua, finish frag	Domestic		Ring finish
Ottery	MDS	560			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	561			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	562			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	563			1			Cast iron			Unidentified		Possible machine part	Indefinite		
Ottery	MDS	564			1			Copper alloy			Medal		Philadelphia Surgical College faculty prize; backplate missing	Personal		"Collegium Medico Chirurgicale Philadelphiense"; pillar entwined by a serpent
Ottery	MDS	565			1			Iron			Nut and bolt		Corroded	Structural		
Ottery	MDS	566			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	567			1			Iron			Nail		Machine cut	Structural		
Ottery	MDS	568			1			Iron			Unidentified		Flat, round	Indefinite		Possible cap or button
Ottery	MDS	570			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	571			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	572			1			Iron			Hook			Structural		
Ottery	MDS	573			1			Iron			Sheet metal			Indefinite		
Ottery	MDS	574			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	575			1			Aluminum			Unidentified	red	Red paint	Indefinite		Possible can seam
Ottery	MDS	576			1			Copper alloy			Wire			Structural		
Ottery	MDS	577			1		31.18	Slag					Coal slag	By-Product		

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Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Ottery	MDS	578			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	579			1		14.17	Coal						Fuel		
Ottery	MDS	580			1		17.01	Coal						Fuel		
Ottery	MDS	581			1			Iron			Nail		Hand wrought	Structural		
Ottery	MDS	582			1		14.17	Coal						Fuel		
Ottery	MDS	583			1			Iron			Nail		Unidentified type	Structural		
Ottery	MDS	585			1			Iron			Unidentified		Possible bracket or hinge	Indefinite		
Ottery	MDS	586			1			Copper alloy			Wire			Structural		
Hunter	MDS		3	1	1			ferrous metal		fragment	spike			Structural	Building Materials	unidentified
Hunter	MDS		5	1	1			ferrous metal			nail			Structural	Building Materials	unidentified
Hunter	MDS		6	1	1			ferrous metal			nail			Structural	Building Materials	unidentified
Hunter	MDS		8	1	1			ferrous metal		fragment	nail			Structural	Building Materials	unidentified
Hunter	MDS		9	1	1			ferrous metal		fragment	nail			Structural	Building Materials	door nail, large head
Hunter	MDS		10	1	1	0.617	21.1	lead		whole	musket ball			Ammunition	Arms and Armor	21.1 g, impacted, calculated diameter 0.617"
Hunter	MDS		11	1	1			lead		fragment	barrel cleaner			Ammunition	Arms and Armor	0.38 caliber barrel cleaner
Hunter	MDS		12	1	1			ferrous metal		fragment	nail			Structural	Building Materials	unidentified
Hunter	MDS		13	1	1			ferrous metal		fragment	nail			Structural	Building Materials	unidentified
Hunter	MDS		14	1	1			ferrous metal		whole	nail			Structural	Building Materials	unidentified
Hunter	MDS		15	1	1			ferrous metal		whole	nail			Structural	Building Materials	unidentified
Hunter	MDS		16	1	1			ferrous metal		fragment	nail			Structural	Building Materials	unidentified
Hunter	MDS		17	1	1			ferrous metal		fragment	horseshoe			Activities	Agriculture/ Equestrian	
Hunter	MDS		18	1	1			ferrous metal		fragment	nail			Structural	Building Materials	unidentified
Hunter	MDS		19	1	1			ferrous metal		whole	nail			Structural	Building Materials	unidentified
Hunter	MDS		20	1	1			ferrous metal		fragment	nail			Structural	Building Materials	unidentified

Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Hunter	MDS		21	1	1			ferrous metal		whole	spike			Structural	Tools/Hardware	unidentified; L head; possible railroad spike
Hunter	MDS		22	1	1	2		ferrous metal		whole	harness ring			Activities	Agriculture/ Equestrian	2" diameter
Hunter	MDS		23	1	1			ferrous metal		whole	nail			Structural	Building Materials	unidentified
Hunter	MDS		25	1	1			ferrous metal		fragment	nail			Structural	Building Materials	unidentified
Hunter	MDS		26	1	1			ferrous metal		fragment	horseshoe			Activities	Agriculture/ Equestrian	
Hunter	MDS		27	1	1			ferrous metal		fragment	spike			Structural	Building Materials	unidentified
Hunter	MDS		28	1	1			ferrous metal		fragment	nail			Structural	Building Materials	unidentified
Hunter	MDS		30	1	1			ferrous metal		fragment	nail			Structural	Building Materials	unidentified
Hunter	MDS		32	1	1			ferrous metal		whole	nail			Structural	Building Materials	unidentified
Hunter	MDS		33	1	1			ferrous metal		fragment	nail			Structural	Building Materials	door nail; large head
Hunter	MDS		35	1	1			ferrous metal		whole	washer			Structural	Tools/Hardware	
Hunter	MDS		36	1	1			ferrous metal		whole	nail			Structural	Building Materials	unidentified
Hunter	MDS		37	1	1			ferrous metal		fragment	nail			Structural	Building Materials	unidentified
Hunter	MDS		38	1	1	1.1	82	ferrous metal		whole	grape shot			Ammunition	Arms and Armor	82g, 1.1" diameter, 3 oz.
Hunter	MDS		39	1	1			ferrous metal		fragment	nail			Structural	Building Materials	unidentified
Hunter	MDS		40	1	1			ferrous metal		fragment	nail			Structural	Building Materials	unidentified
Hunter	MDS		41	1	1			ferrous metal		fragment	nail			Structural	Building Materials	unidentified
Hunter	MDS		42	1	1			ferrous metal		fragment	hinge			Structural	Tools/Hardware	H shape
Hunter	MDS		43	1	1			ferrous metal		whole	bolt			Structural	Tools/Hardware	unidentified
Hunter	MDS		44	1	1			ferrous metal		fragment	nail			Structural	Building Materials	unidentified
Hunter	MDS		45	1	1			ferrous metal		whole	nail			Structural	Building Materials	unidentified
Hunter	MDS		46	1	1			ferrous metal		fragment	nail			Structural	Building Materials	unidentified
Hunter	MDS		47	1	1	0.9		ferrous metal		fragment	disk			Indefinite	Unidentified	0.9" diameter, disk shaped fragment

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Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Hunter	MDS		48	1	1			ferrous metal		fragment	nail			Structural	Building Materials	unidentified
Hunter	MDS		49	1	1			ferrous metal		fragment	nail			Structural	Building Materials	unidentified
Hunter	MDS		50	1	1			ferrous metal		whole	nail			Structural	Building Materials	unidentified
Hunter	MDS		52	1	1			ferrous metal		fragment	nail			Structural	Building Materials	unidentified
Hunter	MDS		53	1	1			ferrous metal		fragment	plate			Indefinite	Unidentified	flat plate fragment with remnant of one round full thickness perforation; possible stove part
Hunter	MDS		54	1	1			ferrous metal		fragment	horseshoe			Activities	Agriculture/ Equestrian	
Hunter	MDS		55	1	1			ferrous metal		whole	staple			Structural	Building Materials	large U-shaped staple
Hunter	MDS		56	1	1			ferrous metal		fragment	hook			Structural	Tools/Hardware	
Hunter	MDS		57	1	1			ferrous metal		fragment	nail			Structural	Building Materials	unidentified
Hunter	MDS		58	1	1			ferrous metal		fragment	nail			Structural	Building Materials	unidentified
Hunter	MDS		60	1	1			ferrous metal		fragment	nail			Structural	Building Materials	unidentified
Hunter	MDS		61	1	1	0.87	3.5	ferrous metal		whole	grape shot			Ammunition	Arms and Armor	3.5g, 0.87" diameter, 1.2 oz.
Hunter	MDS		62	1	1			ferrous metal		whole	horseshoe			Activities	Agriculture/ Equestrian	L 5.5in, W 0.6in, T 0.35in, branch width 5"; fullering, toe clip
Hunter	MDS		64	1	1			ferrous metal		fragment	spike			Structural	Building Materials	unidentified
Hunter	MDS		65	1	1			ferrous metal		whole	horseshoe			Activities	Agriculture/ Equestrian	L 5.5in, W 0.63in, T 0.3in, branch width 4.25"; one calkin. end of other branch broken off, fullering with some nails intact
Hunter	MDS		65	1	1			ferrous metal		fragment				Indefinite	Unidentified	flat, rectangular fragment
Hunter	MDS		66	1	1	1.1		copper alloy		whole	coin			Personal	Commerce	Liberty head large cent; 1.1" diameter
Hunter	MDS		67	1	1			white metal		fragment				Indefinite	Unidentified	thin curved fragment
Hunter	MDS		68	1	1			copper alloy		whole	bracket			Structural	Tools/Hardware	0.56" diameter, possible flag mount

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Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Hunter	MDS		70	1	1			ferrous metal		fragment	bayonet			Ammunition	Arms and Armor	tapering triangle in cross-section; L 2"
Hunter	MDS		71	1	1			ferrous metal		fragment	horseshoe			Activities	Agriculture/ Equestrian	
Hunter	MDS		72	1	1			ferrous metal		fragment	horseshoe			Activities	Agriculture/ Equestrian	
Hunter	MDS		73	1	1			ferrous metal		fragment	hinge			Structural	Tools/Hardware	
Hunter	MDS		74	1	1			ferrous metal		fragment	nail			Structural	Building Materials	unidentified
Hunter	MDS		75	1	1			ferrous metal		fragment	nail			Structural	Building Materials	unidentified
Hunter	MDS		76	1	1	0.7		copper alloy		whole	button			Personal	Clothing Related	loop shank; 0.7" diameter; unidentified back mark lettered ì... GILT". South Typology Type 18 1800-1865 [Noel-Hume 1969:90]
Hunter	MDS		77	1	1			ferrous metal		fragment	nail			Structural	Building Materials	unidentified
Hunter	MDS		78	1	1			ferrous metal		fragment	nail			Structural	Building Materials	unidentified
Hunter	MDS		79	1	1			ferrous metal		fragment	nail			Structural	Building Materials	unidentified
Hunter	MDS		80	1	1			ferrous metal		fragment	nail			Structural	Building Materials	unidentified
Hunter	MDS		81	1	1			ferrous metal		whole	hinge			Structural	Tools/Hardware	unidentified; one section with remnant of three nails/screws intact
Hunter	MDS		82	1	1			ferrous metal		fragment	bolt			Structural	Tools/Hardware	unidentified
Hunter	MDS		83	1	1			ferrous metal		fragment	nail			Structural	Building Materials	unidentified
Hunter	MDS		85	1	1	0.9	40	ferrous metal		whole	grape shot			Ammunition	Arms and Armor	40g, 0.9" diameter, 1.4 oz.
Hunter	MDS		87	1	1			ferrous metal		whole	nail			Structural	Building Materials	unidentified
Hunter	MDS		88	1	1			ferrous metal		fragment	nail			Structural	Building Materials	unidentified
Hunter	MDS		90	1	1			ferrous metal		fragment	hinge			Structural	Building Materials	H shape
Hunter	MDS		91	1	1			ferrous metal		fragment	spike			Structural	Building Materials	

Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Hunter	MDS		92	1	1			ferrous metal		fragment	spike			Structural	Building Materials	unidentified
Hunter	MDS		93	1	1			ferrous metal		fragment	nail			Structural	Building Materials	unidentified
Hunter	MDS		94	1	1			ferrous metal		fragment	bolt			Structural	Tools/Hardware	nut corroded to end
Hunter	MDS		95	1	1			ferrous metal		fragment	nail			Structural	Building Materials	unidentified
Hunter	MDS		96	1	1			ferrous metal		whole	horseshoe			Activities	Agriculture/ Equestrian	L 5.25in, W 0.6in, T 0.38in, bent, unable to determine branch width; calkins, fullering
Hunter	MDS		99	1	1					fragment	shoe buckle			Personal	Clothing Related	bent fragment of undecorated rectangular frame
Hunter	MDS		100	1	1			ferrous metal		fragment	nail			Structural	Building Materials	unidentified
Hunter	MDS		101	1	1	0.683	28.7	lead		whole	musket ball			Ammunition	Arms and Armor	28.7g, impacted, calculated diameter 0.683"
Hunter	MDS		102	1	1			ferrous metal		whole	horseshoe			Activities	Agriculture/ Equestrian	L 7in, W 1.2in, T 0.45in, branch width 6.5"; calkins, fullering with some nails intact, toe clip
Hunter	MDS		103	1	1			ferrous metal		whole	nail			Structural	Building Materials	unidentified
Hunter	MDS		105	1	1			ferrous metal		whole	bolt			Structural	Tools/Hardware	unidentified; nut corroded to end
Hunter	MDS		107	1	1			ferrous metal		fragment	bracket			Structural	Tools/Hardware	rectangular box-like bracket with four small projections for attachment, large oval perforation off center
Hunter	MDS		110	1	1			ferrous metal		fragment	hinge			Structural	Tools/Hardware	
Hunter	MDS		112	1	1			ferrous metal		fragment				Indefinite	Unidentified	flat, T-shaped fragment
Hunter	MDS		113	1	1			ferrous metal, composite		fragment	pocket knife			Personal	Cutlery	ferrous metal with remnant of bone plates on exterior
Hunter	MDS		115	1	1			ferrous metal		fragment	kettle			Domestic	Kitchen	remnant of seam
Hunter	MDS		116	1	1			ferrous metal		fragment	kettle			Domestic	Kitchen	
Hunter	MDS		117	1	1			ferrous metal		fragment	nail			Structural	Building Materials	unidentified

Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Hunter	MDS		119	1	1			copper alloy		fragment	plate			Electrical	Tools/Hardware	L 4in, W 2.7in, T 0.12in; flat rectangular plate with beveled edges on one surface, large round recessed area in center of plate, jagged perforation, back surface with two round recessed areas, stamped lettering "THE PERKINS Electric SWITCH MFG CO. HARTFORD, CT" "PATENTED MARCH 27 1894 OCTOBER 13 1898"
Hunter	MDS		120	1	1			ferrous metal		fragment	spike			Structural	Building Materials	unidentified
Hunter	MDS		122	1	1			ferrous metal		fragment	nail			Structural	Building Materials	unidentified
Hunter	MDS		124	1	1	1.09		copper alloy		whole	coin			Personal	Commerce	unidentified; 1.09" diameter
Hunter	MDS		125	1	1	0.95	43	ferrous metal		whole	grape shot			Ammunition	Arms and Armor	43g, 0.95" diameter, 1.5 oz.
Hunter	MDS		126	1	1			ferrous metal		whole	nail			Structural	Building Materials	unidentified
Hunter	MDS		131	1	1			ferrous metal		fragment	horseshoe			Activities	Agriculture/ Equestrian	
Hunter	MDS		133	1	1	0.675	27.7	lead		whole	musket ball			Ammunition	Arms and Armor	27.7g, impacted against curved object on one surface, possibly bone, deep pinched marks on opposite surface possibly due to extraction, calculated diameter 0.675"
Hunter	MDS		134	1	1			ferrous metal		fragment	horseshoe			Activities	Agriculture/ Equestrian	
Hunter	MDS		137	1	1	1	51	ferrous metal		whole	grape shot			Ammunition	Arms and Armor	51 g, 1" diameter, 1.8 oz.
Hunter	MDS		138	1	1			ferrous metal		whole	hook			Structural	Tools/Hardware	wrought; closed eye opposite hook

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Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Hunter	MDS		139	1	1			copper alloy		whole	ramrod holder			Ammunition	Arms and Armor	ramrod holder from Brown Bess per personal communication Daniel Sivilich 7/18/03
Hunter	MDS		140	1	1			ferrous metal		fragment				Indefinite	Unidentified	long flat strip of ferrous metal, T-shaped in cross-section; L: 16"
Hunter	MDS		142	1	1			ferrous metal		fragment	horseshoe			Activities	Agriculture/ Equestrian	
Hunter	MDS		143	1	1			ferrous metal		fragment	nail			Structural	Building Materials	unidentified,
Hunter	MDS		144	1	1			ferrous metal		fragment	wire			Indefinite	Unidentified	
Hunter	MDS		146	1	1			ferrous metal		fragment				Indefinite	Unidentified	bent rod, possibly bar stock
Hunter	MDS		147	1	1			copper alloy		fragment				Indefinite	Unidentified	thin rectangular fragment, long edges folded over
Hunter	MDS		148	1	1			ferrous metal		fragment	horseshoe			Activities	Agriculture/ Equestrian	
Hunter	MDS		149	1	1			ferrous metal		fragment				Indefinite	Unidentified	
Hunter	MDS		152	1	1			ferrous metal		fragment	nail			Indefinite	Tools/Hardware	unidentified; scrap, fragment, curved terminal, remnant of nail or tack corroded in place
Hunter	MDS		153	1	1	4.9		ferrous metal		whole	collar/sleeve			Indefinite	Tools/Hardware	4.9" diameter; possible wagon wheel hub
Hunter	MDS		154	1	1			ferrous metal		fragment	bar stock			Structural	Manufacturing	
Hunter	MDS		156	1	1	0.64	23.7	lead		whole	musket ball			Ammunition	Arms and Armor	palmation; 23.7g, 0.64" diameter; ramrod dimple
Hunter	MDS		157	1	1			ferrous metal		fragment	nail			Structural	Building Materials	unidentified
Hunter	MDS		159	1	1			ferrous metal		fragment				Indefinite	Unidentified	possible kettle handle
Hunter	MDS		160	1	1			copper alloy		fragment	key			Personal	Tools/Hardware	
Hunter	MDS		162	1	1	0.92	38	ferrous metal		whole	grape shot			Ammunition	Arms and Armor	38g, 0.92" diameter, 1.3 oz
Hunter	MDS		163	1	1			ferrous metal		fragment				Indefinite	Unidentified	
Hunter	MDS		164	1	1	2.7		ferrous metal		fragment	disk			Indefinite	Unidentified	2.7" diameter; disk with large square nut projecting from side

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Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Hunter	MDS		165	1	1			ferrous metal		fragment				Indefinite	Tools/Hardware	flat L-shaped section. T-shaped in cross-section reinforcing the interior of the angle, possibly fragment of C-clamp
Hunter	MDS		166	1	1			ferrous metal		whole	nail			Structural	Building Materials	unidentified
Hunter	MDS		167	1	1			ferrous metal		whole	nail			Structural	Building Materials	unidentified
Hunter	MDS		168	1	1	0.9		ferrous metal		fragment				Structural	Tools/Hardware	0.9" diameter; cylindrical fragment with internal threads
Hunter	MDS		169	3	2			coal		fragment	coal			Fuel	Energy	
Hunter	MDS		169	2	1			ferrous metal		fragment	wire			Indefinite	Unidentified	
Hunter	Surface		169	1	1			coarse earthenware		fragment	brick			Structural	Building Materials	
Hunter	Surface		169	4	1			glass		fragment		brown		Indefinite	Glass Vessels	unidentified; curved
Hunter	MDS		170	1	1			ferrous metal		whole	bolt			Structural	Tools/Hardware	unidentified; nut corroded in place
Hunter	MDS		171	1	1			ferrous metal		fragment				Indefinite	Unidentified	
Hunter	MDS		172	1	1			ferrous metal		fragment	nail			Structural	Building Materials	unidentified
Hunter	MDS		176	1	1			lead		fragment				Indefinite	Unidentified	unidentified lead strip, folded over double thickness with center seam on one surface, rounded slightly tapering finished terminal; L: 3"
Hunter	MDS		177	1	1			ferrous metal		fragment				Indefinite	Unidentified	possible kettle fragment
Hunter	MDS		179	1	1			ferrous metal		whole	nail			Structural	Building Materials	unidentified
Hunter	MDS		180	1	1			ferrous metal		fragment	strap			Indefinite	Tools/Hardware	unidentified strap fragment
Hunter	MDS		182	1	1			ferrous metal		fragment	hinge			Structural	Tools/Hardware	
Hunter	MDS		183	1	1			ferrous metal		fragment	rod			Indefinite	Unidentified	possible bar stock
Hunter	MDS		184	1	1	1.48		white metal		fragment	lid			Indefinite	Unidentified	1.48" diameter
Hunter	MDS		185	1	1	2.2		ferrous metal		whole	harness ring			Activities	Agriculture/ Equestrian	2.2" diameter
Hunter	MDS		186	1	1			ferrous metal		whole	spike			Structural	Building Materials	unidentified

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Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Hunter	MDS		187	1	1			ferrous metal		fragment	horseshoe			Activities	Agriculture/ Equestrian	
Hunter	MDS		188	1	1			ferrous metal		whole	nail			Structural	Building Materials	unidentified
Hunter	MDS		189	1	1			copper alloy		whole	jewelry			Personal	Personal Items	L 1.2in, W 1 in, T 0.05in; large oval religious medal, unidentified lettering arched around; standing figure in long robes on front, unidentified lettering arched around child with standing angel
Hunter	MDS		191	1	1			ferrous metal		fragment	bolt			Structural	Tools/Hardware	unidentified
Hunter	MDS		192	1	1			ferrous metal		whole	horseshoe			Activities	Agriculture/ Equestrian	L 5in, W 0.7in, T 0.4in, branch width 5î; fullering
Hunter	MDS		194	1	1			ferrous metal		fragment	nail			Structural	Building Materials	unidentified
Hunter	MDS		195	1	1			ferrous metal		fragment	horseshoe			Activities	Agriculture/ Equestrian	
Hunter	MDS		196	1	1			ferrous metal		whole	spike			Structural	Building Materials	unidentified
Hunter	MDS		197	1	1			ferrous metal		fragment	drain			Indefinite	Unidentified	flat, round drain with remnant of round perforations
Hunter	MDS		199	1	1			ferrous metal		fragment	nail			Structural	Building Materials	unidentified
Hunter	MDS		200	1	3			copper alloy		fragment				Indefinite	Unidentified	thin strips
Hunter	MDS		201	1	1			ferrous metal		fragment	bolt			Structural	Tools/Hardware	unidentified
Hunter	MDS		202	1	2			ferrous metal		fragment	tie bar			Structural	Tools/Hardware	one section with square nut adhered by corrosion
Hunter	MDS		203	1	1			ferrous metal		fragment				Indefinite	Unidentified	unidentified
Hunter	MDS		204	1	1	1.6		ferrous metal		whole	collar/sleeve				Tools/Hardware	1.6" diameter, probably wagon or carriage part
Hunter	MDS		206	1	1			ferrous metal		fragment				Indefinite	Unidentified	
Hunter	MDS		207	1	1			ferrous metal		fragment	spike			Structural	Building Materials	unidentified
Hunter	MDS		208	1	1			ferrous metal		fragment	horseshoe			Activities	Agriculture/ Equestrian	

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Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Hunter	MDS		209	1	1			ferrous metal		fragment	horseshoe			Activities	Agriculture/ Equestrian	
Hunter	MDS		210	1	1			ferrous metal		fragment	horseshoe			Activities	Agriculture/ Equestrian	
Hunter	MDS		211	1	1			ferrous metal		fragment	horseshoe			Activities	Agriculture/ Equestrian	
Hunter	MDS		212	1	1			ferrous metal		fragment	strap			Indefinite	Tools/Hardw are	possible wagon/carriage part; large rectangular strap tapering at terminal and turned to form hook. L shaped rectangular reinforcing plate attached to portion of strap
Hunter	MDS		213	1	1			ferrous metal		fragment	spike			Structural	Building Materials	unidentified
Hunter	MDS		214	1	1			ferrous metal		whole	nail			Structural	Building Materials	unidentified
Hunter	MDS		215	1	1			ferrous metal		whole	staple			Structural	Building Materials	unidentified
Hunter	MDS		217	1	1	1.09		copper alloy		whole	coin			Personal	Commerce	Liberty head large cent; 1.09" diameter
Hunter	MDS		220	1	1			ferrous metal		fragment	handle			Indefinite	Unidentified	possible pan handle
Hunter	MDS		222	1	1			ferrous metal		fragment	nail			Structural	Building Materials	unidentified
Hunter	MDS		223	1	1			ferrous metal			kettle			Domestic	Kitchen	kettle foot
Hunter	MDS		225	1	1			ferrous metal		fragment	bolt			Structural	Tools/Hardw are	unidentified
Hunter	MDS		226	1	1			ferrous metal		fragment	strap			Indefinite	Tools/Hardw are	unidentified.; possible wagon hardware; flat, roughly rectangular strap sides curved in slightly, ends bow out. curved terminal, single round full thickness perforation near center
Hunter	MDS		227	1	1	0.98	47	ferrous metal		whole	grape shot			Ammunition	Arms and Armor	47g, 0.98" diameter, 1.6 oz
Hunter	MDS		228	1	1			ferrous metal		fragment	nail			Structural	Building Materials	door nail; large head
Hunter	MDS		232	1	1	0.76		ferrous metal		fragment	tube/collar			Indefinite	Unidentified	calculated external diameter 0.76"
Hunter	MDS		233	1	1			ferrous metal		fragment	cap/lid			Indefinite	Unidentified	domed cap/lid with internal threads

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Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Hunter	MDS		234	1	1	1.1		copper alloy		whole	coin			Personal	Commerce	Liberty head large cent; 1.1" diameter
Hunter	MDS		237	1	1			ferrous metal		fragment	spike			Structural	Building Materials	unidentified
Hunter	MDS		239	1	1			ferrous metal		fragment	nail			Structural	Building Materials	unidentified
Hunter	MDS		240	1	1			ferrous metal		whole	horseshoe			Activities	Agriculture/ Equestrian	L 5.5in, W 0.9in, T 0.4in, branch width 4.75"; calkins, fullering with some nails intact
Hunter	MDS		241	1	1	1		copper alloy		whole	harness bell			Activities	Agriculture/ Equestrian	1" diameter
Hunter	MDS		242	1	1			ferrous metal		fragment	horseshoe			Activities	Agriculture/ Equestrian	
Hunter	MDS		243	1	1			ferrous metal		fragment	strap			Indefinite	Tools/Hardw are	unidentified
Hunter	MDS		244	1	1			ferrous metal		fragment	spike			Structural	Building Materials	unidentified
Hunter	MDS		245	1	1			ferrous metal		fragment	spike			Structural	Building Materials	unidentified
Hunter	MDS		246	1	1			ferrous metal		fragment				Indefinite	Tools/Hardw are	possible wagon axel fragment
Hunter	MDS		247	1	1			ferrous metal		whole	bolt			Structural	Tools/Hardw are	carriage bolt with remnant of washer and nut corroded in place
Hunter	MDS		248	1	1			ferrous metal		fragment	nail			Structural	Building Materials	unidentified
Hunter	MDS		249	1	1			ferrous metal		whole	bolt			Structural	Tools/Hardw are	nut and washer corroded in place
Hunter	MDS		250	1	1			ferrous metal		fragment	horseshoe			Activities	Agriculture/ Equestrian	
Hunter	MDS		252	1	1			ferrous metal		whole	horseshoe			Activities	Agriculture/ Equestrian	L 5.5in, W 0.9in, T 0.43in, branch width 5"; worn calkins, fullering, toe clip
Hunter	MDS		254	1	1			ferrous metal		fragment				Indefinite	Unidentified	remnant of full thickness round perforation. possible tool machine part
Hunter	MDS		255	1	1			ferrous metal		whole	spike			Structural	Building Materials	unidentified

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Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Hunter	MDS		257	1	1			copper alloy		whole	plate			Indefinite	Unidentified	unidentified label; plate/tag stamped "N.J. 1958" over, "PRINCETON TWP." over, "116"
Hunter	MDS		259	1	1			ferrous metal		whole	hook			Structural	Tools/Hardware	large hook projecting from flat rectangular plate with two round perforations for attachment
Hunter	MDS		260	1	1			ferrous metal		whole	horseshoe			Activities	Agriculture/ Equestrian	L 7.25in, W 1.1in, T 0.4in, branch width 6ì; fullering with some nails intact
Hunter	MDS		261	1	1			composite		fragment	spoon			Domestic	Cutlery	copper alloy with silver plating. remnant of stamped lettering back of handle " ... ER PLATE"; unidentified stamped bead and band decoration on handle
Hunter	MDS		262	1	1			ferrous metal		whole	horseshoe			Activities	Agriculture/ Equestrian	L 5.25in, W O.67in, T 0.47in; shoe bent, branch width 4 .15", calkins, fullering
Hunter	MDS		263	1	1			ferrous metal		fragment	spike			Structural	Building Materials	unidentified
Hunter	MDS		267	1	1			ferrous metal		fragment	kettle			Domestic	Kitchen	
Hunter	MDS		268	1	1			copper alloy		whole				Plumbing	Tools/Hardware	cylindrical sleeve with wide rib at both ends with row of raised projections approximately 0.75" in from each end; possible coupling adapter for hose
Hunter	MDS		269	1	1			ferrous metal		fragment	spike			Structural	Building Materials	unidentified
Hunter	MDS		270	1	1			ferrous metal		fragment	horseshoe			Activities	Agriculture/ Equestrian	
Hunter	MDS		271	1	1			ferrous metal		fragment	chain			Structural	Tools/Hardware	unidentified
Hunter	MDS		273	1	1			ferrous metal		fragment	wire			Indefinite	Unidentified	L: 9", 0.25" diameter; possibly nail wire

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Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Hunter	MDS		276	1	1			ferrous metal		fragment	spike			Structural	Building Materials	unidentified
Hunter	MDS		277	1	1			ferrous metal		fragment	spike			Structural	Building Materials	unidentified
Hunter	MDS		278	1	1			ferrous metal		fragment	hinge			Structural	Building Materials	hinge strap
Hunter	MDS		278	2	1			ferrous metal		fragment				Indefinite	Unidentified	
Hunter	MDS		279	1	1			ferrous metal		fragment				Indefinite	Unidentified	
Hunter	MDS		281	1	3			copper alloy		fragment				Indefinite	Unidentified	large piece of thin copper twisted and bent on itself, some edges with remnant of folded seam; possible kettle fragment
Hunter	MDS		282	1	1			ferrous metal		fragment				Indefinite	Tools/Hardware	possible wagon hitch pin
Hunter	MDS		284	1	1			ferrous metal		fragment	horseshoe			Activities	Agriculture/ Equestrian	
Hunter	MDS		285	1	1	1		copper alloy		fragment	disk			Indefinite	Unidentified	1" diameter. button-like disk. outer edge rough and turned under, reinforced area on back probably for attachment; possible decorative horse harness hardware
Hunter	MDS		286	1	1			ferrous metal		fragment	horseshoe			Activities	Agriculture/ Equestrian	
Hunter	MDS		287	1	1			copper alloy		whole	badge			Indefinite	Unidentified	L 1.26in, W 0.78in, T 0.08in; shield shaped badge with two projecting pins from back, possibly for attachment to leather or heavy fabric
Hunter	MDS		288	1	1			ferrous metal		fragment				Indefinite	Unidentified	possible bolt fragment
Hunter	MDS		289	1	1			ferrous metal		whole	horseshoe			Activities	Agriculture/ Equestrian	L 5in, W 0.77in, T 0.24in, shoe bent, branch width 6"

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Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Hunter	MDS		290	1	1			ferrous metal		fragment	hinge			Structural	Tools/Hardware	hinge strap fragment, bent at 90 degree angle with second slight angle near terminal; possible wagon box hinge
Hunter	MDS		291	1	1			ferrous metal		whole	horseshoe			Activities	Agriculture/ Equestrian	L 5.25in, W 0.7in, T O.44in, branch width 4.75"; fullering
Hunter	MDS		292	1	1			ferrous metal		fragment	strap/plate			Structural	Tools/Hardware	unidentified; plate/strap fragment, curved terminal, raised reinforcing rib on surface
Hunter	MDS		293	1	1			ferrous metal		whole	horseshoe			Activities	Agriculture/ Equestrian	L 4.25in, W 0.7in, T 0.35in, branch width 3.75"
Hunter	MDS		294	1	1	0.86	34	ferrous metal		fragment	grape shot			Ammunition	Arms and Armor	34g, 0.86" diameter, 1.2 oz.
Hunter	MDS		295	1	1	0.48	10	lead		whole	shot			Ammunition	Arms and Armor	10g, 0.48" diameter
Hunter	MDS		296	1	1	0.76		copper alloy		fragment	button			Personal	Clothing Related	loop shank; 0.76" diameter, dented domed face, featuring eagle with shield containing letter ìIî, remnant of back mark "W.H. HORSTMANN &. CO ... "; South Typology Type 18 1800-1865 [Noel-Hume 1969;90]
Hunter	MDS		297	1	1			ferrous metal		fragment	unidentified			Indefinite		curved; possibly fragment of cylindrical object, possible nose cap from Committee of Safety Musket per personal communication Ernest Bower 7/19/03
Hunter	MDS		298	1	1	0.9	35	ferrous metal		whole	grape shot			Ammunition	Arms and Armor	35g, 0.9" diameter, 3.2 oz
Hunter	MDS		299	1	1			white metal		fragment	slag			By-Product	Manufacturing	5g

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Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Hunter	MDS		300	1	1			white metal		fragment	disk			Indefinite	Unidentified	thin, flat disk, possible zinc milk cap liner
Hunter	MDS		301	1	1	0.8	5	ferrous metal		whole	grape shot			Ammunition	Arms and Armor	30g, 0.8" diameter, 1 oz
Hunter	MDS		302	1	1			ferrous metal		fragment	kettle			Domestic	Kitchen	
Hunter	MDS		303	1	1	0.7		copper alloy		fragment	button			Personal	Clothing Related	loop shank; 0.7" diameter; unidentified lettering on back, South Typology Type 18 1800-1865 [Noel-Hume 1969:90]
Hunter	MDS		304	1	1			copper alloy		whole	fastener			Personal	Clothing Related	strap slide, for adjusting length; undecorated rectangular frame with center bar
Hunter	MDS		305	1	1			copper alloy		fragment	buckle			Personal	Clothing Related	unidentified; undecorated square frame buckle; possible man's belt buckle
Hunter	Surface		350	1	1			jasper		whole	flake	reddened		Prehistoric	Lithics	debitage, whole flake; cortex; thermal alteration; 2g, 30 mm class
Hunter	Surface		351	1	1		2	chert			projectile point	black		Prehistoric	Chipped Lithics	triangular; L 27.9mm, W 22mm, T 6.5mm, 2g; reworked into drill/perforator
Hunter	Surface		353	1	1		43	jasper			tested cobble	tan		Prehistoric	Lithics	cortex; 43g
Hunter	Surface		354	1	1		61	quartz		fragment	biface	white		Prehistoric	Chipped Lithics	proximal fragment; W 43.4mm, T 18.3mm, 61g, middle stage, L 65
Hunter	Surface		355	1	1		1370	quartzite			thermally-altered rock	reddened		Prehistoric	Lithics	cortex; 1370g
Hunter	Surface		356	1	1		220	quartzite			thermally-altered rock	reddened		Prehistoric	Lithics	cortex; 220g
Hunter	Surface		357	1	1		428	quartzite			thermally-altered rock	reddened		Prehistoric	Lithics	cortex; 428g
Hunter	Surface		358	1	1		88	quartzite			thermally-altered rock	reddened		Prehistoric	Lithics	cortex; 88g

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Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Hunter	Surface		359	1	1		280	quartzite			thermally-altered rock	reddened		Prehistoric	Lithics	cortex; 280g
Hunter	Surface		360	1	2		418	quartzite			thermally-altered rock	reddened		Prehistoric	Lithics	cortex; 418g
Hunter	Surface		361	1	1		292	quartz			thermally-altered rock	reddened		Prehistoric	Lithics	cortex; 292g
Hunter	Surface		363	1	1		512	quartzite			thermally-altered rock	reddened		Prehistoric	Lithics	cortex; 512g
Hunter	Surface		364	1	1		2	jasper			flake	white		Prehistoric	Lithics	debitage, whole flake; cortex; thermal alteration; 2g, 30 mm class
Hunter	MDS		365	1	1	0.84	36	ferrous metal		whole	grape shot			Ammunition	Arms and Armor	36g, 084" diameter, 1.2 oz
Hunter	Surface		368	1	1		30	quartzite			thermally-altered rock	reddened		Prehistoric	Lithics	cortex; 30g
Hunter	Surface		369	1	1		41	quartzite			thermally-altered rock	reddened		Prehistoric	Lithics	cortex; 41g
Hunter	Surface		370	1	1		136	quartzite			thermally-altered rock	reddened		Prehistoric	Lithics	cortex; 136g
Hunter	MDS		371	1	1			ferrous metal		fragment	nail			Indefinite	Unidentified	possibly several nails attached by corrosion
Hunter	MDS		372	1	1			ferrous metal		fragment				Indefinite	Unidentified	
Hunter	MDS		373	1	1		15	ferrous metal		fragment	nail			Structural	Building Materials	unidentified
Hunter	MDS		374	1	1	0.55	15	lead		whole	musket ball			Ammunition	Arms and Armor	15g, 0.55" diameter
Hunter	MDS		375	1	1	0.3	2.4	lead		whole	buck shot			Ammunition	Arms and Armor	2.4g, impacted, calculated diameter 0.3"
Hunter	MDS		377	1	1			copper alloy		fragment	strap/plate			Indefinite	Unidentified	corner fragment strap/plate with remnant of one round full thickness perforation; L: 0.9", W: 0.7", T: 0.08"

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Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Hunter	MDS		378	1	1			ferrous metal		fragment				Indefinite	Unidentified	thin strap-like fragment, curved along one edge, with remnant of round perforation
Hunter	Surface		379	1	1		84	quartzite			thermally-altered rock	reddened		Prehistoric	Lithics	cortex; 84g
Hunter	MDS		380	1	1			ferrous metal		fragment	chain			Structural	Tools/Hardware	single link
Hunter	Surface		382	1	1		153.09	course earthenware		fragment	brick			Structural	Building Materials	over-fired; 5.4 oz.
Hunter	Surface		383	1	1		6	jasper			thermally-altered rock	reddened		Prehistoric	Lithics	cortex; 6g
Hunter	Surface		384	1	1		39	quartzite			thermally-altered rock	grey		Prehistoric	Lithics	cortex; 39g
Hunter	MDS		385	1	1	0.9		ferrous metal		fragment				Indefinite	Unidentified	0.9" diameter, tubular fragment
Hunter	MDS		386	1	1			ferrous metal		whole	plumb bob			Personal	Tools/Hardware	
Hunter	MDS		387	1	1			lead		fragment				Indefinite	Unidentified	thin, flat roughly rectangular fragment bent lengthwise
Hunter	Surface		388	1	1		434	quartzite			thermally-altered rock	grey		Prehistoric	Lithics	cortex; 434g
Hunter	Surface		389	1	1		106	argillite		fragment	core	grey		Prehistoric	Chipped Lithics	L 86mm, W 59mm, T 23mm, 106g
Hunter	Surface		390	1	1		654	quartzite			thermally-altered rock	reddened		Prehistoric	Lithics	cortex; 654g
Hunter	Surface		391	1	2		270	quartzite			thermally-altered rock	reddened		Prehistoric	Lithics	cortex; 270g
Hunter	Surface		392	1	1		338	quartzite			thermally-altered rock	reddened		Prehistoric	Lithics	cortex; 338g
Hunter	Surface		393	1	1		70	quartzite			thermally-altered rock	reddened		Prehistoric	Lithics	cortex; 70g
Hunter	Surface		394	1	1		1	chert		fragment	flake	black		Prehistoric	Lithics	debitage; 1 g

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Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Hunter	Surface		396	1	1		15	argillite		fragment	biface	grey		Prehistoric	Chipped Lithics	contracting stem, proximal fragment; W 30mm, T 10.7mm, 15g, L 52.7
Hunter	Surface		397	1	1		308	quartzite		whole	hammerstone	reddened		Prehistoric	Cobble-based Lithics	cobble-based tool, thermal alteration; L 88.4mm, W 61.5mm, T 41.8mm, 308g; battering on one margin
Hunter	MDS		398	1	1			ferrous metal		fragment				Indefinite	Unidentified	
Hunter	MDS		400	1	1	0.93	42.52	ferrous metal		whole	grape shot			Ammunition	Arms and Armor	42g, 0.93" diameter, 1.5 oz
Hunter	MDS		401	1	1	0.54		composite		fragment				Indefinite	Unidentified	0.54" diameter; large copper alloy rivet surrounded by remnants of leather
Hunter	MDS		402	1	1			ferrous metal		fragment	nail			Structural	Building Materials	unidentified
Hunter	MDS		404	1	1	0.8		copper alloy		whole	button			Personal	Clothing Related	loop shank; 0.8" diameter; unidentified stamped floral decoration on face, back mark "RICH" "GOLD" "CO ... ", South Typology Type 18 1800-1865 [Noel-Hume I 969:90]
Hunter	MDS		407	1	1			ferrous metal		whole	finial			Indefinite	Unidentified	1.3î diameter, cone shaped pole finial, L: 4.8"
Hunter	MDS		408	1	1	0.85	33	ferrous metal		whole	grape shot			Ammunition	Arms and Armor	33g, 0.85" diameter, 1.4 oz
Hunter	MDS		409	1	1	0.518	12.5	lead		whole	musket ball			Ammunition	Arms and Armor	12.5g, 0.518" diameter, possible ramrod dimple
Hunter	Surface		410	1	1		164	quartzite			thermally-altered rock	grey		Prehistoric	Lithics	cortex; 164g
Hunter	MDS		412	1	1			copper alloy		fragment	rivet			Indefinite	Unidentified	rivet with remnant of leather
Hunter	MDS		413	1	1	0.63	22.4	lead		whole	musket ball			Ammunition	Arms and Armor	22.4g, 0.63" diameter
Hunter	MDS		415	1	1	0.94	40	ferrous metal		whole	grape shot			Ammunition	Arms and Armor	40g, 0.94" diameter, 1.4 oz

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Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Hunter	MDS		416	1	1		5	white metal		fragment	slag			By-Product	Manufacturing	5g
Hunter	MDS		417	1	1	0.93		aluminum		fragment	disk			Indefinite	Unidentified	unidentified disk; 0.93" diameter
Hunter	MDS		418	1	1		9	white metal		fragment	slag			By-Product	Manufacturing	9g
Hunter	MDS		419	1	1	0.54	11	pewter		whole	musket ball			Ammunition	Arms and Armor	11g, 0.54" diameter
Hunter	MDS		420	1	1		1	silver		whole	coin			Personal	Commerce	1g, 15mm; 1/2 Real Spanish cob, irregular shape; bent along one edge, probably made in Mexico 1572-1733; crown atop small "P" . large "P" large "S" .. . on obverse side, "Cruz Aorenzada" reverse [Budde-Jones 1989:5]
Hunter	MDS		421	1	1		4.4	lead		fragment	musket ball			Ammunition	Arms and Armor	4.4g; possibly "halved" or intentionally altered to cause more damage
Hunter	MDS		422	1	1	0.66	25	lead		whole	musket ball			Ammunition	Arms and Armor	25g, 0.66" diameter
Hunter	MDS		423	1	1			ferrous metal		fragment	pocket knife			Personal	Cutlery	
Hunter	MDS		424	1	1			ferrous metal		fragment				Indefinite	Unidentified	
Hunter	MDS		425	1	1	0.38		copper alloy		fragment	sleeve/collar			Indefinite	Unidentified	0.38" diameter
Hunter	MDS		426	1	1			ferrous metal		whole	nail			Structural	Building Materials	unidentified
Hunter	MDS		427	1	1			ferrous metal		fragment	chisel			Personal	Tools/Hardware	
Hunter	Surface		428	1	1		14	chert		fragment	core	grey		Prehistoric	Chipped Lithics	L 34.4mm, W 32.5mm, T 14mm, 14g
Hunter	Surface		429	1	1		486	quartzite			thermally-altered rock	reddened		Prehistoric	Lithics	cortex; 486g
Hunter	MDS		430	1	1			pewter		fragment	spoon			Domestic	Cutlery	handle fragment with central raised spine on both sides
Hunter	MDS		432	1	1		10	lead		fragment				Ammunition	Arms and Armor	10g, spillage
Hunter	MDS		433	1	1	0.479	9.9	lead		whole	shot			Ammunition	Arms and Armor	9.9g; probably modern; impacted, calculated diameter 0.479"

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Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Hunter	MDS		434	1	1	1.07		copper alloy		whole	coin			Personal	Commerce	unidentified; 1.07" diameter
Hunter	MDS		435	1	1	0.514	12.2	lead		fragment	musket ball			Ammunition	Arms and Armor	12.2g, impacted, calculated diameter 0.514"
Hunter	MDS		436	1	1	0.613	20.7	lead		whole	musket ball			Ammunition	Arms and Armor	20.7g, impacted, calculated diameter 0.613"
Hunter	MDS		437	1	1			ferrous metal		fragment	nail			Structural	Building Materials	unidentified
Hunter	MDS		438	1	1			ferrous metal		fragment	nail			Structural	Building Materials	cut type
Hunter	Surface		439	1	1		15	chert		fragment	core	black		Prehistoric	Chipped Lithics	L 38.5mm, W 33.7mm, T 10.4mm, 15g; pebble core
Hunter	MDS		440	1	1		10	lead		fragment	flint wrap			Ammunition	Arms and Armor	10g; thin. flattened fragment, folded over
Hunter	MDS		441	1	1		27	lead		whole	musket ball			Ammunition	Arms and Armor	27g, impacted, calculated diameter 0.67î
Hunter	MDS		442	1	1			copper alloy		whole	finial			Ammunition	Arms and Armor	can ridge box finial (similar to examples from Monmouth Battlefield, personal communication Daniel Sivilich 8/8/03)
Hunter	MDS		443	1	1		4	lead		fragment				Indefinite	Unidentified	4g, thin, flattened fragment, trimmed along two edges
Hunter	MDS		444	1	1			ferrous metal		fragment				Indefinite	Unidentified	
Hunter	MDS		445	1	1	0.75		copper alloy		whole	button			Personal	Clothing Related	loop shank; 0.75" diameter; stamped backmark "TREBLE", "GILT", with remnant of gilt on back, South Typology Type 18 1800-1865 [Noel-Hume 1969:90]
Hunter	MDS		446	1	1	0.625	22	lead		whole	musket ball			Ammunition	Arms and Armor	22g, 0.625" diameter, ramrod dimple

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Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Hunter	MDS		447	1	1	0.73		copper alloy		fragment	button			Personal	Clothing Related	loop shank; 0.73" diameter, loop shank missing, remnant of gilt on back. unidentified lettered back mark; South Typology Type 18 1800-1865 [Noel-Hume 1969:90]
Hunter	MDS		448	1	1	0.69		rubber		fragment	button			Personal	Clothing Related	loop shank, 0.69î diameter; hard rubber, air bubble on front surface, manufacturing flaw
Hunter	MDS		449	1	1	0.69	29.7	lead		whole	musket ball			Ammunition	Arms and Armor	29.7g, 0.69" diameter; ramrod dimple
Hunter	Surface		450	3	1			course earthenware		fragment	brick			Structural	Building Materials	
Hunter	Surface		450	11	1			course earthenware		fragment		brown manganese		Domestic	Ceramic Vessels	redware; coarse hollow ware; glazed both surfaces
Hunter	Surface		450	13	1			course earthenware		rim		clear lead		Domestic	Ceramic Vessels	unidentified form; redware; glazed interior
Hunter	Surface		450	12	1			course earthenware		fragment		brown manganese		Domestic	Ceramic Vessels	unidentified form; redware; glazed interior
Hunter	Surface		450	1	1			ferrous metal		fragment	rake				Agricultural/ Equestrian	
Hunter	Surface		450	4	1			ferrous metal		fragment	nail			Structural	Building Materials	
Hunter	Surface		450	7	1			ferrous metal		base				Domestic	Cutlery	unidentified central plate
Hunter	Surface		450	6	1			ferrous metal		whole	lock/lock part			Personal	Tools/Hardware	
Hunter	Surface		450	2	1			glass		fragment	bottle	olive green		Domestic	Glass Vessels	unidentified
Hunter	Surface		450	10	1	2.5		glass		shoulder	container	clear/uncolored		Domestic	Glass Vessels	unidentified; lead glass; 2.5" diameter
Hunter	Surface		450	8	1			glass		fragment		light aqua		Indefinite	Glass Vessels	flat
Hunter	Surface		450	9	1			glass		fragment	jar	light aqua		Domestic	Glass Vessels	unidentified
Hunter	Surface		450	17	1			porcelain		fragment				Domestic	Ceramic Vessels	hard paste; porcelain; unidentified form

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Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Hunter	Surface		450	18	1			refined earthenware		fragment		black		Domestic	Ceramic Vessels	ironstone; hollow ware; transfer printed underglaze; black indeterminate motif; 1940-1915
Hunter	Surface		450	15	1			refined earthenware		base and foot ring				Domestic	Ceramic Vessels	unidentified form; ironstone; 1840-Present
Hunter	Surface		450	14	2			refined earthenware		fragment				Domestic	Ceramic Vessels	unidentified form; ironstone; surface missing; 1840-Present
Hunter	Surface		450	16	1			refined earthenware		base				Domestic	Ceramic Vessels	unidentified form; semi-porcelain; 1870-Present
Hunter	Surface		450	5	1			shell		fragment	clam			Faunal	Indeterminate Fauna	
Hunter	Surface		451	6	5			Glass		fragment	window	light aqua		Structural	Building Materials	
Hunter	Surface		451	7	2			coarse earthenware		fragment	flower pot			Domestic	Ceramic Vessels	redware
Hunter	Surface		451	8	2			coarse earthenware		fragment		brown manganese		Domestic	Ceramic Vessels	redware; hollow ware; glazed both surfaces, brown manganese
Hunter	Surface		451	9	1			coarse earthenware				brown manganese		Domestic	Ceramic Vessels	redware; unidentified form, rim; glazed interior, brown manganese
Hunter	Surface		451	21	1			porcelain						Domestic	Ceramic Vessels	hard paste; lid, rim; transfer printed underglaze; blue indeterminate motif
Hunter	Surface		451	20	2			porcelain						Domestic	Ceramic Vessels	hard paste; unidentified form; rim and body; transfer printed underglaze; blue, scroll and floral motif
Hunter	Surface		451	19	1			porcelain		fragment				Domestic	Ceramic Vessels	hard paste; unidentified form; fragment
Hunter	Surface		451	15	1			refined earthenware			plate			Domestic	Ceramic Vessels	ironstone; rim; 1840-Present
Hunter	Surface		451	12	1			refined earthenware						Domestic	Ceramic Vessels	ironstone; unidentified form; base and foot ring, 1840-Present

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Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Hunter	Surface		451	14	1			refined earthenware		fragment				Domestic	Ceramic Vessels	ironstone; unidentified form; interior surface missing; remnant of black printed maker's mark, British Royal Arms, lettered " . . . ORIA ... " over, crown atop oval shield flanked right by standing unicorn. 1840-Present
Hunter	Surface		451	13	1			refined earthenware		fragment				Domestic	Ceramic Vessels	ironstone; unidentified form; remnant of black printed maker's mark "... INA". 1840-Present
Hunter	Surface		451	11	2			refined earthenware		fragment				Domestic	Ceramic Vessels	ironstone; unidentified form; surface missing; 1840-Present
Hunter	Surface		451	10	2			refined earthenware		fragment				Domestic	Ceramic Vessels	ironstone; unidentified form; 1840-Present
Hunter	Surface		451	22	1			refined earthenware		fragment				Domestic	Ceramic Vessels	unidentified; burned
Hunter	Surface		451	17	1			refined earthenware				blue		Domestic	Ceramic Vessels	whiteware, hollow ware; rim; sponged, blue; 1815 - 1940
Hunter	Surface		451	16	1			refined earthenware		fragment		blue		Domestic	Ceramic Vessels	whiteware, hollow ware; dipped/annular; interior surface missing; 1815-1900
Hunter	Surface		451	18	1			refined earthenware			plate	blue		Domestic	Ceramic Vessels	whiteware; rim. Shell Edge-Impressed; 1775-1875
Hunter	Surface		451	23	2			stoneware		fragment				Domestic	Ceramic Vessels	grey body; unidentified form; fragment; burned; possibly alkaline glazed Chinese stoneware; one piece with remnant of hand painted blue decoration on interior surface

Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Hunter	Surface		451	5	1			Glass			bottle	light aqua		Domestic	Glass Vessels	unidentified; base and body, rectangular with chamfered corners; remnant of tubular pontil, remnant of embossed lettering "... S ... "
Hunter	Surface		451	3	1			Glass		fragment		green		Domestic	Glass Vessels	curved; unidentified
Hunter	Surface		451	2	1			Glass		fragment		opaque white		Domestic	Glass Vessels	curved; unidentified
Hunter	Surface		451	4	3			Glass		fragment		clear/uncolored		Domestic	Glass Vessels	curved; unidentified
Hunter	Surface		451	1	1			Shell		fragment	oyster			Faunal	Faunal	
Hunter	Surface		451	3	1			coarse earthenware			mug/tankard	brown manganese		Domestic	Ceramic Vessels	redware; large hollow ware, body; glazed both surfaces; over-fired buff body; mug/tankard, base and body, salt glaze
Hunter	Surface		451	2	1			refined earthenware		fragment				Domestic	Ceramic Vessels	ironstone; unidentified form; transfer printed underglaze; black indeterminate motif, 1840-1915
Hunter	Surface		451	4	2			stoneware			mug/tankard			Domestic	Ceramic Vessels	stoneware, buff bod; base and body; salt glaze both surfaces. sherds mend, narrow reeding above base on exterior surface, possibly locally manufactured
Hunter	Surface		451	1	1			Glass			bottle	light aqua		Domestic	Glass Vessels	unidentified; finish and neck, down-tooled finish
Hunter	Surface		451	2	1			Glass			bottle	light aqua		Domestic	Glass Vessels	unidentified; base and body, rectangular with chamfered comer, recessed panels, remnant of embossed lettering "... C ... "
Hunter	Surface		451	1	1			Glass		fragment		olive green		Domestic	Glass Vessels	curved; unidentified

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Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Hunter	STP		454	1	1		5	jasper		fragment	core	red		Prehistoric	Chipped Lithics	thermal alteration; L 31mm, W 15.3mm, T 12.4mm, 5g
Hunter	STP		454	2	1			jasper		fragment	flake	brown		Prehistoric	Lithics	debitage; < 1 g
Berger	MDS	M-1	455	1	1			metal					nail	Structural		wire drawn
Berger	Surface	M-2	456	1	1			argillite					flake	Prehistoric		broken
Berger	MDS	M-3	457	1	1			metal					buckle frame fragment	Personal		
Berger	MDS	M-4	458	1	1			copper alloy					sheet metal	Structural		folded
Berger	Surface	M-5	459	1	1			ceramic					ironstone	Domestic		rim fragment
Berger	MDS	M-6	460	1	1			metal					spike	Structural		machine cut
Berger	MDS	M-7	461	1	1			metal					nut	Structural		square
Berger	MDS	M-8	462	1	1			metal					nail	Structural		wire drawn
Berger	MDS	M-9	463	1	1			metal					nail	Structural		wire drawn
Berger	MDS	M-10	464	1	1			metal					unidentified	Indefinite		
Berger	MDS	M-11	465	1	1			metal					nail	Structural		machine cut
Berger	MDS	M-12	466	1	1			metal					iron bar	Structural		2'11" long; bent
Berger	MDS	M-13	467	1	1			metal					iron bar	Structural		could not remove
Berger	MDS	M-14	468	1	1			metal					unidentified	Indefinite		poss. machine part
Berger	MDS	M-15	469	1	1			aluminum					can	Modern		"Budweiser"
Berger	MDS	M-16	470	1	1			metal					can	Modern		punctuated
Berger	MDS	M-17	471	1	1			metal					pin with iron ring	Indefinite		poss. wagon related
Berger	MDS	M-18	472	1	1			metal					spike	Structural		poss. handwrought
Berger	MDS	M-19	473	1	1			metal					spike	Structural		poss. handwrought mushroom head
Berger	MDS	M-20	474	1	1			metal					shaft			metal w/loop extension
Berger	MDS	M-21	475	1	1			metal					harness snap			
Berger	MDS	M-22	476	1	1			metal					horseshoe			fragment
Berger	MDS	M-23	477	1	1			metal					spike			handwrought
Berger	MDS	M-24	478	1	1			metal					spike/pin			poss. handwrought
Berger	MDS	M-25	479	1	1			metal					poss. two tined fork			
Berger	Surface	M-26	480	1	1			ceramic					whiteware			blue sponge decoration
Berger	Surface	M-27	481	1	1			ceramic					ironstone			body fragment

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Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Berger	Surface	M-28	482	1	1			sandstone					rock			ferrous content
Berger	Surface	M-29	483	1	1			sandstone					poss. fire cracked rock			
Berger	MDS	M-30	484	1	1			metal					horseshoe			fragment
Berger	MDS	M-31	485	1	1			metal					poss. nail fragment			square
Berger	Surface	M-32	486	1	1			glass					light bulb			clear
Berger	Surface	M-33	487	1	1			glass					bottle fragment			clear
Berger	MDS	M-34	488	1	1			metal					nail			machine cut
Berger	MDS	M-35	489	1	1			metal					wire			non-electrical
Berger	MDS	M-36	490	1	1			metal					nail			handwrought
Berger	MDS	M-37	491	1	1			metal					nail			machine cut
Berger	MDS	M-38	492	1	1			metal					spike			poss. handwrought
Berger	MDS	M-39	493	1	1			metal					file			triangular
Berger	MDS	M-40	494	1	1			metal					monkey wrench			
Berger	MDS	M-41	495	1	1			metal					spike			wire drawn
Berger	MDS	M-42	496	1	1			metal					spike			handwrought
Berger	Surface	M-43	497	1	1			jasper					natural spall			
Berger	MDS	M-44	498	1	1			metal					horseshoe			fragment
Berger	MDS	M-45	499	1	1			metal					nail			handwrought
Berger	MDS	M-46	500	1	1			metal					nail			handwrought
Berger	Surface	M-47	501	1	1			jasper					natural spall			
Berger	MDS	M-48	502	1	1			metal					spike			poss. mushroom head
Berger	MDS	M-49	503	1	1			metal					chain			section fused to small ferrous post
Berger	MDS	M-50	504	1	1			metal					poss. skeleton key			
Berger	MDS	M-51	505	1	1			metal					horseshoe			
Berger	MDS	M-52	506	1	1			metal					nail			machine cut
Berger	MDS	M-53	507	1	1			metal					poss. kettle fragment			
Berger	MDS	M-54	508	1	1			copper alloy					coin			penny - 1994
Berger	MDS	M-55	509	1	1			copper alloy					coin			dime - 1985
Berger	MDS	M-56	510	1	1			metal					nail			handwrought
Berger	MDS	M-57	511	1	1			aluminum					foil			

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Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Berger	MDS	M-58	512	1	1			aluminum					can			"Tear Drop"; 1962-1980
Berger	MDS	M-59	513	1	1			aluminum					can			"Tear Drop"; 1962-1980
Berger	MDS	M-60	514	1	1			metal					cast iron fragment			crescent shaped; circular hole in center
Berger	MDS	M-61	515	1	1			metal					cast iron fragment			poss. farm equipment; joined w/ bolt
Berger	MDS	M-62	516	1	1			metal					spike			machine cut
Berger	MDS	M-63	517	1	1			copper alloy					shotgun shell head			copper/brass
Berger	MDS	M-64	518	1	1			metal					nail			wire drawn
Berger	MDS	M-65	519	1	1			metal					nail			machine cut
Berger	MDS	M-66	520	1	1			metal					nail			machine cut
Berger	Surface	M-67	521	1	1			jasper					natural spall			
Berger	MDS	M-68	522	1	1			metal					spike			wire drawn, large
Berger	MDS	M-69	523	1	1			metal					horseshoe			
Berger	MDS	M-70	524	1	1			metal					poss. strap hinge fragment			w/nail
Berger	MDS	M-71	525	1	1			metal					nail			machine cut
Berger	MDS	M-72	526	1	1			metal					nail			machine cut
Berger	Surface	M-73	527	1	1			brick					brick fragment			
Berger	MDS	M-74	528	1	1			metal					washer			large
Berger	MDS	M-75	529	1	1			metal					nail			machine cut
Berger	Surface	M-76	530	1	1			ceramic					tobacco pipe bowl			kaolin fragment
Berger	MDS	M-77	531	1	1			metal					ring handle			tong/scissors
Berger	MDS	M-78	532	1	1			metal					nail/pin fragment			
Berger	MDS	M-79	533	1	1			metal					nail			machine cut
Berger	MDS	M-80	534	1	1			metal					nail			machine cut
Berger	MDS	M-81	535	1	1			metal					horseshoe			
Berger	MDS	M-82	536	1	1			metal					spike			machine cut
Berger	MDS	M-83	537	1	1			metal					nail			machine cut
Berger	MDS	M-84	538	1	1			metal					rectangular fragment			flat back w/ hole
Berger	MDS	M-85	539	1	1			metal					pipe			T-Junction

Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Berger	MDS	M-86	540	1	1			aluminum					arrow point and shaft			
Berger	MDS	M-87	541	1	1			metal					nail			machine cut
Berger	MDS	M-88	542	1	1			aluminum					arrow shaft			
Berger	MDS	M-89	543	1	1			aluminum					arrow shaft			
Berger	MDS	M-90	544	1	1			aluminum					arrow shaft			
Berger	MDS	M-91	545	1	1			metal					poss. bucket handle			
Berger	MDS	M-92	546	1	1			metal					nail			machine cut nail, poss. horseshoe nail
Berger	MDS	M-93	547	1	1			metal					poss. kettle fragment			cast iron w/ nail/pin
Berger	MDS	M-94	548	1	1			metal					nail			machine cut
Berger	MDS	M-95	549	1	1			metal					horseshoe			
Berger	MDS	M-96	550	1	1			iron					pipe			
Berger	MDS	M-97	551	1	1			aluminum					foil			
Berger	MDS	M-98	552	1	1			metal					rod			U shaped
Berger	MDS	M-99	553	1	1			aluminum					bottle cap			"SnappIe"
Berger	MDS	M-100	554	1	1			metal					spike			machine cut
Berger	MDS	M-101	555	1	1			metal					nail			machine cut
Berger	MDS	M-102	556	1	1			metal					caster			
Berger	MDS	M-103	557	1	1			metal					washer			w/ iron capped plastic nail
Berger	MDS	M-104	558	1	1			metal					poss. buckle frame fragment			
Berger	MDS	M-105	559	1	1			aluminum					foil			
Berger	MDS	M-106	560	1	1			aluminum					foil			
Berger	MDS	M-107	561	1	1			aluminum					foil			
Berger	MDS	M-108	562	1	1			aluminum					foil			
Berger	MDS	M-109	563	1	1			aluminum					foil			
Berger	MDS	M-110	564	1	1			aluminum					foil			
Berger	MDS	M-111	565	1	1			aluminum					foil			
Berger	MDS	M-112	566	1	1			metal					horseshoe			
Berger	MDS	M-113	567	1	1			aluminum					foil			"Dannon Yogurt"
Berger	MDS	M-114	568	1	1			metal					nail head			
Berger	MDS	M-115	569	1	1			copper alloy					rifle bullet cartridge			.223 Winchester Remington post 1957

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Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Berger	MDS	M-116	570	1	1			copper alloy					rifle bullet cartridge			.223 Winchester Remington post 1957
Berger	MDS	M-117	571	1	1			copper alloy					rifle bullet cartridge			.223 Winchester Remington, post 1957
Berger	MDS	M-118	572	1	1			metal					nail			machine cut
Berger	MDS	M-119	573	1	1			metal					poss. utensil shaft			two fragments, mend
Berger	MDS	M-120	574	1	1			metal					iron disk			poss. pulley housing
Berger	MDS	M-121	575	1	1			metal					spike			machine cut
Berger	MDS	M-122	576	1	1			copper alloy					brass band			poss. oil lamp part; threaded interior
Berger	MDS	M-123	577	1	1			copper alloy					coin			penny - 1971
Berger	MDS	M-124	578	1	1			aluminum					metal tree tag			"Taxus Cuspidata; Green Mountain; Plant Patent 1311" (Japanese Yew)
Berger	MDS	M-125	579	1	1			metal					wire			non-electrical
Berger	MDS	M-126	580	1	1			metal					nail			wire drawn
Berger	MDS	M-127	581	1	1			steel					washer			
Berger	MDS	M-128	582	1	1			metal					nail			wire drawn
Berger	MDS	M-129	583	1	1			metal					nail			machine cut
Berger	MDS	M-130	584	1	1			lead alloy					poss. rim			
Berger	MDS	M-131	585	1	1			metal					nut			large
Berger	MDS	M-132	586	1	1			aluminum					foil			
Berger	MDS	M-133	587	1	1			metal					staple			large
Berger	MDS	M-134	588	1	1			metal					wire			non-electrical
Berger	MDS	M-135	589	1	1			metal/wood					chisel			V shaped; wood handle; steel attachment collar
Berger	MDS	M-136	590	1	1			metal					iron band			w/ holes for attachment
Berger	MDS	M-137	591	1	1			metal					washer			
Berger	MDS	M-138	592	1	1			metal					nail			wire drawn, large
Berger	MDS	M-139	593	1	1			metal					rivet			wire drawn
Berger	Surface	M-140	594	1	1			wood					wooden rod			
Berger	MDS	M-141	595	1	1			metal					nail			machine cut fragment
Berger	MDS	M-142	596	1	1			metal/plastic					iron capped plastic nail			

Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Berger	MDS	M-143	597	1	1			metal					nut			hexagonal
Berger	MDS	M-144	598	1	1			metal					bolt			w/ nut and metal strips; torque strip?
Berger	MDS	M-145	599	1	1			aluminum					can			"Pepsi", modern
Berger	MDS	M-146	600	1	1			metal/plastic					iron capped plastic nail			
Berger	MDS	M-147	601	1	1			metal					nail			wire drawn, cladding/decking nail
Berger	MDS	M-148	602	1	1			metal					horseshoe			
Berger	MDS	M-149	603	1	1			copper alloy					shot gun shell head			"Winchester Patented", 2mm in diameter
Berger	MDS	M-150	604	1	1			metal					nail			wire drawn
Berger	MDS	M-151	605	1	1			metal					nail			wire drawn, cladding/decking nail
Berger	MDS	M-152	606	1	1			metal					nail			wire drawn, cladding/decking nail
Berger	MDS	M-153	607	1	1			metal					nail			wire drawn, roofing
Berger	MDS	M-154	608	1	1			metal					nail			wire drawn, cladding/decking nail
Berger	MDS	M-155	609	1	1			metal					nut			hexagonal
Berger	MDS	M-156	610	1	1			metal					nail			wire drawn, roofing
Berger	MDS	M-157	611	1	1			metal					nail			machine cut
Berger	MDS	M-158	612	1	1			metal					screw			Phillips head
Berger	MDS	M-159	613	1	1			metal					nail			wire drawn
Berger	MDS	M-160	614	1	1			metal					nail			wire drawn
Berger	MDS	M-161	615	1	1			metal					bell			small, silver color
Berger	MDS	M-162	616	1	1			metal					screw			Phillips head
Berger	MDS	M-163	617	1	1			metal					nail			wire drawn, small, fragment
Berger	MDS	M-164	618	1	1			metal					nail			wire drawn, cladding/decking nail
Berger	MDS	M-165	619	1	1			metal					screw			Phillips head
Berger	MDS	M-166	620	1	1			metal					poss. hook			T shaped
Berger	MDS	M-167	621	1	1			metal					spike			machine cut
Berger	MDS	M-168	622	1	1			metal					wire			non-electricaI
Berger	MDS	M-169	623	1	1			coal/cinder					coal/cinder			
Berger	MDS	M-170	624	1	1			metal					nail			handwrought
Berger	MDS	M-171	625	1	1			metal					wire			non-electricaI

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Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Berger	MDS	M-172	626	1	1			aluminum					can			"Diet Coca-Cola"; 8-inches BGS
Berger	MDS	M-173	627	1	1			metal					bolt			fragment, w/ one square nut and one hexagonal nut
Berger	Surface	M-174	628	1	1			mortar					mortar			sand/gravel temper
Berger	MDS	M-175	629	1	1			metal					wire			non-electrical
Berger	MDS	M-176	630	1	1			metal					nail			wire drawn
Berger	MDS	M-177	631	1	1			metal					sheet			metal angular; curved, flashing
Berger	MDS	M-178	632	1	1			metal					iron bar			"T shaped" in plan
Berger	MDS	M-179	633	1	1			metal					poss. buckle frame fragment			
Berger	MDS	M-180	634	1	1			metal					butt hinge			1.1' BGS
Berger	MDS	M-181	635	1	1			metal					nail			poss. handwrought
Berger	MDS	M-182	636	1	1			metal					iron band			
Berger	MDS	M-183	637	1	1			metal					poss. nail/pin fragment			
Berger	MDS	M-184	638	1	1			aluminum					foil			
Berger	MDS	M-185	639	1	1			metal					iron bar			
Berger	MDS	M-186	640	1	1			metal					bolt			
Berger	MDS	M-187	641	1	1			metal					sheet			metal
Berger	MDS	M-188	642	1	1			metal					nail			wire drawn
Berger	MDS	M-189	643	1	1			metal					metal plate			with thinner strip affixed
Berger	MDS	M-190	644	1	1			metal					spring			
Berger	Surface	M-191	645	1	1			ceramic					redware			"plug"
Berger	MDS	M-192	646	1	1			metal					sheet metal			sample; from cinder/ash layer; 0.8' BGS
Berger	MDS	M-193	647	1	1			slag					slag			sample; from cinder/ash layer; 0.8' BGS
Berger	Surface	M-194	648	1	1			glass					window			gglass from cinder/ash layer; 0.8' BGS
Berger	MDS	M-195	649	1	1			metal					bolt			
Berger	MDS	M-196	650	1	1			metal					nail			wire drawn
Berger	MDS	M-197	651	1	1			metal					nail			wire drawn
Berger	MDS	M-198	652	1	1			metal					strap hinge			

Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Berger	MDS	M-199	653	1	1			metal					iron band			
Berger	MDS	M-200	654	1	1			metal					nail			wire drawn
Berger	MDS	M-201	655	1	1			metal					sheet metal fragment			irregular shape
Berger	MDS	M-202	656	1	1			metal					sheet metal fragment			
Berger	MDS	M-203	657	1	1			metal					spike			wire drawn
Berger	MDS	M-204	658	1	1			metal					ring fragment			semi-circular
Berger	MDS	M-205	659	1	1			metal					pipe			
Berger	MDS	M-206	660	1	1			metal					spike			wire drawn
Berger	MDS	M-207	661	1	1			metal					unidentified			poss. staple
Berger	MDS	M-208	662	1	1			metal					wire			fence
Berger	MDS	M-209	663	1	1			metal					wire			fence
Berger	MDS	M-210	664	1	1			metal					nail			wire drawn
Berger	MDS	M-211	665	1	1			metal					nail			wire drawn
Berger	MDS	M-212	666	1	1			metal					nail			wire drawn
Berger	MDS	M-213	667	1	1	2.5		metal					can			lid; evidence of opening; poss. "Sanitary Can"; "No. 1 Can" (2.5" diameter)
Berger	MDS	M-214	668	1	1			metal					spike			wire drawn
Berger	MDS	M-215	669	1	1			metal					sheet			metal with wire drawn nails
Berger	MDS	M-216	670	1	1			metal					spike			wire drawn
Berger	MDS	M-217	671	1	1			metal					nail			wire drawn
Berger	MDS	M-218	672	1	1			metal					nail			wire drawn
Berger	MDS	M-219	673	1	1			metal					wire			fence
Berger	MDS	M-220	674	1	1			metal					nail			wire drawn
Berger	MDS	M-221	675	1	1			metal					nail			wire drawn
Berger	MDS	M-222	676	1	1			metal					wire			poss. fence wire
Berger	MDS	M-223	677	1	1			metal					nail			machine cut
Berger	MDS	M-224	678	1	1			metal					buckle fragment			
Berger	MDS	M-225	679	1	1			metal					wire			fence
Berger	MDS	M-226	680	1	1			metal					knob			stainless steel
Berger	MDS	M-227	681	1	1			metal					nail			machine cut
Berger	MDS	M-228	682	1	2			metal					nail			machine cut fragments

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Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Berger	MDS	M-229	683	1	4			metal					wire			non-electrical; fragments
Berger	MDS	M-230	684	1	1			metal					nail			wire drawn
Berger	MDS	M-231	685	1	1			metal					barbed wire			
Berger	MDS	M-232	686	1	1			metal					wire			poss. fence wire
Berger	MDS	M-233	687	1	2			metal					wire			poss. fence wire
Berger	MDS	M-234	688	1	1			metal					unidentified			poss. farm equipment
Berger	MDS	M-235	689	1	1			metal					bolt			associated with M-234
Berger	MDS	M-236	690	1	1			metal					bolt			associated with M-234
Berger	MDS	M-237	691	1	1			metal					bolt			associated with M-234
Berger	MDS	M-238	692	1	1			steel					cotter pin			
Berger	MDS	M-239	693	1	1			metal					nail			poss. wrough/cut shank
Berger	MDS	M-240	694	1	1			metal					crown cap			"Reed's Original Ginger Brew" twist off
Berger	MDS	M-241	695	1	1			metal					nail			wire drawn tack
Berger	MDS	M-242	696	1	1			metal					washer			
Berger	MDS	M-243	697	1	1			metal					nail			wire drawn
Berger	MDS	M-244	698	1	1			metal					can			fragments
Berger	MDS	M-245	699	1	1			metal					spike			wire drawn
Berger	MDS	M-246	700	1	1			metal					crown cap			"Budweiser"
Berger	MDS	M-247	701	1	1			metal					nail			wire drawn
Berger	MDS	M-248	702	1	1			metal					wire			non-electrical
Berger	MDS	M-249	703	1	1			metal					wire/nail fragments			
Berger	MDS	M-250	704	1	1			metal					nail			wire drawn
Berger	MDS	M-251	705	1	1			metal					nut			square
Berger	MDS	M-252	706	1	1			metal					opener			can/wine opener
Berger	MDS	M-253	707	1	1			metal					wire			non-electrical 3(h)
Berger	MDS	M-254	708	1	1			metal					nail			wire drawn
Berger	MDS	M-255	709	1	1			aluminum					foil			milk bottle, "CASTANEA DAIRY TRENTON, NJ"
Berger	MDS	M-256	710	1	1			metal					crown cap			heavily encrusted
Berger	MDS	M-257	711	1	1			metal					light fixture			w/ chain
Berger	MDS	M-258	712	1	1			metal					key			

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Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Berger	MDS	M-259	713	1	1			aluminum					foil			milk bottle, "CASTANEA DAIRY TRENTON, NJ"
Berger	MDS	M-260	714	1	1			metal					can			fragments
Berger	MDS	M-261	715	1	1			lead					lead fragment			
Berger	MDS	M-262	716	1	1			metal					monkey wrench			
Berger	MDS	M-263	717	1	1			metal					cast iron plate fragment			rectangular; center hole w/ two rectangular
Berger	MDS	M-264	718	1	1			metal					hasp assembly			
Berger	MDS	M-265	719	1	1			metal					nail			machine cut, associated w/ M-234
Berger	MDS	M-266	720	1	1			metal					nail			wire drawn
Berger	MDS	M-267	721	1	1			metal					nail			wire drawn
Berger	MDS	M-268	722	1	3			metal					nail			wire drawn, 3 individual nails
Berger	MDS	M-269	723	1	1			metal					plow blade			possible
Berger	MDS	M-270	724	1	1			metal					washer			
Berger	MDS	M-271	725	1	1			metal					tile			bathroom; pink glaze
Berger	MDS	M-272	726	1	1			metal					sheet metal fragment			rectangular; w/ holes/slots
Berger	MDS	M-273	727	1	1			metal					flashing			white paint
Berger	MDS	M-274	728	1	1			metal					crown cap			"Molson Gold"
Berger	MDS	M-275	729	1	1			copper alloy					coin			penny - 1975
Berger	MDS	M-276	730	1	1			metal					horseshoe			fragment; w/ nails
Berger	MDS	M-277	731	1	1			metal					pipe			
Berger	MDS	M-278	732	1	1			metal					bolt			w/ hexagonal nut
Berger	MDS	M-279	733	1	1			metal					strip			steel; w/ rivets
Berger	MDS	M-280	734	1	1			metal					nail			wire drawn nail fragment
Berger	MDS	M-281	735	1	25			metal					nail			cluster, 15 individual wire drawn nails, 2 spikes, 8
Berger	MDS	M-282	736	1	1			metal					nail			wiredrawn
Berger	Surface	M-283	737	1	1			bakelite					button			bakelite; 4 perforations
Berger	MDS	M-284	738	1	1			metal					nail			wiredrawn
Berger	MDS	M-285	739	1	1			metal					key fragment			
Berger	MDS	M-286	740	1	1			metal					spike			wire drawn

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Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Berger	MDS	M-287	741	1	1			metal					pipe			spiral; poss. electrical conduit?
Berger	MDS	M-288	742	1	1			metal					nail			wire drawn
Berger	MDS	M-289	743	1	1			metal					white sheet metal fragment			small circles stamped into both sides
Berger	MDS	M-290	744	1	1			metal					spike			wire drawn
Berger	MDS	M-291	745	1	1			metal					nail			wire drawn
Berger	MDS	M-292	746	1	1			metal					cast iron fragment			yellow paint; grooved exterior
Berger	MDS	M-293	747	1	1			metal					washer			large
Berger	MDS	M-294	748	1	1			copper alloy					coin			penny - 1993
Berger	MDS	M-295	749	1	1			aluminum					can			"safety can"; food product
Berger	MDS	M-296	750	1	1			metal					end nut			steel; plumbing related
Berger	STP	STP A-1	751	1	1			glass					bottle fragments			clear, curved
Berger	STP	STP A-6	752	1	1			ceramic					whiteware			
Berger	STP	STP C-2	753	1	1			ceramic					brick fragment			
Berger	STP	STP C-3	754	1	8			sandstone					poss. fire cracked rock			
Berger	STP	STP C-5	755	1	1			sandstone					fire cracked rock			
Berger	STP	STP C-7	756	1	1			glass					lighting glass			
Berger	STP	STP C-7	757	1	1			sandstone					poss. fire cracked rock			found on surface just north of STP C-7
Berger	STP	STP E-1	758	1	2			glass					bottle fragments			amber, curved
Berger	STP	STP E-2	759	1	1			ceramic					whiteware			poss. burned
Berger	STP	STP E-2	760	1	2			sandstone					poss. fire cracked rock			
Berger	STP	STP E-7	761	1	30			sandstone					poss. fire cracked rock			
Berger	STP	STP F-1	762	1	1			sandstone					natural rock			preformed projectile point?
Berger	STP	STP F-8	763	1	1			brick					brick fragment			
Berger	STP	STP H-1	764	1	2			sandstone					poss. fire cracked rock			

Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Berger	STP	STP H-3	765	2	1			chert					flake			
Berger	STP	STP H-3	765	1	2			metal					nail			machine cut
Berger	STP	STP H-3	765	3	1			quartz					poss. shatter			
Berger	STP	STP H-3-C	766	1	1			sandstone					poss. fire cracked rock			
Berger	STP	STP I-5	767	1	1			basalt					poss. fire cracked rock			
Berger	STP	STP I-7	768	1	1			glass					light bulb			
Berger	STP	STP I-8	769	1	1			brick					brick fragment			
Berger	TU	TU 2	770	7	1			bone					faunal			poss., calcified
Berger	TU	TU 2	770	1	1			brick					brick fragment			
Berger	TU	TU 2	770	6	1			chert					flake/shatter			fire reddened
Berger	TU	TU 2	770	2	1			coal					coal			sample
Berger	TU	TU 2	770	3	1			glass					bottle fragments			light olive green
Berger	TU	TU 2	770	4	1			glass					bottle fragments			clear
Berger	TU	TU 2	770	5	1			glass					bottle fragments			clear, base fragments
Berger	TU	TU 2	771	1	1			charcoal					charcoal			sample
Berger	Surface	Surface	772	1	1			ceramic					ironstone			body fragment
Berger	Surface	Surface	773	1	1			hammerstone					poss.			sandstone
Berger	Surface	Surface	774	1	1			chert					flake			
Berger	MDS	M-297	775		1			metal					unidentified machine part			cast aluminum
Berger	MDS	M-298	776		1			metal					washer			ferrous; encrusted
Berger	MDS	M-299	777		1			metal					bolt			hexagonal head; threaded; pointed end; ferrous; galvanized
Berger	MDS	M-300	778		1			metal					washer			ferrous; encrusted
Berger	MDS	M-301	779		1			metal					nail			wire drawn; ferrous; encrusted
Berger	MDS	M-301_2	780		1			metal					bolt			hexagonal head; threaded; pointed end; ferrous; galvanized
Berger	MDS	M-302	781		1			metal					spike			machine cut; ferrous; encrusted

Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Berger	MDS	M-303	782		1			metal					reciprocal saw blade			ferrous; encrusted
Berger	MDS	M-304	783		1			metal					electrical wire			insulated with red plastic
Berger	MDS	M-305	784		1			copper					sheet metal			possible roof flashing; thin, triangular piece
Berger	MDS	M-306	785		1			metal					nail			wire drawn; ferrous; encrusted
Berger	MDS	M-307	786		1			copper					sheet metal			possible roof flashing; thin, rectangular piece
Berger	MDS	M-308	787		1			copper					sheet metal			possible roof flashing; thin, triangular piece
Berger	MDS	M-309	788		1			metal					washer			ferrous; encrusted
Berger	MDS	M-310	789		1			metal					spike			wire drawn; ferrous; encrusted
Berger	MDS	M-311	790		1			metal					nail			wire drawn; ferrous; encrusted
Berger	MDS	M-312	791		1			metal					nail			wire drawn; ferrous; encrusted
Berger	MDS	M-313	792		1			metal					nail			wire drawn; ferrous; encrusted
Berger	MDS	M-314	793		1			metal					unidentified			circular (bent/curved) with hole in center
Berger	MDS	M-315	794		1			metal					nail			wire drawn; ferrous; encrusted
Berger	MDS	M-316	795		1			metal					tow ring			ferrous; encrusted
Berger	MDS	M-370	796		1			metal					pipe fragment			ferrous; encrusted
Berger	MDS	M-371	797		1			metal					ring			ferrous; encrusted
Berger	MDS	M-372	798		1			metal					nail			wire drawn; ferrous; encrusted
Berger	MDS	M-373	799		1			metal					wire			ferrous; encrusted
Berger	MDS	M-374	800		1			metal					bar/pipe			ferrous; cylindrical
Berger	MDS	M-375	801		1			metal					wire			copper wire
Berger	MDS	M-376	802		1			metal					ring			ferrous; encrusted
Berger	MDS	M-377	803		1			metal					strap hinge with nails			five nails; ferrous; encrusted
Berger	MDS	M-378	804		1			metal					horseshoe			large; ferrous
Berger	MDS	M-379	805		1			metal					rebar			ferrous
Berger	MDS	M-380	806		1			metal					unidentified			cast aluminum with checkerboard motif
Berger	MDS	M-381	807		1			metal					screw			ferrous; encrusted

Firm	Method	Field Bag #	Catalog #	Row #	Quant.	Dia. (in)	Weight (g)	Material 1	Material 2	Whole/ Frag	Form	Color	Description	Group	Category	Comments
Berger	MDS	M-382	808		1			metal					electrical wire casing			encrusted
Berger	MDS	M-383	809		2			metal					nail			wire drawn; ferrous; encrusted
Berger	MDS	M-384	810		1			metal					bolt			ferrous; encrusted
Berger	MDS	M-385	811		1			metal					bolt			ferrous; encrusted
Berger	Surface	M-385_2	812		1			glass					window glass			aqua
Berger	Surface	M-385_3	813		1			earthenware					ceramic			whiteware sherd (1820-2000)
Berger	MDS	M-386	814		1			metal					wire			ferrous; encrusted
Berger	Surface	M-386_2	815		1			glass					bottle glass			clear
Berger	MDS	M-387	816		1			metal					screw			wire draws; ferrous
Berger	MDS	M-388	817		1			metal					pipe fragment			ferrous; encrusted
Berger	Surface	M-388_2	818		1			glass					bottle glass			brown; paneled; partial base; beer bottle
Berger	MDS	M-389	819		1			composite material					penny			penny--1977
Berger	Surface	M-389_2	820		1			plastic					plastic			rectangular fragment; clouded
Berger	MDS	M-390	821		1			metal					nail			wire drawn; ferrous; encrusted
Berger	MDS	M-391	822		1			metal					iron piece			ferrous; encrusted
Berger	Surface	M-391_2	823		1			glass					bottle glass			amber
Berger	MDS	M-392	824		1			metal					iron piece			ferrous; encrusted
Berger	Surface	M-392_2	825		1			glass					bottle glass			clear
Berger	MDS	M-393	826		1			metal					nail			wire drawn; ferrous; encrusted
Berger	MDS	M-394	827		1			metal					possible farm equipment			triangular piece with nail; ferrous; encrusted (possible plow blade)
Berger	MDS	M-395	828		1			metal					possible hinge			metal plate with nail/bolt; ferrous; encrusted

APPENDIX B:
Geophysical Survey

Institute for Advanced Study, Princeton, New Jersey

Report on Geophysical Surveys, July 14-21, 2014

for

The Ottery Group, Inc.

T.J. Horsley, Ph.D.

April 2015

Horsley Archaeological Prospection, LLC

HAP2014-17

IAS, PRINCETON, NEW JERSEY
Report on Geophysical Surveys, July 14-21, 2014

Summary

Non-invasive geophysical surveys have been conducted across 6.8 acres of IAS property in Princeton, New Jersey. A combination of magnetometer, electromagnetic induction, and ground-penetrating surveys were employed in the hope of identifying buried cultural features and artifacts, some of which might be associated with the Revolutionary War Battle of Princeton. A wide range of magnetic anomalies have been detected caused by subsurface features, including geological variations, buried utilities, recent geophysical test units, and even vehicle ruts; however, very few anomalies that might potentially be of archaeological interest were identified. The results provide no evidence for burials or any type of significant military soil disturbance, although it is possible that the latter – if they existed – have been removed by later agricultural activities.

Both the magnetometer and EMI results reveal the locations of a large number of surface or near-surface metallic objects. Unlike a metal detector survey that can locate relatively small metal objects within the top few inches of soil, these techniques – and the field methodologies employed – are limited to detecting larger pieces of metal, but they do have the potential to detect objects within and below the plowzone. Three or four clusters of metallic debris suggest foci of past human activity. While these surveys help to differentiate between ferrous and non-ferrous metals, it is not possible to distinguish between modern or historic artefacts from their geophysical anomalies alone, and these locations will therefore require further investigation using intrusive methods to obtain dating evidence and determine the nature of these activities.

A limited number of GPR profiles were recorded at wide intervals across the area of interest with the primary aim of assessing the potential of GPR in this environment. The results reveal a few discrete locations where subsurface anomalies are present, most likely rocks weathered from the bedrock; these will also require ground-truthing for verification. No evidence has been found for any burials, although it should be stressed that GPR sampling was limited.

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INSTITUTE FOR ADVANCED STUDY, PRINCETON, NJ
Report on Geophysical Surveys, July 14-21, 2014

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1. Introduction

1.1 Horsley Archaeological Prospection, LLC, (HAP), has conducted geophysical surveys over areas at the Institute for Advanced Study (IAS) in Princeton, New Jersey. An integrated approach combining magnetometry, electromagnetic induction survey (EMI), and ground-penetrating radar (GPR) was employed to locate and map any buried features and large metal artifacts and features associated with the Battle of Princeton, a Revolutionary War battlefield that is believed to have extended into this area. Numerous metal detector surveys within the current area of interest (AOI) over the last 25 years have yielded military material associated with this battle (see LBG 2011; 2012; JMA 2010, Appendix 5). While geophysical methods are not commonly employed to detect artifacts, it was hoped that they might detect more deeply buried larger metallic objects, as well as help to identify any intact subsurface features that may relate to the battlefield and encampments, such as fortification ditches, hearths, latrines, or possible burials. Prehistoric features can also be expected, as well as later historic cultural resources. This work was undertaken in response to a request from The Ottery Group, Inc. for IAS.

1.2 The geophysical surveys were centered on approximately 444300E, 545800N (NAD1983, State Plane New Jersey [feet]), or 527890E, 4464230N (UTM coordinates, zone 18T). The locations of the area of investigation and geophysical survey areas are shown in Figure 1.

1.3 The soil within the AOI is described as the well drained Bucks silt loam (USDA-NRCS 2015). The typical profile comprises silt loam down to around 0.43m (27”), with a channery silt loam between 0.43-1.22m (27-48”), over weathered bedrock. Such homogenous soils ought to provide near-ideal conditions for many geophysical methods as anthropogenic anomalies should present distinct contrasts. The relatively shallow weathered bedrock may mean that geological variations will also produce clear geophysical responses; however, these are expected to be fairly easy to distinguish from archaeological sources.

1.4 The bedrock underlying the site is the Stockton Formation, an arkosic sandstone (i.e. primarily quartz and feldspar), with lesser silty mudstone, argillaceous (i.e. clayey) siltstone, and shale (USGS 2015). This variable parent material can lead to magnetic anomalies that are detectable at the surface, especially where the overlying soil is shallow. Variations in the permeability of the bedrock composition may also produce anomalies detectable by a conductivity survey. As stated above, these are expected to be distinguishable in the geophysical data, or at least easily tested by ground-truthing.

1.5 Land-use in the survey area is agricultural, with the two fields currently used for hay. A section of asphalt road runs along the northern edge of the AOI, and a dirt track runs down the western side of a dense line of trees that divides the fields. At least one utility pipe is known to run along the southern side of the road at the northern end of the AOI.

1.6 Given the nature of the expected archaeological remains and the environmental conditions, it was decided to conduct a combination of geophysical methods for this investigation. An initial magnetometer survey was conducted to cover a broad area to obtain a general view of the subsurface and potentially identify archaeological features relating to the battlefield and other cultural activities. This was followed by an electromagnetic induction survey to target areas of interest identified by the magnetometer findings. A small number of GPR traverses were then collected within both fields in part to assess its utility in this environment and to provide additional information on the magnetic and conductivity anomalies. These were not intended to determine or rule out the presence of burials within the AOI, as this would require a significantly higher resolution survey that was not feasible at this stage of the investigation.

1.7 Geophysical surveys were undertaken between July 14-21, 2014. Weather conditions during the survey and for the week prior to fieldwork were ideal, presenting favorable soil conditions for each of these methods.

2 Geophysical prospection methods

2.1 Geophysical methods include a range of non-destructive techniques for detecting subsurface disturbances associated with buried remains. It is important to note that these techniques do not detect the features themselves, but rather physical variations – or *anomalies* – that require interpretation. For a buried feature to be detected there must therefore be some degree of physical contrast between it and the natural soil and subsoil that surrounds it; if no such contrast exists, that feature will be effectively be invisible. It should also be noted that different subsurface situations may give rise to very similar, if not identical, above-ground geophysical anomalies. The interpretation of such results therefore requires experience working with shallow geophysical data, and familiarity with archaeological and natural features and deposits. Interpretation may also draw on excavation and other archaeological evidence that can aid in the identification of specific feature types, materials and depths. Only through investigation using more intrusive methods can datable artifacts and material be obtained, and causative features be accurately determined.

2.2 Many archaeological features exhibit physical contrasts to natural soils and sediments, either through the addition of foreign material into the soil (e.g. building materials such as bricks and rocks), or by altering the soils and subsoils (e.g. conversion of magnetic properties through heating, or the silting up of cut features such as pits and ditches). A selection of geophysical techniques is available for archaeological prospection, including magnetometry, electrical resistance, and GPR. Each method measures a different physical property and therefore a particular method or combination of methods may be chosen that will be best suited to the conditions at a given site.

2.3 Magnetometry is currently the most rapid geophysical method and can detect a broad range of both prehistoric and historic archaeological features on account of contrasts in *magnetic susceptibility* (MS) and/or the presence of a permanent magnetization. MS the ability of a material to become magnetized when placed in a magnetic field; in soils, this is related to the naturally occurring iron minerals present. These minerals can be converted to more magnetic forms through many anthropogenic activities, such as heating and the decomposition of organic material. In addition to pits, ditches, larger postholes, and many burnt remains, it is often possible to identify former occupation areas using a magnetometer by an increase in background levels of magnetic noise. Heating soils to high temperature can cause a strong, permanent magnetization to be retained, such that kilns and furnaces can be detected, as well as accumulations of brick and tile. Historic sites are therefore usually more easily identified on account of the higher concentration of magnetic material in the form of brick, tile and ceramics, in addition to iron objects. Due to the speed with which measurements can be made this method is well suited to characterize magnetic anomalies over large areas at high resolution.

Further information on this technique may be found in Appendix 1.

2.4 Electromagnetic methods include techniques ranging from GPR to metal detectors. Unlike magnetometers, these are active instruments, in that they measure variations in a signal generated by the equipment itself. Electromagnetic induction (EMI) instruments induce electrical current flow in conducting materials, and how easily current flows in a soil or sediment – its electrical conductivity – is related to factors including moisture content, material type, and compaction. In this way, conductivity contrasts can indicate the presence of buried pits, ditches, floors and foundations, as well as natural variations in soil moisture that may be due to pedological, geological, or topographic changes.

Since metal is a good electrical conductor, buried metal objects can produce distinctive conductivity anomalies that reveal their location. The *Geonics* EM38 electromagnetic induction meter employed here allows both soil conductivity and magnetic data to be collected simultaneously. Differences between the two data sets permit a distinction between ferrous and non-ferrous metal objects to be made. Furthermore, one version of this instrument allows simultaneous collection of these data from two different coil spacings: 0.5m and 1.0m. These effectively correspond to two different depths of investigation, therefore comparison between the data can help to characterize anomalies as archaeological or geological.

In addition, it is also possible to obtain information on the magnetic susceptibility of subsurface soils using EMI. While the results can be less detailed than seen a magnetometer survey, differences between the two data sets can be informative.

Further information on this technique may be found in Appendix 2.

2.5 GPR is a relatively new addition to the geophysical archaeologist's toolkit, being greatly enhanced by dedicated computer software for processing and display, as well as a better understanding of the types of environments where this method can be applied successfully. In contrast to other methods, GPR has the potential to provide detailed information on the depth of subsurface remains by recording energy reflections from sub-horizontal features (such as cultural layers, soil horizons); vertical features (e.g. trenches, foundations); and discrete bodies (such as rocks and boulders). Where conditions allow different features to be resolved it can be possible to identify vertical relationships between them. Since the energy reflections occur where there is a change in the velocity of the emitted GPR energy, such as between different materials, soil textures, or water content, it may not be possible to detect features where there is a gradual transition or no contrast from one material to another.

One of the most useful aspect of this method for archaeological investigations is the ability to produce so-called *amplitude time-slices* – horizontal plans that correspond to different depths below the ground surface that more closely resemble archaeological plans. When used in combination with the individual radar profiles, interpretations can be produced for different depth ranges. Data collection with this method is somewhat slower than magnetometry, but adequate data processing and analysis takes significantly longer. It is therefore usual to target specific areas of interest with GPR rather than conduct a total area survey. Further details on this method are provided in Appendix 3.

3 Methodology

3.1 In order to accurately locate any resulting anomalies, geophysical surveys are undertaken over a regular grid. For these investigations at the IAS, the surveys were based on the arbitrary grid established by The Ottery Group and later tied into permanent features. Using a total station, a baseline was set out along the western side of the AOI from a temporary datum at the northwestern corner. Bamboo canes were then placed at 30m intervals within both fields to form a grid of 30m x 30m squares (see Figure 1). In this way, an accurate grid encompassing the area of interest was maintained to ensure proper positioning of the geophysical equipment during the surveys.

3.2 The magnetometer survey was undertaken using a *Bartington Grad601-2 dual fluxgate gradiometer*. Data were collected within 30m grid squares at a sample interval of 0.125m (4.9") along traverses spaced 0.5m (19.7") apart. Each line was walked in opposite directions, in the so-called zig-zag fashion. Before and during the course of the survey the electronic and mechanical setup of the instrument was adjusted to correct for electronic drift and variations in coil orientation. The magnetometer was set to a recording sensitivity of 0.1nT. In total, an area of around 2.75 hectares (6.8 acres) was covered with this method.

3.3 Magnetometer data were downloaded using *TerraSurveyor 3* for initial treatment and processing. For these data sets, treatment was restricted to *clipping* of the data to reduce the influence of extreme readings, followed by *sensor destripe* to reduce or remove any striping in the data due to sensor mismatch (see Horsley and Wilbourn 2009). For some grid squares it was necessary to also apply a *zero mean traverse* to remove additional striping still visible in the data. Finally, the data were *interpolated* once in the y-direction, resulting in a resolution of 0.25m x 0.125m (9.8" x 4.9"); this produces a smoother appearance and aids the identification and interpretation of anomalies.

3.4 The electromagnetic induction survey was undertaken using a *Geonics EM38-MK2*. Both quadrature and in-phase measurements were recorded simultaneously to effectively generate conductivity and magnetic susceptibility data. The instrument was carried horizontally such that the coil orientation was in the horizontal dipole, corresponding to effective depths of investigations of 0.3m and 0.6m for magnetic susceptibility (for 0.5m and 1.0m coil separations respectively), and 0.37m and 0.75m for conductivity measurements.

Readings were collected along 60m traverses, (i.e. within two adjacent 30m grid squares), at a timed-sample interval corresponding to approximately 0.25m (9.8"), with traverses spaced 1.0m (39.4") apart. Each line was walked in opposite directions. Before and during the course of the survey the electronic and mechanical setup of the instrument was adjusted to correct for instrument drift. Since this technique was used to target smaller areas, a total area of 1.88 ha (4.65 acres) was surveyed.

3.5 EMI data were downloaded and converted using the dedicated *DAT38MK2* software, resampled using *Surfer* from *Golden Software*, and imported into *TerraSurveyor 3* for processing and analysis. Processing was restricted to zero median traverse (when necessary), the application of a High Pass spatial filter to enhance small scale variations, and interpolation to smooth the overall appearance of the results and aid analysis.

3.6 The GPR test was conducted using a *GSSI SIR-3000* ground-penetrating radar system. A 400 MHz antenna was employed after comparing results from both 400 MHz and 200 MHz antennas: the higher frequency provided better subsurface resolution and adequate depth penetration (around 1.4m) for this environment. Since neither magnetometer nor EM surveys provided strong evidence for locations worthy of conducting a high resolution survey across an area, individual GPR profiles were collected in Field 1 along transects oriented approximately SW-NE (i.e. across the field), spaced 10m apart (Fig. 1). Along these transects, measurements were taken at 0.02m intervals, triggered using a survey wheel integrated into the cart used to collect the data.

Two additional GPR profiles were collected in Field 2, oriented roughly NW-SE and separated by 10m (see Fig. 1).

3.7 All GPR data were collected and recorded onto the dedicated data recorder and subsequently downloaded onto a PC. Data processing was undertaken using the 2D data analysis module in *Reflex-Win Version 3.5*. Minimal treatment was undertaken prior to analysis: a standard procedure consisting of *de-wowing*, *gain correction* and *time-zero correction*. Following initial analysis of the radargrams, additional processing was applied to remove horizontal banding (*background removal*), and *migration* to collapse hyperbolic reflections back into point source reflections. Both steps have aided analysis of the results, and reference was made to all processed data sets when interpreting the data.

3.8 To allow conversion of two-way travel time to real depth, the average velocity of the ground was found by matching computer-generated hyperbolae to the data. This velocity is specific to different sediments and water content, and for this survey it was found to be around 0.098m/ns. It is worth noting that this is the average velocity for the entire profile, and the component velocities will be different for different materials, such as gravel, topsoil, subsoil, feature fill, as well as variations in water content. Therefore any depths given here should be taken as approximations, but are expected to be within 10-20% of the actual depths.

4 Results

4.1 ***Magnetometer survey*** – Figures 2-4

4.1.1 A plot of the magnetometer data is presented in Figure 2 after (i) clipping, (ii) treatment to reduce striping, and (iii) interpolation (see Section 3.3). An interpretation of the data is presented in Figure 3 (overlain on the satellite image), and in Figure 8, where they are combined with the interpretation of the EM data (see Section 4.2), and displayed on the arbitrary site grid. The probable archaeological anomalies are also included in the final interpretation map in Figure 12.

4.1.2 As is commonly seen in magnetometer data, the IAS results reveal anomalies due to both natural and cultural surface and subsurface features. It was hoped that the soils at the site would be sufficiently deep to reduce any geological responses; while this is the case for much of the northern portion of the survey, the southern end of Field 1 is characterized by relatively strong positive and negative anomalies due to naturally occurring magnetic variations in the underlying Stockton Formation. These bipolar responses are mostly within ±8nT in strength, although in a few localized instances they measure in excess of ±20nT. This area is highlighted in gray at [a] in Figures 3 and 8. It mostly coincides with the slight rise in the field, strengthening the interpretation that these responses are natural in origin.

4.1.3 As the bedrock becomes more deeply buried and overlying soils thicken, the strength of these geological signals quickly drops off. In some instances it can be difficult to distinguish archaeological and natural responses (e.g. see [f], [g] and [l] to [m] below), but long positive and negative trends, up to 80m in length and mostly oriented within approximately 20° of west-east, are quite clearly geological in origin. These trends are highlighted in Figures 3 and 8, but not labeled.

4.1.4 While some of these geological anomalies described above are relatively strong, they are easily distinguishable from the discrete, more intense bipolar responses caused by iron metal and other ferrous material. Such anomalies are commonly seen in magnetometer over agricultural land and can be modern, recent, or historic in origin. Without excavating each iron object it is impossible to determine whether they are of archaeological interest or not, however, concentrations of these responses can indicate areas of former human activity. The clearest ferrous anomalies are plotted in Figure 3 (as "probable ferrous material"), and it has also been possible to identify four concentrations of small scale magnetic noise that probably represents foci of former anthropogenic activity (at [b], [d], [e], and [h]), as well as disturbance due to the modern track. These are discussed in the following sections.

4.1.5 A cluster of discrete positive and bipolar anomalies is visible in Field 1, highlighted at [b] in Figure 3. This strongly suggests a concentration of historic debris in the soil, although whether this represents the former site of a small structure or a dump of material is impossible to determine from the geophysical results alone. The bipolar responses indicate larger pieces of iron metal, whereas the positive anomalies suggest localized areas of magnetic enhancement, such as in situ burnt soils, small pits, or concentrations of fired clay such as brick; the locations of both potential artifacts and features are shown in Figure 3. Some 25m northwest of this area at [c] is a distinct positive anomaly that likely represents an archaeological feature and may therefore be associated with this historic activity. It is discussed in further detail in Section 4.1.10 below.

The area of magnetic noise at [b] has also been detected in the EMI quadrature survey (at [i] in Figure 7), and is also discussed in Sections 4.2.5.

4.1.6 Two areas of magnetic noise indicating historic activity are identified in Field 2 at [d] and [e] in Figure 3. Close to the road, [d] may be due to a former structure or a dump of historic trash, perhaps associated with a demolished structure that stood immediately north of the survey area. There is no evidence for a substantial foundation within this noise. Alternatively, this area of magnetic noise could be due to material brought in to level the ground when the road was constructed, although the shape of the spread of this material makes this interpretation unlikely. Excavation would be required to verify the origin of this material and obtain dating evidence.

4.1.7 The area highlighted at [e] in Figure 3 is less easily explained as there are fewer ferrous responses and the small scale noise is more subtle. This area coincides with a slight rise in the field, and so it is possible that this was the site of historic or prehistoric activity/occupation. It also coincides with a small cluster of Revolutionary War artifacts discovered in previous metal detector surveys, further suggesting that this was the focus of activity at that time (compare with Figs 1 and 12). However, since this slight topographic rise is probably due to a rise in the underlying geology, an alternative explanation is that the increased noise is simply due to weathered bedrock closer to the surface at this position. A group of at least 8 discrete positive anomalies visible in this area, each 0.5-1.0m in diameter, could indicate a ring of buried pits containing burnt, magnetically enhanced soil, (i.e. historic or prehistoric features); however, based on their form, most – if not all – are more likely due to subsoil or geological features. The two responses at [f] and [g] are slightly better defined than the others, suggesting that their causative features are shallower and therefore possibly anthropogenic. These anomalies might be worthy of further investigation using intrusive methods, even if only to rule out any archaeological significance.

4.1.8 The small area of Field 3 that lies within the AOI is dominated by intense magnetic anomalies due to historic and/or recent activities. A band of small scale magnetic noise ([h] in Fig. 3) is accompanied by linear positive and negative responses. Based on their dimensions and position these may represent the remains of an earlier track; alternatively, they indicate the courses of two or three buried utilities. These utilities would be in addition to the very clear evidence for two iron pipes that also run through this area: one along the southern side of the modern road, and the other, probably a storm drain, crossing under the road towards the tree line between Fields 2 and 3.

To the southeast of the road and the band of noise described above, two discrete positive magnetic anomalies can be seen, labeled [j] and [k] in Figure 3. These may represent buried archaeological features and are discussed below in Section 4.1.11.

4.1.9 The most intense areas of small scale magnetic noise are easily attributed to the modern gravel track that runs down the eastern side of Field 1. These are highlighted in Figure 3 and simply indicate that this gravel material possesses a natural, remanent magnetization. Some iron material is likely also present. It is worth nothing that these intense responses may mask weaker anomalies of archaeological origin, if present.

4.1.10 The discrete positive response at [c] represents one of the few magnetic anomalies in this survey that strongly indicates a buried archaeological feature. The response measures around 1.8m in diameter and between 5-36nT, and indicates a localized concentration of strongly magnetic material at this position. Possible interpretations include in situ burning of soil, or a pit containing burnt soil and/or fire-cracked rock. The feature therefore has the potential to be prehistoric in origin, and it is worth noting that is lies within the concentration of prehistoric artifacts that had previously been identified (see Figs. 8 and 12). Alternatively, it is possible that this anomaly represents a pit with some iron metal at least 0.5m below the ground surface. Either a historic privy or a well would produce such a response, and excavation will be necessary to accurately determine the causative feature and obtain dating evidence.

4.1.11 A small number of similar ‘pit-like’ anomalies have been detected elsewhere in this survey. As noted above, two positive anomalies were detected at [j] and [k], in the northern portion of Field 3. Anomaly [j] measures around 1.5m in diameter and between 8-36nT in strength, while [k] is just 0.7m across and up to 10nT. Both are consistent with being caused by pits containing differing concentrations of burnt material. As such, these features could be either relatively recent, historic, or prehistoric in origin, and will require further work to better understand them.

4.1.12 Many weaker, discrete positive magnetic anomalies are visible throughout the survey area and are included in the interpretation in Figure 3. As the legend indicates, many of these are probably due to natural features such as localized variations in the type and depth of bedrock, but it is not always possible to rule out an archaeological interpretation. Where these anomalies, (shown as orange and yellow in Fig. 3), coincide with geological trends, (the dashed gray lines), a geological explanation is more likely. Others, such as the clusters of positive responses at [l], [m], and [n], are consistent with the types of anomalies seen over prehistoric occupation features (e.g. pits, hearths, etc.), and may be worthy of further investigation or monitoring. The cluster at [m] lies within the concentration of previously identified prehistoric material, but many, if not all of these anomalies could well be due to geological variations.

4.1.13 Two sections of linear positive anomaly have been detected at the northern end of Field 1, highlighted at [o] in Figure 3. These indicate sections of a trench or channel around 0.4m across and at least 18m long. Such a narrow ditch would not be defensive and, given that its alignment closely matches the edge of the field, this is more likely due to a relatively recent agricultural feature, such as plow headland. Other, much weaker linear anomalies can be discerned running parallel to this one clear response, supporting an agricultural interpretation. The strength of the anomaly at [o], up to 6-7nT, indicates a fairly strong magnetic contrast between the topsoil filling the trench and the subsoil. While such a contrast could reflect a natural variation in the subsoil or geology, the very localized nature of this anomaly implies an anthropogenic source. Earlier occupation, prehistoric or historic, has the effect of locally enhancing topsoil magnetic properties, and these areas can produce better defined plow scar anomalies. Such occupation would have to be prolonged, and this is unlikely related to any relatively brief Revolutionary War activity. Despite being recent or historic in date, this agricultural feature may therefore indicate the presence of earlier occupation, even if features have been plowed out.

4.1.14 A number of discrete negative magnetic anomalies are visible in the survey: two at [p], two at [q], one at [r], and one at [s], all in Field 1; and one at [t] in Field 2. Negative anomalies indicate material that is less magnetic than the surrounding soil, and in this instance they are quite certainly caused by looser soil associated with former geophysical test units that were known to have been excavated at an earlier phase of the IAS Faculty Housing Project. The anomaly at [p] is adjacent to an area of magnetic noise, and this is known to be due to gravel that was observed on the ground surface during the survey.

Modern vehicle ruts have also been detected in these surveys as parallel, weakly negative linear and curvilinear anomalies. Many of these can also be related to these test unit locations. These are all shown in Figures 3 and 8, but since they are clearly modern in origin, they are not shown in Figure 12.

4.1.15 At the northern end of Field 2 is evidence for one buried utility, with suggestions of two additional utilities or trenches. A linear alignment of positive and negative magnetic responses is visible at [t], running SSW in from the edge of the survey area and stopping at an intense bipolar ferrous anomaly. Such a response could be due to either a deeply buried iron pipe or a more shallow clay tile pipe. One of the GPR traverses (2360.9'E) crossed over this probable pipe, (See Section 4.3.2 and Figure 11), and those results support the interpretation that this is a metal pipe and indicate that its top is at around 0.5m below the surface.

Southeast of [t] are two linear magnetic anomalies that are also most likely relatively recent in origin. These are highlighted as [u] and [v] in Figure 3. Both anomalies are fairly weak, less than 3nT, and almost perfectly straight, suggesting >50m long narrow trenches cut and backfilled. The reason for them is unclear as it is not possible to identify a pipe within either of them, although it is possible that a small pipe or cable would be undetectable. The two GPR transects in this field also passed over these features, but provide no further clues to their cause.

4.2 ***Electromagnetic induction results*** - Figures 4-7

4.2.1 Following the magnetometer survey, areas were selected for resurvey using the EMI instrument. The primary reason for employing this method was for its ability to detect and discriminate between ferrous and non-ferrous metallic objects, although the data also contain information on subsurface features, some of which may be cultural.

4.2.2 Three of the four sets of data collected by this instrument are presented here: the in-phase (i.e. ‘magnetic susceptibility’) measurement made with the 0.5m coil separation and corresponding to approximately 0.3 m.b.s. (Fig. 4); the quadrature (i.e. ‘conductivity’) measurement collected with the 0.5m coil separation, corresponding to around 0.37 m.b.s. (Fig. 5); and the quadrature measurement made with the 1.0m coil separation, corresponding to approximately 0.75 m.b.s. (Fig. 6). Since the in-phase measurements are mostly closely related to the magnetic susceptibility of the soil, the results add little new information to the magnetometer survey and it is only worth presenting the results corresponding to the shallower depth. Conversely, the two sets of quadrature data provide information on the conductivity of the soils for differing depths, and can therefore help to distinguish between archaeological and natural variations. A combined interpretation of the three data sets is shown in Figure 7.

4.2.3 As noted above, the in-phase EMI results are most closely related to the magnetic susceptibility of the soil, and consequently there is good correlation with the magnetometer results. Differences between the magnetometer results in Fig. 2 and EMI in-phase results in Fig. 4 are due to a number of factors, including the fact that the magnetometer responds to more deeply buried magnetic variations on account of it measuring the geomagnetic field. The other major difference between these data sets is due to the coarser resolution at which the EMI data were collected. In Field 1, the EMI survey was undertaken at 0.25m x 1.00m, compared with 0.125m x 0.5m. In Field 2, the smaller EMI data were collected at 0.25m x 0.50m.

4.2.4 For the EMI in-phase results from Field 1 (Fig. 4), the clearest and most intense anomalies are over the areas of gravel in the modern track, and can be dismissed. The surface gravel close to a former geophysical test pit, ([p] in Figure 3), has also again been detected for the same reason and can be ignored.

In addition, comparison between Figures 2 and 4 reveals good correlation between the broad area of geological noise at the southern end of Field 1, and this is also not discussed any further.

4.2.5 The in-phase results in Figure 4 have provided some evidence for near-surface ferrous materials throughout the survey area, but not at the high resolution provided by the magnetometer survey. Where these data do clarify the picture somewhat is over the area of magnetic noise seen in Field 1, highlighted in Figure 3 at [b]. In Figure 4, a smaller area of enhanced magnetic susceptibility is suggested that better defines this probable concentration of historic activity. This area is highlighted at [i] in Figure 7. A small number of discrete ferrous responses are also identified here, but the 0.5m quadrature results (Figure 5) reveal a number of additional non-ferrous objects that cluster around this area. As with the magnetometer results, it is not possible to identify specific features or structural elements associated with this concentration of historic material, and this may therefore represent a dump of material rather than the site of a former structure.

4.2.6 A higher resolution EMI survey was conducted in Field 2 over the slight rise where a number of potentially interesting magnetic anomalies were identified ([e] in Figure 3). Surprisingly, only one response indicating a metallic (probably non-ferrous) object was identified in this area (at [ii] in Figure 7), which is not what would be expected if this had been a focus of historic activity. Smaller areas of positive magnetic susceptibility enhancement have been identified in this area, each around 1-2m in diameter (e.g., [iii] to [vi] in Fig. 7). Three of these coincide with anomalies seen in the magnetometer data; however, detection of the same buried features in two data sets neither supports nor refutes an anthropogenic interpretation. It is possible that they represent prehistoric features such as hearths or pits, but they might instead be localized variations in the depth of subsoil. These anomalies will therefore require further investigation using intrusive methods to better understand them, but this geophysical evidence does not suggest a concentration of past historic activity.

4.2.7 Two areas of higher conductivity are visible in both the 0.5m and 1.0m coil separation data (Figs. 5-6), and are highlighted at [v] and [vii] in Figure 7, with [v] also coinciding with a magnetic susceptibility anomaly. These indicate wetter areas of soil that could either be due to the looser fill of cut and filled features, such as pits, or areas where the subsoil is deeper, allowing water to pool. The appearance of these higher conductivity areas in both sets of data, as well their positions in a broader east-west band of slightly higher conductivity (and corresponding magnetic trends interpreted as geological), hints towards these being natural features; however, despite a few localized areas of high conductivity in Field 1 (discussed in Sections 4.2.8 below), these anomalies stand out, and an anthropogenic explanation is not out of the question. In particular, the anomaly at [v] is worthy of further investigation as it coincides with a magnetic anomaly and is the most likely to be caused by an archaeological feature.

4.2.7 A clear positive in-phase response has been detected over the buried trench or headland plow scar suggested by the magnetometer results at the northern end of Field 1 (compare

EMI anomaly [viii] in Fig. 7 with magnetic anomaly [o] in Fig. 3). The EMI results provide no additional information about the cause of this response, and it is still most likely a recent agricultural artifact.

4.2.8 As noted in Section 4.2.6, the quadrature EMI data reveal additional areas of higher conductivity soil in Field 1. These are more clearly defined in the 0.5m coil separation than the 1.0m data, which is partly a function of the greater volume of soil being sampled by the latter configuration, but also indicates that the causative features are not simply shallow sources. They are therefore more likely to be natural in origin, probably related to thicker soils where the underlying bedrock is deeper. The two higher conductivity areas at [ix] and [x] in the northern portion of Field 1 appear to be parts of broader east-west trends of increased conductivity, mirroring the magnetic geological trends identified previously (see Section 4.1.3).

Additional high conductivity areas have been detected at the southern end of Field 1, highlighted at [xi] and [xii] in Figure 7. The response at [xii] extends beyond the survey area making it difficult to assess its cause, but given its fairly amorphous shape and large dimensions (at least 20m on one axis), this is likely a natural moisture variation.

Due to its proximity to [xii], the anomaly at [xi] may also have a natural explanation; however, it is more regular in shape, forming a rectangle roughly 7.5m x 5.0m, suggesting that it could be anthropogenic. This is the only geophysical anomaly detected by any technique in this investigation that most strongly resembles a large pit such as a mass grave. That said, there is little evidence to support such an interpretation. While comparison between Figures 5 and 6, corresponding to effective depths of 0.37m and 0.75m respectively, indicates that this anomaly is better defined at shallower depths, hinting at an archaeological source, in Figure 6 it appears to be part of the broader area of higher conductivity at this greater depth. This implies that it is more likely natural in origin, probably relating to increased moisture availability caused by geological variations. A small test excavation unit would be necessary to ground truth this feature.

4.3 ***GPR results*** - Figures 9-11

4.3.1 The processed individual radargrams collected within Fields 1 and 2 are presented in Figures 9-11. As noted previously, the GPR profiles were conducted as a test of this method in this environment, and not to collect high resolution data across the entire project area. Radargrams were collected at 10m intervals down Field 1, with two additional profiles recorded in Field 2 (see Figures 1 and 8). Each radargram was processed as described in Section 3.7 to remove horizontal banding and boost the signal from greater depths. While the maximum depth displayed is around 1.5m below surface, these processed data indicate that the depth penetration with the 400MHz antenna employed here is little more than 1.0m, probably due to the moisture content of the soil. A lower frequency antenna, e.g. 200MHz, would be expected to produce clearer results at greater depths, such as the soil-bedrock interface; however, the results obtained here are sufficient to determine the presence or absence of buried historic cultural features along each transects.

4.3.2 In short, the GPR results have not provided any unambiguous evidence for buried archaeological features. As noted in Figures 9-11, most profiles reveal reflections due to subsoil variations and occasionally individual rocks, but the majority of these anomalies are likely natural in origin.

In Field 2, the GPR profile at 2360.9'E passed over a buried utility and confirms the presence of a buried metal pipe and other soil disturbances that may be associated with recent activities. The results do not provide any evidence for significant historic features, although only two profiles were collected here.

Significant anomalies are highlighted on the profiles in the Figures 9-11, and anthropogenic interpretations are included where relevant. Since buried rocks and other subsurface disturbances may have a cultural origin, their positions have been included in the final interpretation in Figure 12.

4.4 Final interpretation map

4.4.1 In Figure 12, a final summary of all the probable and possible archaeological anomalies from all three geophysical surveys is provided, based on the site grid in order to facilitate their location on the ground if further investigation is deemed necessary. Anomalies interpreted as geological are not shown, but it is likely that many of the displayed anomalies may be natural in origin. Probable utilities are also shown as their locations may be important in helping to determine placement of future excavation units or other invasive tests. This figure also includes historic and prehistoric find spots from metal detector surveys conducted by the Ottery Group in 2014, and by other groups in recent years.

5. Conclusions

5.1 The geophysical results from the IAS Faculty Housing Project have revealed many anomalies due to subsurface features, however, it is clear that many of these are either natural in origin, or due to fairly recent activities and disturbances. An integrated approach was employed, beginning with high resolution magnetometry over the full project area where modern interference didn't preclude this method. This identified areas where additional electromagnetic induction measurements could be taken. While both techniques are more commonly used to locate and map buried archaeological features, they are also very effective at detecting near-surface metallic objects. They were therefore chosen for use in this investigation to map the distribution of metal artifacts and identify buried any intact archaeological features below the plow zone. It was hoped that this work might provide more information on the Battle of Princeton in this area, but these methods can provide evidence for human activity from any modern, historic or prehistoric period.

5.2 The magnetometer results have mapped many near-surface iron objects; however, it is impossible to state whether these are modern or historic, broken pieces of farm machinery or Revolutionary War artifacts. Ferrous anomalies are commonly detected on agricultural land as a background scatter, so these results are not surprising. If anything, the number of such responses is a little lower than average, perhaps due to 'cleaning' of the site as a result of the many metal detector surveys. The EMI surveys complement this by revealing non-ferrous metal, but again, these objects may date to any historic period. Two concentrations of metallic debris have been identified that may warrant further investigation: one lies a third of the way down Field 1, and a second just south of the modern road in Field 2. No intact structural remains are evident in either area, but whether they represent occupation areas or dumps of historic material is unclear from the geophysical data alone. Both are unlikely the result of short-term camp and are therefore unrelated to the Revolutionary War, but excavation will be necessary to obtain cultural material to date and better understand them.

5.3 A third concentration of potential anthropogenic activity has been identified further south in Field 2; however, the geophysical evidence for this is less clear. This coincides with a low rise that was also the area where four Revolutionary War artifacts had been found during previous investigations. Despite high resolution magnetometer and EMI surveys over this area very few responses due to metallic objects were observed. The magnetometer results suggest soil disturbance that could be due to human activity, but may also reflect the underlying geology at this position. Magnetic and conductivity anomalies could all be explained by natural features, but these anomalies may now be targeted to determine whether they are geological, prehistoric, or perhaps historic in nature.

5.4 A small number of potentially archaeological features have been identified throughout the project area. Most appear to be due to pits containing burnt, and therefore magnetically enhanced, soil, and could be either historic or prehistoric. Given the geological signals that are visible throughout the survey data, it is more difficult to interpret weaker magnetic anomalies, as these could be archaeological, (e.g., pits, middens), or simply due to subsoil and geological variations.

5.5 A number of GPR traverses were recorded to test this technique in this environment and to sample the project area to confirm the interpretations of the magnetometer and EMI data. The results reveal a few isolated and groups of reflections that are most likely rocks weathered from the bedrock, as well as a few disturbances that can be associated with modern utilities. Some reflections may be worth further investigation to confirm their origin and are highlighted in this report.

5.6 As important as what was detected is what has not been detected. None of the geophysical methods has provided evidence for any historic structural remains, former tracks or roads, or substantial soil movement such as trenches or embankments. Beyond the two areas of historic activity discussed above, it has not been possible to identify any concentrations of metallic material that would suggest intense activity on the battlefield or camp sites. The magnetometer results reveal anomalies due to a range of buried features, but there is nothing in the data that indicates burials or a mass grave. Conductivity responses and GPR reflections that could be explained as excavated pits or subsurface voids have been highlighted here for further investigation or monitoring, but it is far more likely that these anomalies have natural causes.

5.7 Finally, it is worth making a note about the effect that proposed construction may have on future geophysical surveys in adjacent areas. As the intense magnetic anomalies associated with buried iron pipes and other modern features in this survey illustrate, new anomalies will be produced by any utilities, structures, and fences containing iron that are constructed in the future. These intense responses will mask any weaker anomalies of archaeological origin that may be present, and it may therefore be worth considering whether any of the proposed work will impact the potential for any future magnetometer investigation in areas beyond the AOI as currently defined. While the exact radius of the halo depends on the quantity and shape of iron, buildings and pipes can produce significant anomalies up to around 10-15m away, preventing the collection of any useful data in this area.

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Fieldwork: T.J. Horsley **Dates of survey**: 07/14/14 – 07/21/14

Report: T.J. Horsley **Date of report**: 04/30/15

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Appendix 1 - Magnetometry

It can be possible to detect subtle anomalies in the Earth's magnetic field caused by buried archaeological remains using a magnetometer. Variations in the magnetism, (the *magnetic susceptibility*), between a feature and the surrounding soil can arise owing to weakly magnetic oxides present in the soil. Past human activities may have redistributed these minerals or converted them into more magnetic forms, so that buried features may be detected and identified by their resulting magnetic anomalies. In this way, it is possible to identify and map buried pits, house basins, ditches, hearths and, depending on their size and degree of magnetic contrast, postholes. Based on patterns and alignments of pits and postholes, it may be possible to identify structural remains.

Features associated with high temperature processes can also be detected on account of a permanent, so-called *thermoremanent* magnetization that is retained when a material containing iron oxides is heated to above around 600-800^{o}C (1000-1400^{o}F) and then cooled. In this way, kilns, furnaces, pit ovens, and often deposits containing bricks, tiles and fire-cracked rocks, can be identified from the more intense magnetic anomalies associated with them.

Burials are not usually identifiable using a magnetometer since neither the cutting and backfilling of the grave shaft, nor the inhumation itself, creates a magnetic contrast that can be measured at the ground surface. Bones are too small to be detected with any geophysical technique and, despite digging of the grave and interment of a body or human remains, the grave is usually immediately backfilled with the same material that was removed and so there may be no difference between the grave fill and the surrounding soil. In some instances, notably historic graves where coffins were used, an air-filled void may be left after the body has decayed; however, this feature is often only detectable using GPR.

Magnetometers are highly sensitive to iron metal and consequently surface or buried iron objects can be detected as very intense responses. While this iron may be archaeological in origin, it is often from modern fences, farm machinery and trash, and it is impossible to distinguish between different sources.

Many magnetometers allow readings to be collected at regular and closely-spaced time intervals, (defined by the operator), such that data may be recorded at regular distance intervals by walking along a marked guide rope at a constant pace guided by a beep. The quality and accuracy of the data is therefore dependent on the operator's ability to walk smoothly and at a constant speed throughout the survey area. Standard practice for such data collection is to establish a grid of 20m or 30m squares that are each surveyed in turn. Within each grid, data may be collected at 0.125m or 0.25m intervals along traverses spaced either 0.5m or 1.0m apart. Decisions about the resolution at which to collect geophysical data are based on factors including the size and nature of expected archaeological features and the time available for survey.

For more information on this technique, see Aspinall *et al*. (2008), Clark (1990: 64-98), Gaffney and Gater (2003: 36-42) and Kvamme (2006).

Appendix 2 - Electromagnetic Induction

Electromagnetic induction, or EMI, is an active prospection method that allows the collection of two sets of data that can be broadly equated to conductivity and magnetic susceptibility. EMI instruments typically consist of two coils: a transmitter coil and a receiver coil. The transmitter coil generates a time-varying magnetic field that induces a time-varying electrical current in the ground or other material. These currents in turn generate a secondary magnetic field that is measured by the receiver coil.

Comparison between the primary and secondary magnetic field provides information about the electrical and magnetic properties of the material, as well as size, shape and orientation of the object relative to the field to which it is exposed. The current induced by the primary field does not begin instantaneously, and this time delay is related to the conductivity of the medium; lower conductivity materials result in longer delays in the onset of the induced current. This time delay can be quantified by comparing the amplitudes of the received signal and the transmitted signal that has been shifted by a quarter of one cycle. This is referred to as the *quadrature* component and is expressed in milliSiemens per meter (mS/m).

Alternatively, the amplitude of the received signal can be compared to the point in time where the transmitted signal is at maximum amplitude. This correlation is referred to as the *in-phase* component and, in archaeological surveying, is frequently associated with the magnetic susceptibility of the material, although this measurement is also related to the conductivity. Since the ratio is usually quite small, measurements are often presented in parts per thousand (ppt).

The distance between the primary and secondary coils determines the effective depth of investigation (DOI) with greater separations allowing greater DOIs.

A wide range of archaeological features can be detected with EMI instruments on account of their possessing contrasts in magnetic susceptibility and/or moisture content. Furthermore, EMI can be used to detect near-surface and buried metallic objects – including non-ferrous materials. In contrast to other geophysical methods, however, the complex relationships between buried archeological features and the in-phase and quadrature anomalies they produces is much less well understood, making interpretation much more problematic.

For more information on this technique, see, Clay (2006), Gaffney and Gater (2003, 42-44) and Witten (2006, 147-213).

Appendix 3 - Ground-penetrating RADAR

Ground-penetrating RADAR, or GPR, involves the transmission of high-frequency radar pulses into the ground from a surface antenna. Where this energy meets discontinuities in the soil, such as soil strata and buried remains, some pulses are reflected back to a receiving antenna while others continue down to be reflected by more deeply buried features. The elapsed time between the energy transmission and reflection provides information on the depth of buried targets, and is used to produce a vertical slice through the ground – a radargram. Unlike other geophysical prospection techniques, such as magnetometry or earth resistance, this profile allows vertical relationships between deposits to be investigated. Furthermore, many closely-spaced transects may be combined to form a three-dimensional block of data that can be re-sampled horizontally. This is used to produce a series of subsurface plans for increasing depths, referred to as time-slices. The depth penetration of the radar pulses is dependent on both the frequency of the antennas employed and the electrical conductivity of the soils and sediments. Lower frequencies may be employed to provide deeper penetration, but at the expense of resolution.

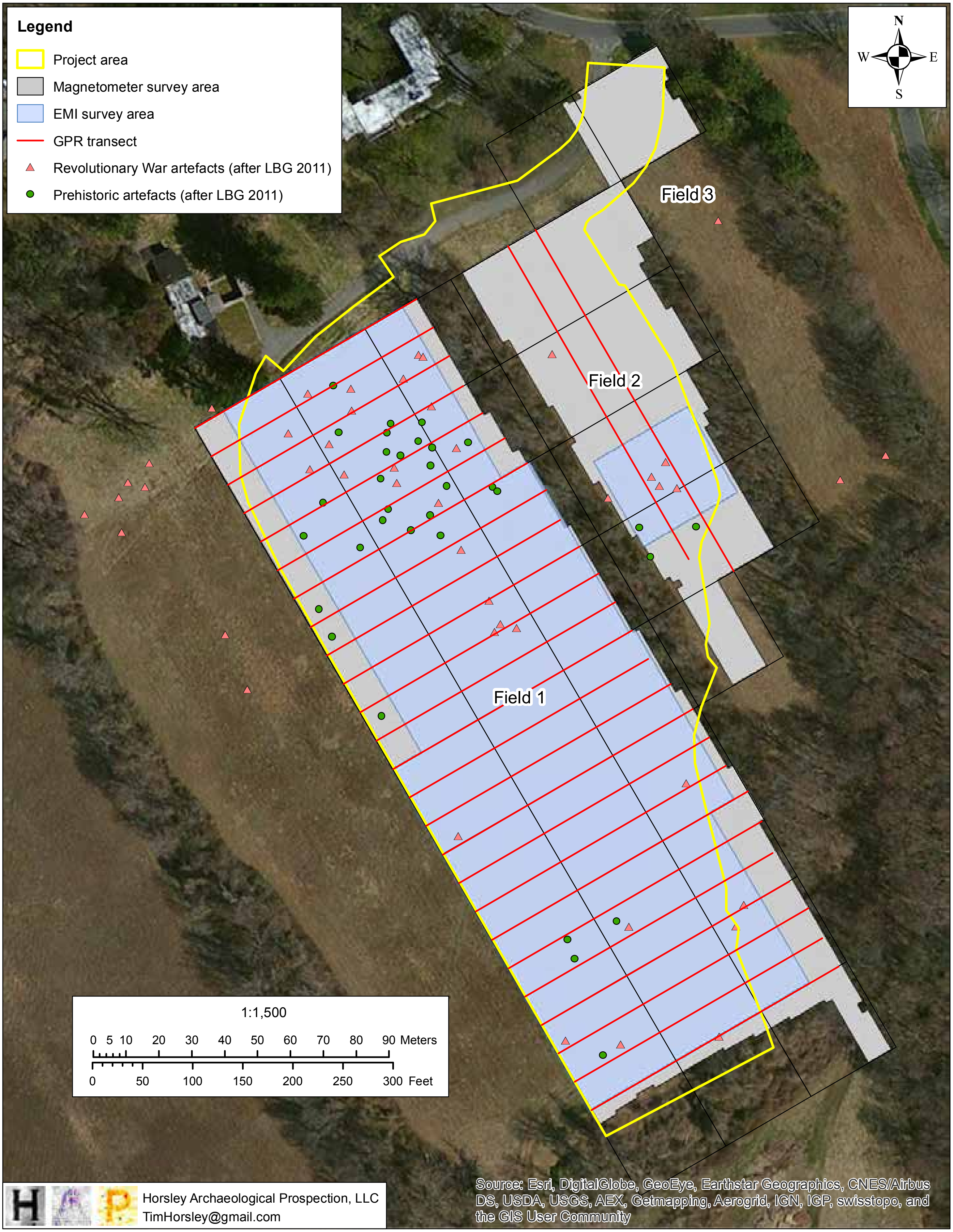
Radargrams are measured in terms of time (two-way travel time of the radar pulse); however, it is possible to calculate real depth values if the velocity of the material through which the radar energy is travelling is known. This can either be achieved in the field or by fitting computer-generated hyperbolae to the data after data collection. Further information on this technique may be found in Conyers (2004; 2006), Gaffney & Gater (2003: 47-51, 74-76), Goodman et al. (1995), and Goodman and Piro (2013).

Whilst previous investigations have shown that GPR can often detect later historic graves (e.g. Bevan 1991; Conyers 2006; King et al. 1993), early historic and prehistoric graves are far more difficult to identify. If the fill of the grave itself is less compact than the surrounding sediments, the sides and base of the grave may be detected using GPR; however the inhumations themselves are unlikely to produce any clear reflection. It is therefore not usually possible to distinguish between any detected pit anomalies and graves.

Historic features such as foundations, floor layers and rubble spreads, produce clearly identifiable radar reflections. Lenses and deposits of sand, gravel, or boulders will produce similar reflections, and distinguishing between them may be difficult and require additional information from other geophysical techniques or intrusive methods.

IAS Faculty Housing Project, Princeton, NJ. Geophysical surveys, July 14-21, 2014.

Figure 1. Location of geophysical surveys and results of previous investigations.

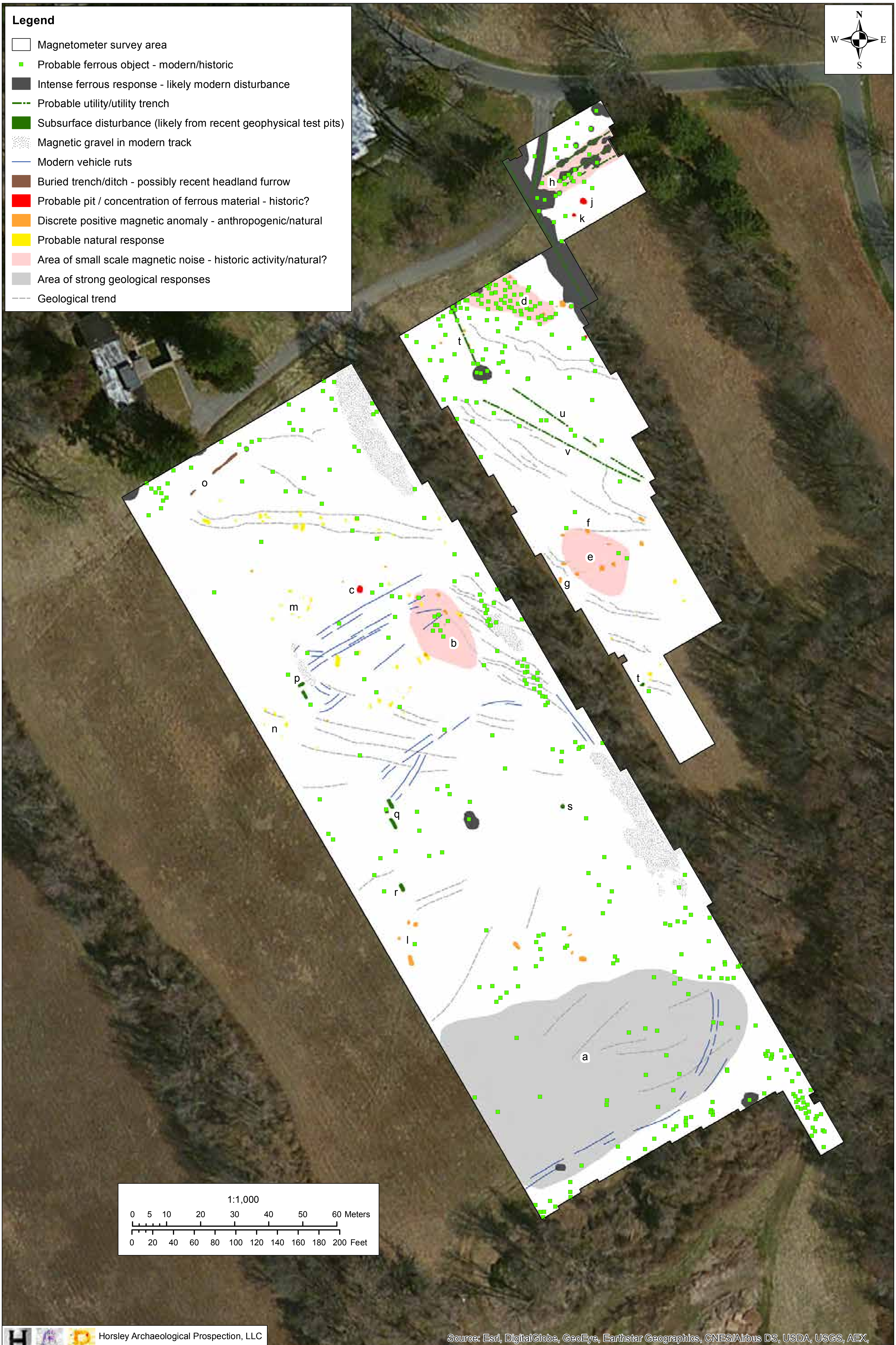


IAS Faculty Housing Project, Princeton, NJ. Geophysical surveys, July 14-21, 2014.

Figure 2. Processed magnetometer data (see text for details).

IAS Faculty Housing Project, Princeton, NJ. Geophysical surveys, July 14-21, 2014.

Figure 3. Interpretation of magnetometer data (see text for details).



IAS Faculty Housing Project, Princeton, NJ. Geophysical surveys, July 14-21, 2014.

Figure 4. Processed EM in-phase data from 0.5m intercoil separation (i.e. magnetic susceptibility at c.0.3m.b.s. - see text for details).

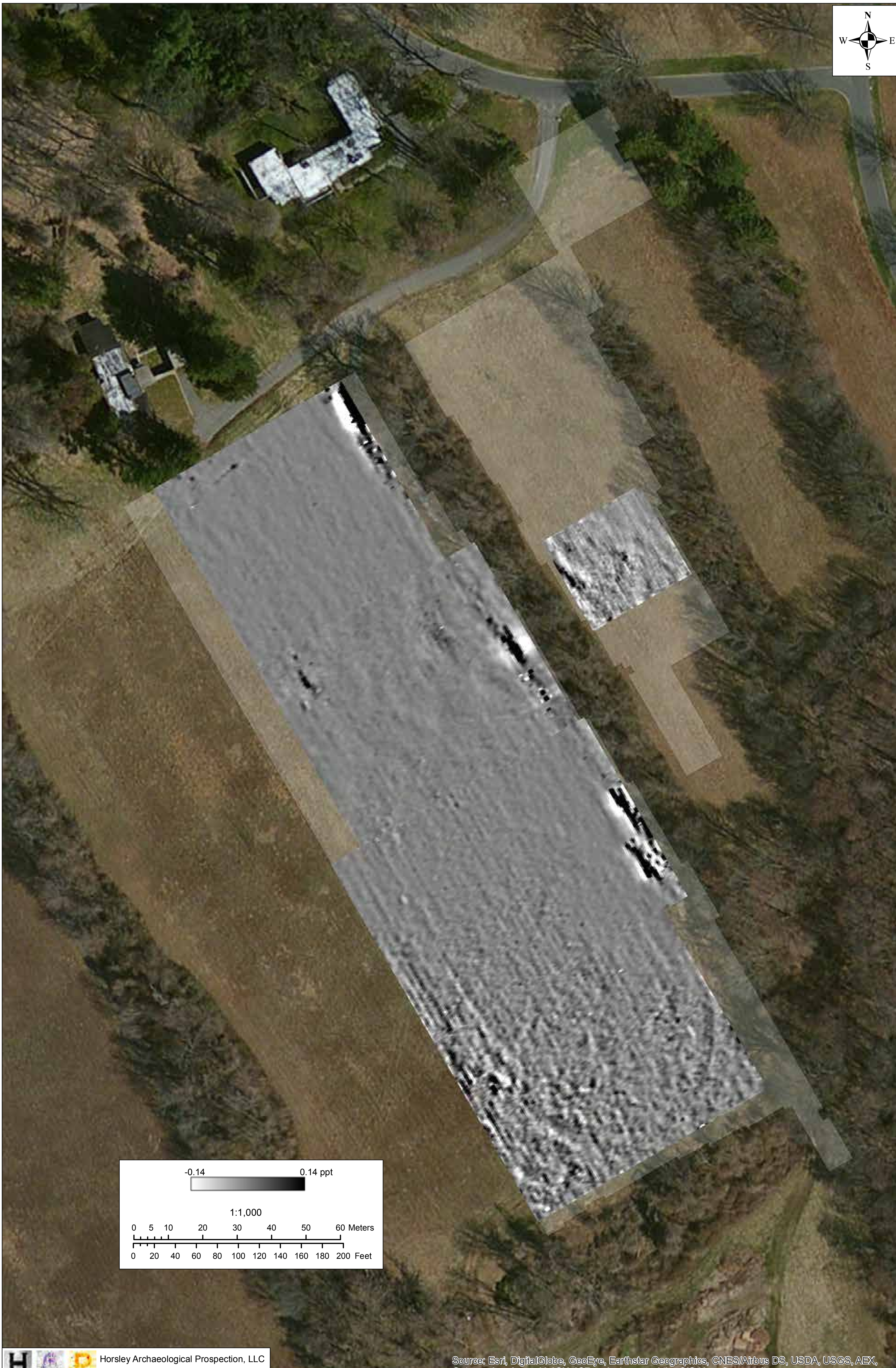


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Figure 5. Processed EM quadrature data from 0.5m coil separation (i.e. shallow conductivity - see text for details).

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Figure 6. Processed EM quadrature data from 1.0m coil separation (i.e. deeper conductivity - see text for details).

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Figure 7. Interpretation of significant EMI anomalies (from both in-phase and quadrature data).

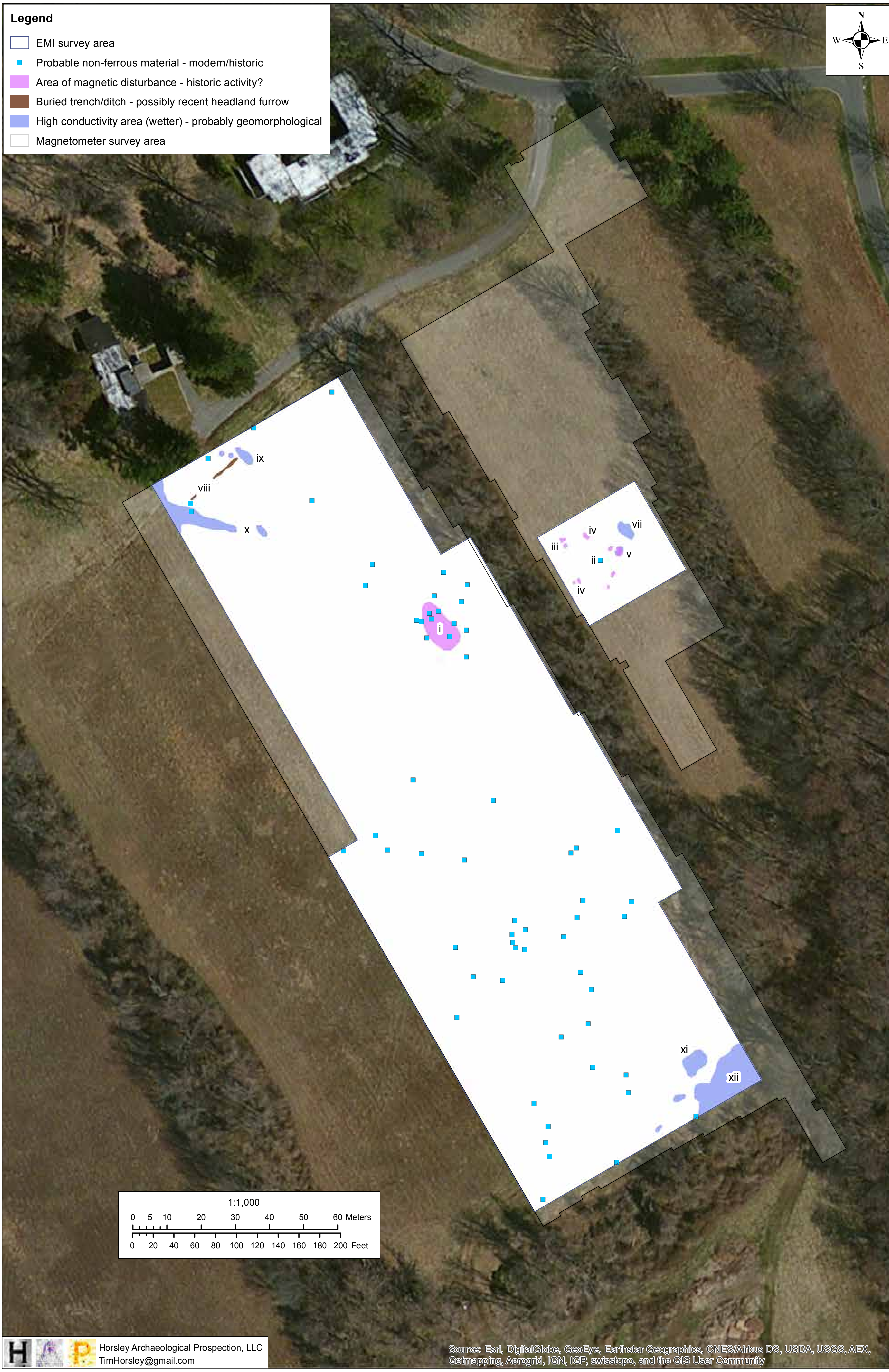

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Figure 8. Interpretation of magnetometer and EM data with GPR traverses and site grid overlaid (see text for details).

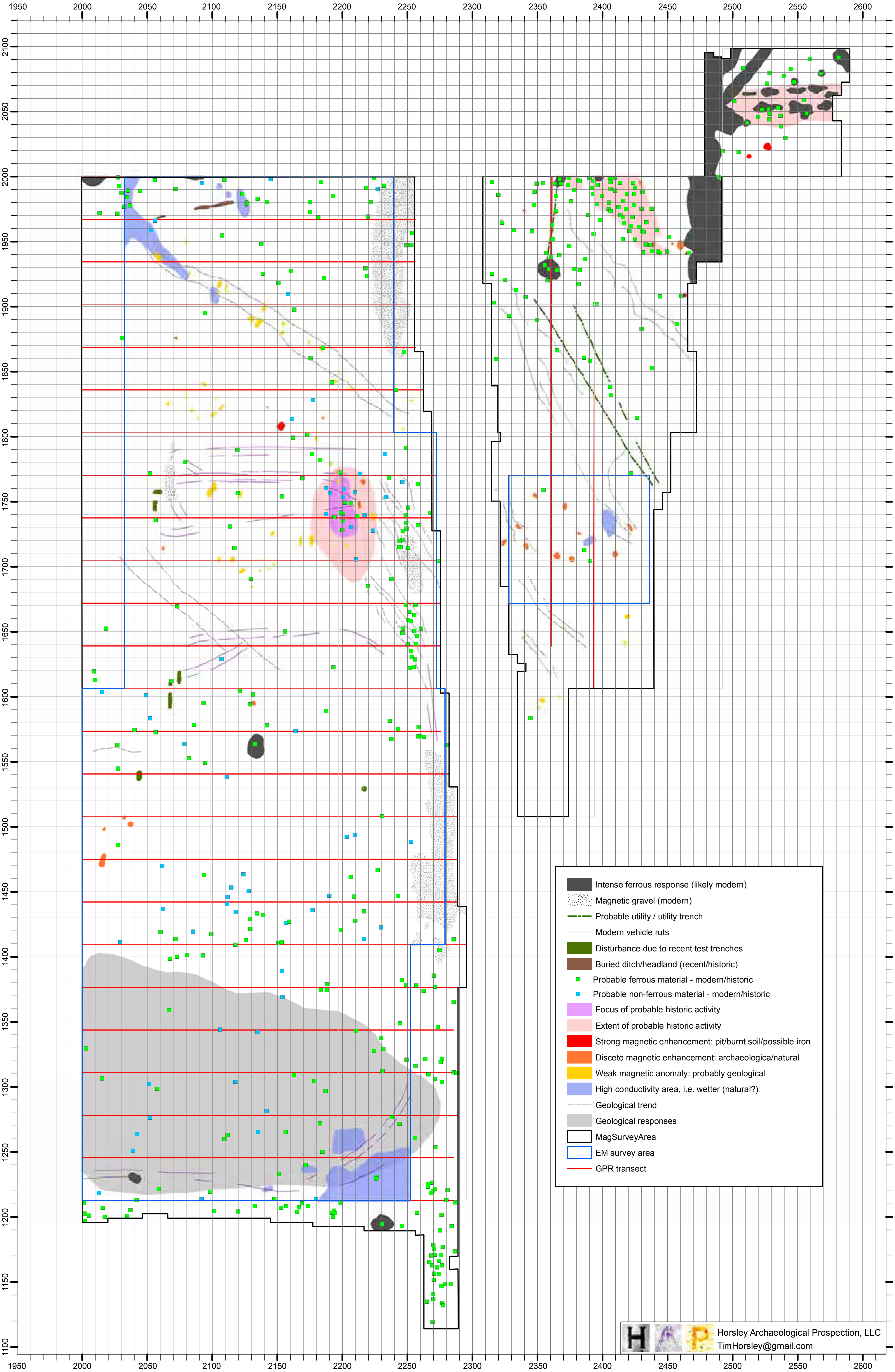

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Figure 9. Processed GPR radargrams from Field 1 (cont. in Fig. 10). Coordinate values are given in feet for the arbitrary site grid. See Figure 8 for locations. (NB. horizontal scales are not the same).

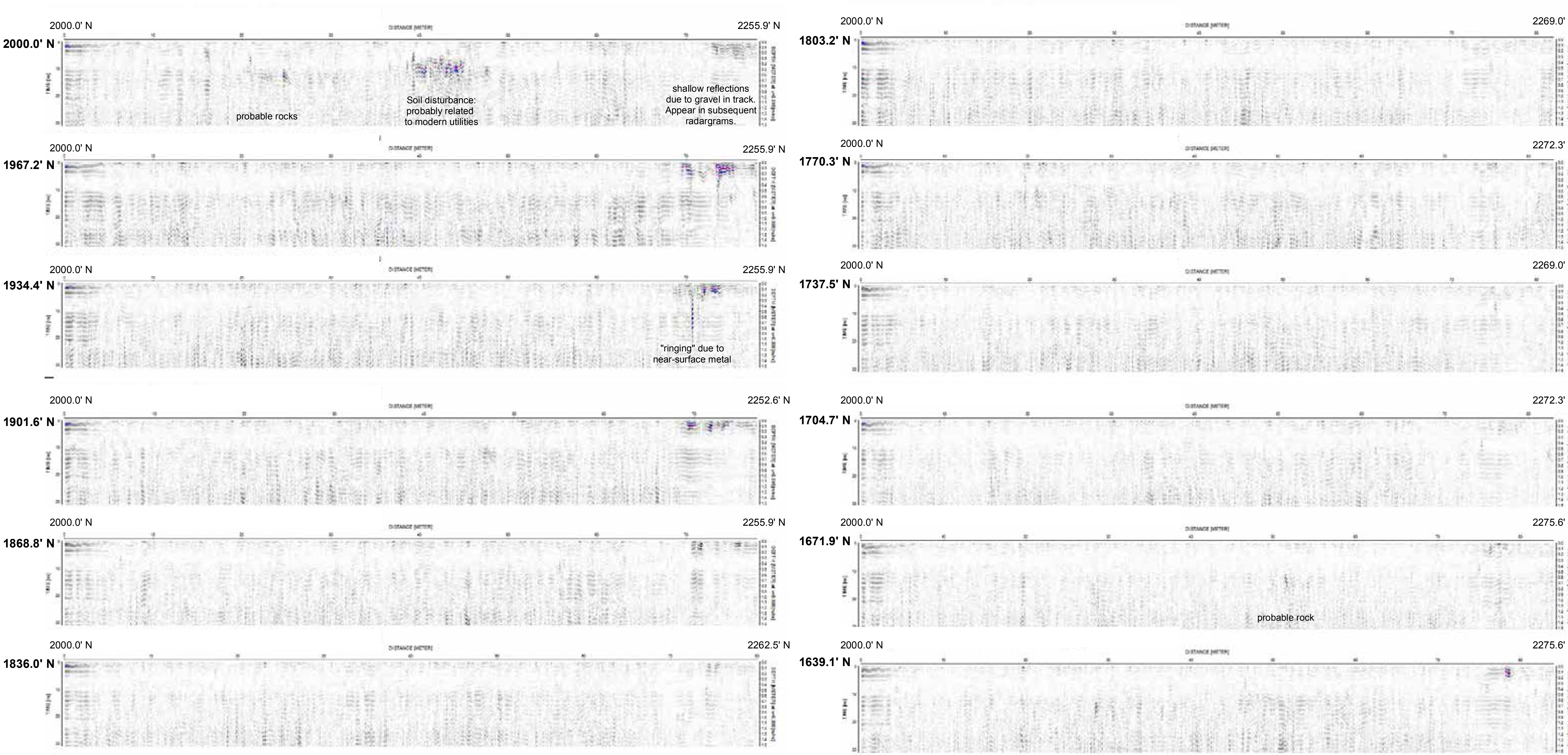

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Figure 10. Processed GPR radargrams from Field 1 (cont. from Fig. 9). Coordinate values are given in feet for the arbitrary site grid. See Figure 8 for locations. (NB. horizontal scales are not the same).

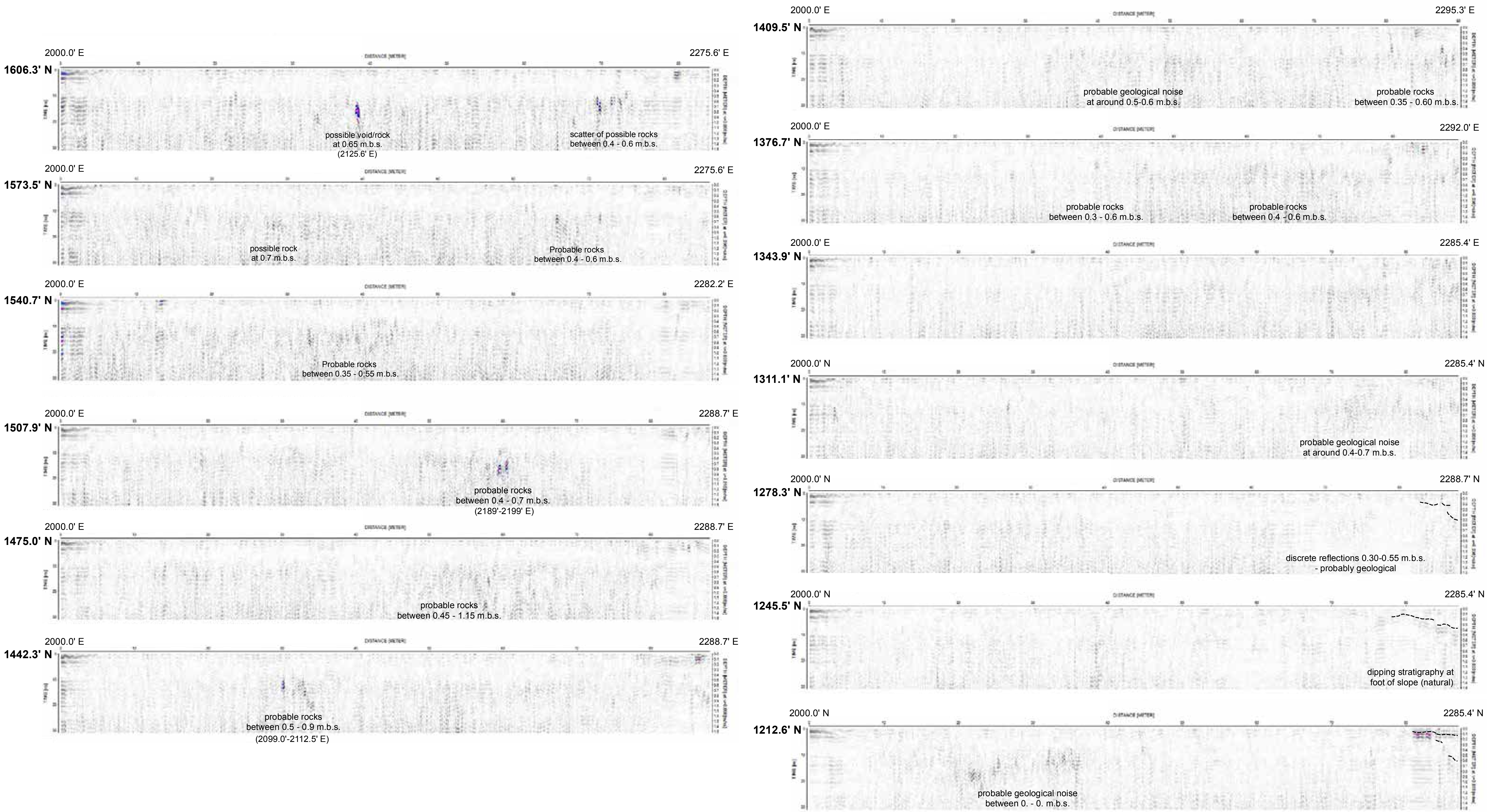

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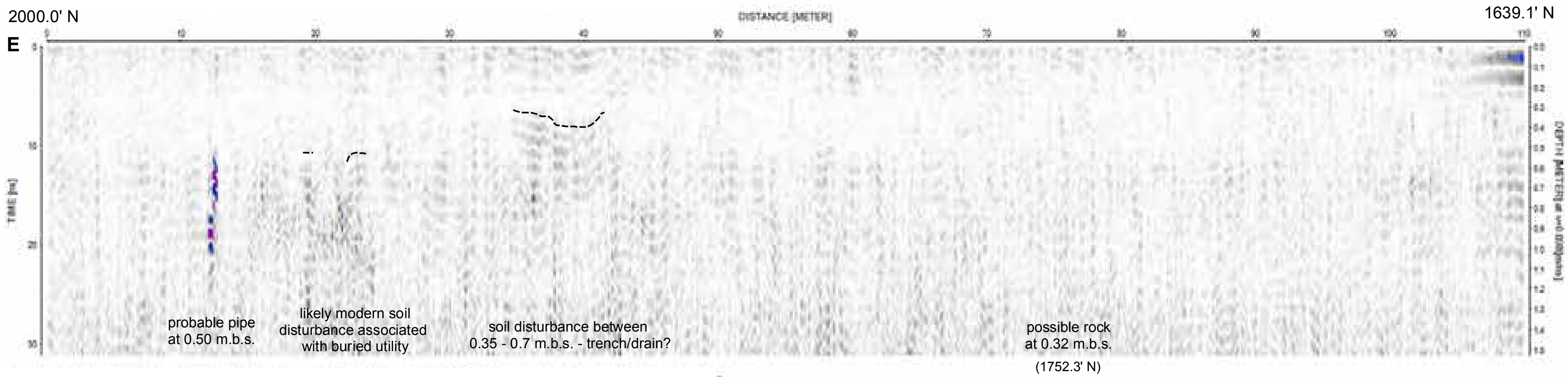
Figure 11. Processed GPR radargrams from Field 2. Coordinate values are given in feet for the arbitrary site grid. See Figure 8 for locations. (NB. horizontal scales are not the same).



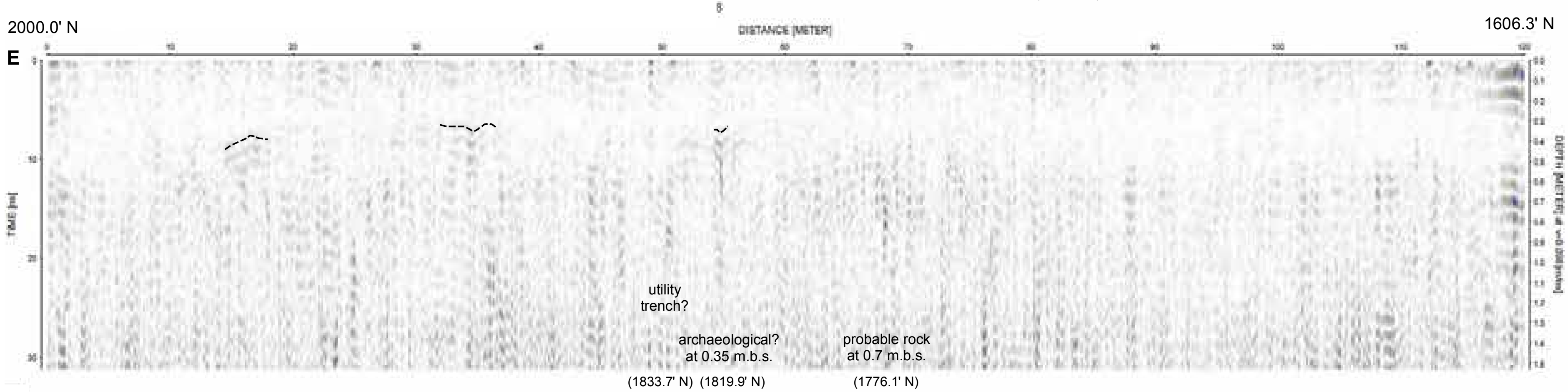


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Figure 12. Interpretation of all potential subsurface anthropogenic features with metal detector finds overlaid (see text for details).