7. PHASE I SURVEY SHOWS THE WAY

After Phase I fieldwork was finished, the investigators evaluated their findings and laid plans for the next phases. Many options were considered.

Phase I investigations showed only two prospectively eligible sites on the property, located near the east and west boundaries, at high, well-drained, elevations overlooking the valley at the head of Hawkey [Hirons] Branch. These two sites were found to be exactly where models predicted.

Two artifact concentrations were identified as a possible ephemeral east site and a well-defined west site (7K-B-23).

A putative east site appeared from the Phase I walkover to be a vaguely-defined scatter of artifacts across the well-drained knob at the summit of the field.

The west site was clearly defined, both spatially and artifactually. All the dateable materials belonged to the period just before, during, and after the Revolutionary War, and most appeared to be concentrated in a space as small as fifty feet across.

ASSESSING PHASE I METHODS

The 50% cultivation method proved to be an effective way to identify a site, but its utility does not extend to defining site boundaries. A follow-up, with full cultivation of the identified area, can cure this inadequacy at the Phase II level.

On the eastern site, boundaries were not easily perceived during the first survey. The artifact concentration that signalled the location of the western site was more compact, and therefore more easily found; it extended into two of the cultivated swaths, which were separated by a single uncultivated swath about twenty feet wide.

Shovel test pits at fixed grid intervals of fifty feet [or smaller] could easily have missed the west site altogether. Gridded shovel test pits are a traditional method that has been challenged as inefficient and wasteful. Recent research has demonstrated that almost any arrangement of regular test pits is better than tests at the square corners on a regular grid. Other arrangements, notably staggered grids and hexagons, have been shown to provide a better likelihood of recovering site data (Kintigh 1988). Even more efficient is the suite of sampling techniques used in this Phase I study, which limits detailed examination to areas indicated by environmental models.

ACCURACY AND BIAS OF SOURCES

The historical sources are adequate for identification, but some documents are sorely missed. For example, the Francis Denney estate appraisal and evaluation would have been invaluable in providing a location and description for tenant houses of the period.

Certain key documents were missing or flawed; the Francis Denney estate map survives as a draft only, and house locations on the Axell estate map would have helped immeasurably.

In general, source material is adequate. The documentary history of the site is not as well fleshed out as the adjacent Allee home farms, or the mansion farms of the other wealthy landowners.

UTILITY OF SOIL TYPE MODELS

Every testing procedure is, in practice, an evaluation of existing assumptions and data-gathering for future models that cannot now be imagined. While local practitioners are becoming comfortable with the existing soil type model, new data must be added to the database for use by future model-builders.

The soil-type model performed well, even though considerable survey was conducted outside the areas where sites were predicted. Across the road, the earlier UDCAR survey had been constrained by schedule to work almost exclusively in areas where the same model predicted sites might be found (Grettler, Seidel and Kraft 1994: 17-25).

The UDCAR party found six archæological sites, of which five were prehistoric. Their site 7K-A-22, a historic site, was found to be congruent with a small ridge of Matapeake soil. The prehistoric sites were identified by sinking a single line of test pits designed to cross several slight ridges of Matapex and Matapeake soils. These ridges were separated by Othello soils in broad, ephemeral drainages.

Exactly the same soil situation existed at the Hurd property, where similar results were obtained. A total lack of resources on the Othello woodlots was not surprising, but poorly-drained soils must not be ignored altogether.

Utility of Predictive Maps

During the course of historical research, a series of historical maps was created, designed to determine the number of sites expected, and to suggest the identity of any remains discovered. These maps proved indispensable. It was possible, using the maps, to postulate the possible locations of tofts.

The soil map (Figure 5, page 11) was the single most useful predictive map. Soil capabilities are the most important single historical factor in site selection.

Predictive maps created by the University of Delaware Center for Archæological Research (Figure 3, page 5) proved to be less useful, because they are intended for broader purposes. The model was designed to indicate the level of effort likely to be necessary to complete the cultural-resources process. A "moderate" probability means that 50%-75% of quadrats (400 by 400 meters) will contain cultural materials.

Both sites were found in the moderate probability area, and the high-probability area contained nothing of cultural interest.

Utility of Shovel Testing

With the sharp accuracy of 20/20 hindsight, it is possible to state that we spent entirely too much effort on shovel test pits in the wooded areas with hydric soil, even though they were included in the area mapped with a high probability. As one local observer remarked, "you don't find trees around here unless the ground is too wet to plow." In view of these and other results from similar traverses, there is no justification for constructing long lines of repeated test units across uninhabitable soil types.

In such wooded, boggy, clay soils, it should be sufficient to explore by digging random, unsifted, test holes to determine if the parcel includes pottery or brick manufacturing sites, or if the soil has been mistakenly mapped. The accumulated evidence certainly does not justify continuing the unproductive ritual of shovel testing, sifting, and recording such loci. The model has been proposed, tested, and proven; it should now be used to reduce the number of test pits.

Eligibility Assessment

Phase I survey does not normally provide an assessment of eligibility, but sometimes a site is obviously eligible. The western locus was obviously eligible for the National Register, on the basis of the artifacts collected from the Phase I survey alone. Phase I evidence was insufficient to assess the eastern locus.

Obvious eligibility of the western site derives from its excellent spatial and temporal integrity. The site was first identified by the presence of high-status ceramic artifacts, concentrated in a tight concentration on the location where models suggested a site should be expected.

The postulated eastern site, while holding enough promise to warrant further investigation, was not so obvious or so well circumscribed. The concentration was not tight, and the artifacts did not appear from the surface survey to be homogenous.

PHASE II CONSIDERATIONS

The primary objective of any Phase II study is to determine if the property is eligible for the National Register of Historic Places (chart, page 19). This involves answering three questions. First, the site's significance must be determined. Then, its integrity must be assessed, relative to similar sites. Finally, its boundaries must be determined. The first question frequently can be answered at the Phase I level, which was the case in this instance. Answers to the other questions require fieldwork.

In the table at the end of this chapter, the "standard" evaluation and analysis options are described in the light of this site's conditions. Three of the techniques are at the core of the Phase II research design.

PHASE II TECHNIQUES

Many alternative survey techniques are available to test cultural resources. The commonest techniques are test squares, shovel test pits, and walkover.

Intra-site spatial definition

Test squares are preferred where a site's location is precisely known, and one seeks to identify subsurface features and to collect a useful artifact sample for analysis.

Shovel test pits can be arrayed across a known site to define limits and activity areas. They can also be used to test a relatively small project area in the vicinity of a known resource, to determine if the known resource extends into a construction site.

Walkover survey of a plowed field provides a sample of all areas. Very small sites that would be missed by interval testing, or sites containing few artifacts, can best be found by walkover.

Walkover survey can take two forms: tightly gridded or loosely controlled. When one is merely trying to find sites in a field where none are known to exist, in a Phase I survey, the typical walkover is loosely controlled, dividing the survey area into broad swaths or areas. This technique avoids undue costly controls, while allowing a surveyor to develop an impressionistic idea of the resource picture in a large area.

More tightly controlled surface surveys, at the Phase II level, involve small grids and, in rare cases, piece plotting. The purpose of these surveys is to create a map, distinguishing activity areas from one another.

No survey method (short of total excavation and incredibly exhaustive analysis) will identify all the project area's resources, but it is possible to reduce the danger of missing resources to an acceptable level. It is therefore the responsibility of the archæologist to recommend a survey method that will detect the largest possible number of sites most clearly.

A tightly-controlled strategy, employing both artifact and soil chemical surveys, can produce a precise map of the resources on a site. In order to be useful, the survey must divide the site into many cells, at close intervals. A spreadsheet or mapping program convert such gridded data into intelligible graphics.

Shovel test pit strategies

Shovel test pitting, marginally useful in Phase I surveys, may be useful in Phase II work. In a Phase II project, lines or grids of shovel test pits may be employed to define the margins of a large site, or to determine where internal concentrations exist. However, shovel test pits are second-best, after cultivation and walkover, which was chosen.

Test squares

A screened test square has two purposes at the Phase II level: to provide a large sample and to afford a view of the subsoil.

Minimum size, generally, is a meter square or five feet square. In many historic sites, with few features, a ten-foot square might be employed in order to define activity areas.

If one wishes to determine the existence of subsurface integrity, it is frequently necessary to open many tests on a typical site. Five-foot test squares were used during the Phase I survey, and were incorporated into the Phase II survey strategy in order to determine the extent of the site and the existence of subsurface features.

Higher-Level Analyses

Once a site has been identified and found to be worthy of further study, a bewildering array of potential data-recovery techniques must be considered. SHPO guidelines call for consideration, at the evaluation and data recovery levels, of such techniques as pedology, soil chemistry, pollen analysis, carbon-14, wood identification, flotation, and phytolith analysis, among others. The table beginning on page 99 considers many of the options.

Phytoliths

Phytoliths are among the most durable, and most common, of plant fossils. Many plants deposit siliceous or calcareous bodies, which are shaped by the plant structures into which they are deposited. Phytolith analysis has become so sophisticated that it is possible now to distinguish not only the species, but the variety, of the plant that created it.

Because opal phytoliths are so durable, they may be recovered from sites where other evidence has been lost. To be useful, phytoliths must potentially answer questions that relate to the research design. Because sample preparation is expensive and difficult, the decision to employ phytolith analysis should be restricted to contexts in which new knowledge could be obtained, in keeping with well-defined research objectives.

The most useful phytolith research has been employed in reconstructing prehistoric agriculture and environment from stratified deposits. Phytoliths are everywhere; they have been recovered from tooth enamel and from coprolites. But a useful phytolith sample must be derived from a clearly-defined context, which is relatively rare in the open field (Piperno 1988).

Pollen

Pollen analysis has been used recently on European-American sites to chronicle changes in ground cover and land use. Pollen tends to migrate down a soil profile at a fixed rate, until it finally disintegrates. The rate of migration must be established anew at each site, and even in different parts of the same site. Because the method requires considerable preparation, a clear research need must be established in advance.

Like phytoliths, pollen can reveal when a property was cleared, and what crops were grown at different times. However, this data is readily available from other sources, and there usually is no need to verify the information.

Soil Chemistry

One of the most profitable techniques for delineating intra-site activity areas, soil chemical surveys are an essential part of the archæologist’s toolkit. The most attractive feature of this technique is its simplicity. Archæological soil samples in Delaware are processed routinely by agricultural soil laboratories, and are reported in the same format as agricultural samples.

Phosphate survey was the first application of this method, as early as 1929. A paper by O. Arrhenius in that year pointed out that soil phosphorous is increased wherever humans have used a place.

It has been argued that the weakness in the system is its association with agriculture, since farmers modify their soils with these same chemicals. In order to offset the effect of fertilization, standard practice has been to take a sample from the topsoil and a sample from the subsoil at each test locus. Recent research has shown that this technique is not useful, and in fact is a waste of time (Walker 1992:70).

Every human activity leaves a chemical residue in the soil, which is almost impossible to erase. Over the years, new land uses might superimpose new chemical residues, but the earlier stains are indelible. In addition to the long-established phosphate surveys, copper and lead have been identified as markers for human activity. Inside old-world walled cities, the trace metal content of the soil soars relative to the adjacent countryside (Bintlif, Davis, Gaffney, Snodgrass and Waters 1992:11)

While almost every site today is surveyed chemically, this technique is most important on low-status historic sites, where structural features might be ephemeral or nonexistent. On this site in particular, the use of soil chemistry was projected to be one of the most profitable lines of research.

The soil survey of the Benjamin Wynn tenancy site illustrates the ability of soil chemicals in expanding our understanding of a site. Calcium, magnesium, pH, and potassium were mapped, together with artifact distributions (Grettler, Miller, Catts, Doms, Guttman, Iplenski, Hoseth, Hodny and Custer 1994:152-155).

TECHNIQUES EVALUATED

Phase I sampling revealed that all cultural remains, from all periods, were concentrated on the summits of two gentle rises of well-drained soil, exactly where the models suggested they would be found.

In spite of the high status of certain ceramics on the sites, historical evidence indicated that the site was owned (and probably occupied) during the eighteenth century by people who were very poor. Because bricks and nails were almost absent from the surface collection, a log house was the most likely shelter type to be expected.

In view of the apparent fragility of low-status sites, a Phase II survey was designed to extract maximum data from an expected minimal body of evidence.

Tightly-controlled surface collection and soil chemistry were the first line of attack. Both are regarded as "proxy" measures, since they seek to describe the effect of a site's presence, rather than visible or detectible features on the site itself.

A ten-foot grid was selected, not only because it is the traditional grid size for historic sites, but because most historic-period structures or features are likely to be bigger than ten feet across. The smallest dwelling house mentioned in the local records was fourteen feet square.

It was important to use proxy measures to restrict the sample size for a more practical reason. Because log buildings are expected, certain site characteristics must be planned into the test strategy.

Log buildings leave few visible traces below grade. Because they often stand on piers, no footers should be expected. Sometimes the only feature from a log house will be the reddened outline of burned subsoil where the chimney stood, and possibly a root cellar or animal burrows under the floor.

PHASE II STRATEGY

Capabilities of the soils, shown in the county soil map (table, page 91) limit the range of expected previous land uses. Some uses, notably cemeteries and kitchen gardens, are marginally likely to be found only on the two well-drained patches. Othello soils would not have been fit to cultivate before drainage systems were installed.

After its Othello soils were drained, the farm became capable of supporting agriculture; before that time, the tract had little to recommend it. Ditches that crisscross the property today are a significant historical feature. But these drainage ditches are modern; some were built by the most recent private owner, while the others can be documented only back to 1937. A modern, machine-cut ditch divides the property and drains the wet uplands.

To visualize the setting before the first drainage ditches were cut, one must imagine isolated hillocks of habitable land, surrounded by hardwood wetland forests that were impassable for vehicles much of the year.

Occupants of the property would most probably have lived close to the branch, where the better natural drainage exists. Since the present Route 6 and Hawkey Branch roads did not exist until the middle of the nineteenth century, the earliest settlers probably used Dutch Neck Road, which lies across the branch, to communicate with “the Cross Roads,” now Smyrna, or the landing at the mouth of Quarter Field Creek on the old Duck Creek.

Because of these considerations, Phase II investigations were confined to the southern part of the property, were artifacts had been found. The Phase II proposal was divided into six steps:

1. Immediately before fieldwork begins, cultivate the well-drained soils on both sides of the drainage ditch, south of the power line right-of-way. This is a total of about ten acres.
2. Stake a ten-foot grid over the apparent site west of the drainage ditch.
3. Surface collect artifacts within the grid on the western part, segregating artifacts by ten-foot unit.
4. Collect soil samples on a ten-foot grid from the western part, for chemical analysis.
5. Surface collect the plowed area east of the ditch, attempting to define any artifact concentrations there. Conduct test excavations as warranted.
6. At the completion of surface collection, hand-excavate test squares in the plow-zone of the previously-identified artifact concentration area.

Artifact-driven testing

Phase I investigation had included two five-foot test units in the apparent center of the artifact concentration, labelled 12 and 13 in the excavation register. These two test squares formed the basis for a grid over the entire western site area.

A controlled surface collection, catalogued by ten-foot square, was to be the first step. Any patterns found in this survey were to be used in formulating the test pattern.

Chemistry-driven tests

Using results of soil chemical analysis, additional test squares were to be positioned over places where high quantities of significant elements were found. The combination of artifact concentrations and chemical markers, it was felt, would reliably indicate the activity areas on the site.

Experience would show, however, that the raw soil chemical data can be deceptive. The naive assumption that one need only find the obvious high spots in the chemical map, would be proven wrong. The chemical tests would not lie, but their interpretation would require statistical refinement before they would be useful.

The eastern field

Across the ditch, a different strategy was necessary. Since no artifact concentration had been identified, plowing and surface collection would be used to identify any concentrations. Subsurface testing in the most likely places would then be employed.

TABLE OF RESEARCH OPTIONS

ARCHÆOLOGICAL TECHNIQUES
THAT MAY BE CONSIDERED AT THE PHASE II OR PHASE III LEVELS.

Footnotes refer to recent or authoritative articles on a subject, as distinct from sources cited in the current project. These references do not necessarily appear in the bibliography at the back of this report, unless they were used.

Technique or method	*Research objective*	*Limitations and constraints*	*Applicability to this project*
Phytolith analysis	Identify wild or cultivated plant material in sealed and dated cultural deposits[1] Such data can aid in analysing diet, ground cover, and agricultural history	Requires a protected environment, such as dental calculus or sealed clay soil matrix. Otherwise, the phytoliths disperse into the surrounding soil. The technique is seldom useful unless there is a context that can be dated.	There are few questions about the cultivated species on this site, that could be answered most efficiently by phytolith analysis.
Blood residue	Determine the species that produced blood found on edged tools or weapons.[2] This data can provide information about the diet of prehistoric people. The most recent development in this area is the application of DNA analysis rather than blood protein analysis. Results have been promising in European cave sites, as far back as the middle paleolithic.[3]	Blood residues seldom survive in sandy soils or in other situations where leaching occurs. False positives are also a problem, requiring the use of multiple specimens and control samples.[4] Specialists in the field have recommended caution in accepting blood residue evidence.[5]	Well-drained soil is unlikely to preserve blood residues intact on edges of prehistoric stone implements. Samples must be harvested from samples that have been protected from leaching, as in caves, containers, or impermeable soils.
Pollen and related floral analysis	Define plant materials in a site's environment at some time in the past, in order to trace changes in historic climate and land use.[6]	Pollen grains deteriorate in the ground over time.[7] The context must be carefully defined when pollen or other plant material is recovered from cores.[8] Since pollens migrate downward in the soil of an open site, interpretation requires great skill, and considerable overhead.	The technique is most useful on prehistoric sites, but has been used effectively on some Euroamerican sites, where boggy deposits are present.

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W. D. Middleton and I. Rovner
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[2] Jay F. Custer, John Ilgenfritz, and Keith L. Doms
1988 Application of blood residue analysis techniques in the Middle Atlantic region. *Journal of Middle Atlantic Archæology* 4:99-104.
Inashima, Paul Y.
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1997 Recovery of mamalian DNA from Middle Paleolithic Stone Tools. *Journal of Archaeological Science* 24(7) 601-6132.

[4] A. P. Manning
1994 A cautionary note on the use of Hemastix and Dot-blot Assays for the detection and confirmation of archæological blood residues. *Journal of Archæological Science* 21(2):159-162.

[5] Elinor F. Downs and Jerold M. Lowenstein
1995 Identification of archæological blood protiens: a cautionary note. *Journal of Archæological Science* 22:11-16

[6] Lucinda McWeeney
1990 The potential of wood and charcoal as environmental and cultural indicators in Middle Atlantic archæological sites. *Journal of Middle Atlantic Archæology* 6:1-14.

[7] Gerald K. Kelso
1994 Pollen percolation rates in Euroamerican-era cultural deposits in the northeastern United States. *Journal of Archæological Science* 21(4):481-488.

[8] Gerald K. Kelso
1994 Palynology in historical rural-landscape studies: Great Meadows, Pennsylvania. *American Antiquity* 59(2): 359-372.

Technique or method	*Research objective*	*Limitations and constraints*	*Applicability to this project*
Radioactive carbon dating	Uses the known decay rate of certain carbon isotopes to date organic remains. Charcoal, shell, artifacts, or tissues can be dated, with varying degrees of reliability. Such dateable materials are then used to date associated diagnostic artifacts.[1]	Requires relatively large quantities of carbon to be recovered by methods that ensure purity; dates are often challenged when they are based on few or small samples. Unreliable for relatively recent sites because of wide margin for error.	Because the site is mostly post-contact, other dating techniques are more precise.
Flotation	Separates organic materials and small artifacts from the soil matrix, by using various devices that separate the heavy fractions from the buoyant ones.[2]	This labor-intensive technique should be considered only after it has been determined that small organic materials are present, and that they can provide unique information. Sampling methods are critical to the quality of laboratory results.[3]	Of little use in the plowzone, the method may be used to isolate seeds or other small organic remains in features with charred organic material.
Geomorphology and pedology	Allows the reconstruction of past landscapes and definition of natural layers through a study of forces that have caused soils to be deposited during the period of human occupation on a site.	Often suffers lacunæ for periods when soil was removed by natural processes, such as wind and water erosion.	Human abuse of the ecosystem through time can be interpreted through sediments. It may be worthwhile to look at the history of Hawkey Branch since agricultural runoff began.
Mean ceramic date	Calculates the mean date of a deposit by comparing the bracket dates for each ceramic type found in the deposit.[4] Later refinements, notably the work of Turnbaugh and Turnbaugh,[5] have allowed researchers to distinguish activity periods within otherwise undifferentiated collections.	The method does not distinguish among long-lasting ceramic types, and excludes large quantities of ill-documented vernacular wares. Does not take into account reuse or curation of discarded or obsolete artifacts.	Will be useful in pinpointing dates of features in areas of the site where large numbers of well-dated ceramic types are present.
Miller ceramic index	Formal analysis of nineteenth-century ceramics can be used to describe expenditure patterns on sites and to establish economic scaling of a site.[6]	Becomes clouded when the economic level of a site's occupants changes.	Most useful when there are large numbers of different nineteenth-century ceramics that can build a statistically valid database.
Clay pipe stem analysis	Because clay pipe stem bores became narrower through time, it is possible to date a site or deposit by measuring the bores of pipe stems found, provided the site was occupied before the middle of the eighteenth century.[7]	The method becomes accurate only when the number of pipes is very large, and when the pipes are all English. After the middle of the eighteenth century, a minimum bore was achieved, and change virtually stopped.	In Delaware, there seldom are enough pipe fragments for application of the Binford method, but a useful Harrington bar graph can be derived from as few as a dozen specimens.

[1] C. E. Buck, C. D. Litton, and A.F.M. Smith
1992 Calibration of radiocarbon results pertaining to related archæological events. *Journal of Archæological Sciences* 19:497-512.

[2] Roger W. Moeller
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1992 Testing old wives' tales in palæoethnobotany: a comparison of bulk and scatter sampling schemes from Pancán, Peru. *Journal of Archæological Science* 19:205-229.

[4] Stanley South
1978 Evolution and horizon as revealed in ceramic analysis in historical archæology. In Robert Schuyler, editor, *Historical Archæology: A guide to substantive and theoretical contributions.* Baywood Publishing Company, Inc.

[5] Turnbaugh, William, and Sarah Peabody Turnbaugh
1977 Alternative applications of the mean ceramic date concept for interpreting human behavior. *Historical Archaeology* 11:90-104.

[6] George L. Miller
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Lewis R. Binford
1978 A new method of calculating dates from kaolin pipe stem samples. In Robert Schuyler, editor, *Historical Archæology: A guide to substantive and theoretical contributions*. Baywood Publishing Company.

Technique or method	*Research objective*	*Limitations and constraints*	*Applicability to this project*
Soil chemistry	Can define intrasite activity areas by measuring chemical residues left in the ground by human activities.[1] The method has a long history of reliability.[2] Phosphorous enrichment in burial areas may be a particularly useful tool.[3]	Agricultural chemicals and industrial residues may mask archæological remains. Only the sample from the bottom of the A horizon may be considered informative.	The method is especially useful for defining intrasite relationships where relatively few subsurface features are expected, as here.
Primary historical research	Primary background research must be sufficient to explain events that may have shaped the site, and to identify the origin of all landscape elements. Intimate knowledge of local historical literature and unwritten lore is essential to the successful completion of a background history, especially at the Phase I level, when significant resources must be identified in the context of local history and culture.	A document is a witness only to itself, and must be evaluated only within the context that caused it to be created.[4] Documentary interpretation may be rendered worthless if misapplied. Some site occupants are not documented, and may be missed if their archæological remains are not sought.	The site is well documented, but it will be important to find peripheral records of the poor owners and tenants, especially since the occupants may have been acculturated Native Americans.
Water screening	Facilitates separation of small artifacts from matrices, including such difficult surrounding materials as clay and organic matter, by passing water through a sample on a fine mesh screen.[5]	Extremely labor-intensive method of reducing the matrix must be used selectively, even though the results may be much more satisfactory than dry recovery methods.	Fills of privies and other organic-rich features should always be sampled by water-screening.
Archeomagnetic dating	Determine the date of a fire by measuring the magnetic north and compass needle dip as reflected in the alignment of iron molecules in the burned soil. Recent studies have shown that it may be possible to distinguish between human-caused and natural fires.[6]	Requires a considerable local body of knowledge regarding the history of magnetic phenomena, but can be extremely precise when the data is available for the local area.	There is enough information on compass deviation in central Delaware to allow rough dating if a hearth is encountered, but the cost of analysis might exceed the benefits.
Harris matrix stratigraphic analysis	Identify and create a seriation for deposits through the use of a structural system.[7] The matrix is most useful on large complex sites with many cultural deposits.[8]	Harris matrix analysis is most effective at sorting many superpositions, in order to create a table in which each deposit is placed in its relative chronological order.	The Harris matrix is often useful, even on sites with few superpositions, when one needs help working out the logical sequence of features and events.

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[7] Edward C. Harris
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[8] Andrew Westman and Liz Shepherd
1992 From City site to research archive... *London Archæologist* volume 6, number 16 (Autumn):435-443.

Technique or method	*Research objective*	*Limitations and constraints*	*Applicability to this project*
Trace elements in human skeletal material	Barium, calcium, and strontium residues in human bone may be used to infer the individual's food preference between terrestrial and marine sources.[1] Isotopic analysis has been used to distinguish between individuals' youthful and mature diets.[2] Very old specimens can yield considerable data because the trace elements seldom leach out while the bone remains intact.[3] The method has been refined to the point where it is now possible to infer diet at different times of life from bone chemistry.[4]	Dietary sources of trace elements may vary in different parts of the world. A local database is necessary for interpretation of chemicals in bone. Such analyses could be useful in coastal sites to define the geographic limits of dependence upon seafood. Deterioration of collagen in older bone samples may limit the value of such analysis.[5]	This method has limited applicability, but should be kept in mind if human remains are recovered. At this site, bones might reveal a high marine dietary component, since fishing was a major subsistence method in this neighborhood during all periods.
Dendrochronology, or tree ring dating	If wood is preserved, it may be possible to determine the date it was felled by comparing tree rings in the specimen with a master table that includes other trees from the region, preferably of the same species.[6] Some useful work has been done with fragmentary specimens on sites where several contemporary or near-contemporary pieces of wood are present.[7] More recent information indicates that there are mathematical ways to overcome a lack of local cores.[8]	Requires good wood preservation, a proven local table of tree-ring thicknesses, and, ideally, the outermost layer of the log.[9] The method is most useful in arid areas, where rainfall fluctuations over broad areas will produce relatively uniform patterns.	Timber material from wells, submerged wooden structures, or the preserved timbers of standing structures, are the most likely places to find specimens for this sort of analysis.

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Technique or method	Research objective	Limitations and constraints	Applicability to this project
Subsurface transect surveys at fixed intervals along a fixed grid	Nonexclusive transect surveys, employing subsurface tests at fixed intervals, often are used to characterize a study area's general characteristics.	Such surveys are useful only in areas where the archæological environment is imperfectly understood. This method "is a slow, expensive, frustrating, and often marginally effective way to locate archeological sites. Small phenomena can still escape notice."[1] Recent studies suggest that tests at regular intervals on a foursquare grid are probably are the least effective method of finding cultural resources.[2]	Fixed interval testing is not indicated in most Delaware sites, where effective models exist, allowing more profitable selective sampling systems.
Controlled nonexclusive walkover survey after cultivation	The preferred method for identifying site locations, and activity areas within located sites, the 100% walkover is the most cost-effective survey.[3] Intrasite geography can be defined by using very small survey grid intervals.[4]	Æolian and alluvial deposits sometimes mask buried sites, even with 100% visibility. If no Holocene deposits have been added to the site, there are no limits on the possibilities of this technique in a plowed field.	A 50% cultivation walkover was used in the Phase I survey to locate resources, and 100% walkover is the selected method for defining the site at the Phase II level.
Sampling survey using predictive models	Predictive sampling surveys attempt to cover large areas with relatively smaller levels of effort by selecting certain units for investigation on the basis of pre-established criteria. Stratified sampling and other systems are constructed in order to reduce bias by directing attention to areas that might have been missed because of the observer's bias.	Sampling surveys are effective when formulating models, or to fine-tune a model for application in a large area. A well-designed sampling survey can produce reliable results if the method of selection is reliable.	Shovel-test transects were used to test low-likelihood areas at the Phase I level on this site, but would be inappropriate in areas where sites are expected.
Faunal analysis	Bone, fish scales, intestintal parasites, feathers, and other animal remains can provide information about dietary habits, economic status, ethnicity, and husbandry practices.	Significant deposits of materials are required in order for faunal analysis to provide a comprehensive picture of diet and resource utilization. Isolated bone remains seldom produce a comprehensive picture.	The soil is conducive to faunal remains being preserved, and a high water table promises to provide a permanently wet environment below grade.

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